CHRESTOMATHIA:

BEING

A COLLECTION OF PAPERS,

EXPLANATORY OF

THE DESIGN OF AN INSTITUTION,

PROPOSED TO BE SET ON FOOT

UNDER THE NAME OF

THE CHRESTOMATHIC DAY SCHOOL,

OR

CHRESTOMATHIC SCHOOL,

FOR THE

EXTENSION OF THE NEW SYSTEM OF INSTRUCTION TO THE HIGHER BRANCHES OF LEARNING,

FOR THE USE OF THE MIDDLING AND HIGHER RANKS IN LIFE.

BY JEREMY BENTHAM.

FIRST PUBLISHED IN 1816

INTRODUCTION BY THE EDITOR.

MR BENTHAM was one of the first to recognise the extraordinary improvement in the method of instruction developed by Mr Lancaster and modified and extended by Dr Bell. The account of the results attending its application to the acquisition of language, given by several eminent teachers from their own actual trial of it, and more especially the statements of Dr Russel, then Head-master of the Charter-house School, and of Mr Pillans and Mr Gray, masters of the High School of Edinburgh, (Appendix No. 2. and 3. pp. 59 and 61)—made a strong impression on Mr Bentham's mind. If it were true, as stated by Dr Russel, that since he had introduced into the Charter-house School books prepared on the simple principle of the Madras System, no boy had ever passed a sentence of which he was ignorant, nor been flogged on the ground of his learning; if it were true, as stated by Mr Gray, that since he had introduced this system into his school, his whole class had gained a more extensive knowledge of the Latin language than he had ever known on any former occasion; that *not a single boy* had failed; that it had enabled him *entirely to abolish corporal punishment*; that it had animated his whole school with one spirit, making them all advance in the intellectual career with the like ardour, and though not with equal success, without *a single failure*, and that Mr Lancaster had put into his hands an instrument which had enabled him to realize his fondest visions in his most sanguine mood;*—if such results were obtained by the application of this instrument to the acquisition of Latin and Greek, what, said Mr Bentham, may not be expected from its application to the whole field of knowledge? Are there not several branches to which it might be applied with still greater advantage than to language; and is there one which does not afford the promise of at least equal success?

Mr Bentham thought that these questions must be answered in the affirmative, and the great interest which he naturally took in this subject, was strengthened by the desire expressed by some friends of his, among whom were several statesmen and men of wealth, that the experiment should be tried; that a Day School should be opened for the children of the middle and higher classes, in which the principles of the new method should be applied, not only to the teaching of language, but of all the other branches of instruction which are ordinarily included in the curriculum of the highest schools. With his usual ardour, Mr Bentham immediately proposed that the school-house should be erected in his own garden, and that he himself should take a chief part in the superintendance of the school; at the same time his opulent friends agreed to supply the requisite funds.

But these arrangements having been determined on, Mr Bentham now saw that the most difficult part of the undertaking still remained to be accomplished. It was necessary to bring out the principles of the new method more distinctly than had yet been done, and to shape them into so many instruments, each capable of being applied, by ordinary hands, to its specific use: it was equally necessary to review the whole field of knowledge in order to ascertain to what branches of instruction these instruments might be applied with the greatest promise of success; and to what, if any, their application should not be attempted.

The accomplishment of such a project was well calculated to call forth all the energies of Mr Bentham's mind, and he immediately applied himself to the work. In the meantime, this new school and the devotion of Mr Bentham to the development of the plan of it, became matter of conversation among the philosophers, statesmen, and friends to education of the day. The determination which had been come to, to exclude Theology from the curriculum of instruction, on the ground that its inclusion would be pregnant with exclusion, was also very generally discussed. Alarm was taken at the rumour of this omission; and clerical influence was brought to bear upon the minds of some of the more opulent persons who had encouraged the project, with the ultimate result of causing them to abandon it. However he might regret the loss of support which had been so readily and confidently assured to him, Mr Bentham was not on that account to be turned aside from his purpose. He resolutely persevered in the completion of his part of the compact; and hence although there is no school in the garden of Queen Square Place, yet we have the Chrestomathia.

Whatever other useful purposes may result from the intellectual labour which has been spent upon the production of these papers, it will be found that they are capable of affording special and invaluable assistance to two different classes of persons. First to him who is desirous of developing and strengthening his own intellectual faculties, and of rendering his

* The essential excellence of this system is not lessened by its having been found to be practicable, after experience in the working of it, to improve the *mechanical* part of it.

mind capable of making some progress in the field of original thought and invention, and of extending the domain of science. Such a person should give his days and nights to the study of the instrument described in Appendix, p. 101—128, (and further illustrated in the work on Logic, p. 253 *et seq.*,) and to actual practice with it. There is no intellectual gymnasium from exercise in which a powerful mind will derive so great an accession of strength.

Secondly, to him who is desirous of improving the character of elementary school-books. In the first number of the *Westminster Review*, in an elaborate article written nearly twenty years ago, on the Chrestomathia, after an attempt to show, that, for perfect instruction in all the physical sciences, as well as in geometry, algebra, and language, nothing is requisite but elementary books adapted to the new system, the writer asks whether "it be too much to hope, that there are men of science, whose benevolence will induce them to undertake a labour which, humble as it may appear, can be performed only by a philosophical mind which has thoroughly mastered the art and science to be taught. Can any scholar be more nobly employed than in writing such a book on language? or any natural, moral, or political philosopher, than in disclosing to the youthful understanding, in the most lucid order, and in the plainest terms, the profound, which are always the simple, principles of his respective science."

Since Mr. Bentham wrote, the perception, in the public mind, has become more clear and strong, of the folly of consuming more than three-fourths of the invaluable time appropriated to education, "in scraping together," as Milton expresses it, "so much miserable Greek and Latin," by persons of the middle classes, to whom it is of no manner of use; to whose pursuits it bears no kind of relation; who, after all, acquire it so imperfectly, as to derive no pleasure from the future cultivation of it; who invariably neglect it as soon as they are released from the authority of school; and, in the lapse of a few years, allow every trace of it to be obliterated from the memory. Not only is it now generally admitted, that the subject-matter of instruction for these classes should consist of the physical sciences, as well as of language, but it is, moreover, beginning to be perceived, that some advantages would result to the community from opening the book of knowledge to the very lowest of the people; that everything which it is desirable to teach even the masses, is not comprehended in the facts, that there is a devil, a hell, a so-called heaven, a Sunday, and a church, but that there are things worthy of their attention connected with the objects of this present world,—the properties and relations of the air they breathe, the soil they cultivate, the plants they rear, the animals they tend, the materials they work upon in their different trades and manufactures,—the instruments with which they work,—the machinery by which a child is able to produce more than many men, and a single man to generate, combine, control, and direct a physical power superior to that of a thousand horses. There is a growing conviction, that the communication of knowledge of this kind to the working classes would make them better and happier men; and that the possession of such knowledge by these classes would be attended with no injury whatever to any other class. The want of elementary books is therefore becoming every day more urgent; nothing has yet been done to supply them; and yet here, in the Chrestomathia, there is a mine from which any competent hand might dig the material, and fashion the instrument.

The comprehensiveness of the view taken by one and the same mind, of every subject included in such a work as the Chrestomathia, cannot be expected to be equal; nor were all the subjects treated of by Mr Bentham left by him in a state which he regarded as complete. The papers which relate to Geometry and Algebra, in particular, appeared to require revision; and the Editor thought it right to place them for that purpose in the hands of a universally acknowledged master of these sciences. After a careful examination of these manuscripts by this gentleman, they were returned to the Editor, with the following observation:—"That although much has been done in relation to these subjects, on many of the points treated of by Mr Bentham, since the time at which he wrote, or so shortly before it, that he could not know of it; and though his views of first principles were unmatured by the consideration of their highest results, yet the publication of these papers, without alteration or omission, is still desirable, as exhibiting many useful, and several original, trains of thought; and offering many suggestions, of which, though some are imperfect, and others obsolete, the greater number may furnish matter for reflection even to those who have made the exact sciences more their special study than did Mr Bentham."

Several passages in this work will appear obscure, and a few perhaps unintelligible, owing to the occurrence in the manuscript of some words, so illegible, that those best acquainted with Mr Bentham's hand-writing have been unable to decypher them. The only liberty taken with the manuscript has been that of supplying, in these comparatively few cases, the best conjectural word that could be imagined. It has been deemed a duty to publish these papers in the state in which Mr Bentham left them, it being no part of the office of an Editor to intermeddle with the thoughts and expressions of the author.

SOUTHWOOD SMITH.

LONDON, *May*, 1841.

CONTENTS.

CHRESTOMATHIA.

FIRST PREFACE TO THE FIRST EDITION.

From the determination to employ the requisite mental labour, in addition to the requisite pecuniary means, in the endeavour to apply the newly invented system of instruction, to the ulterior branches of useful learning, followed the necessity of framing a scheme of instruction for the school, in which it was proposed that the experiment should be made.

From the necessity of framing this scheme, followed the necessity of making a selection among the various branches of learning—art-and-science-learning, as well as language-learning included.

From the necessity of making this selection, followed the necessity of taking a comprehensive—howsoever slight, and unavoidably hasty—survey, of the whole field.

In the course of this survey, several ideas presented themselves, of which some had for some forty or forty-five years been lying dormant, others were brought into existence by the occasion: and, which, appearing to afford a promise of being, in some degree, capable of being rendered subservient to the present design, were—after inquiry among books and men—supposed to have in them more or less of novelty, as well as use.

Introduced, though necessarily in a very abridged form, into the present collection of papers, they will, it is hoped, be productive of one effect—nor will it be deemed an irrelevant one—viz. the contributing to produce—in the breasts of the persons concerned, whether in the character of parents and guardians, or in the character of contributors to the fund necessary for the institution of the proposed experimental course, the assurance that, on the part of the proposed conductors, howsoever it may be in regard to ability, neither zeal nor industry are wanting: and that, having undertaken for the applying, to this, in some respects superior purpose, according to the best of their ability, the powers of the newly invented and so universally approved intellectual machine—their eyes, their hearts, and their hands will continue open, to every suggestion, that shall afford a prospect, of being in any way contributory, to so universally desirable an effect.

In regard to such part of Table II. as regards the PRINCIPLES of the *New Instruction System*, though of the *matter* itself, no part worth mentioning belongs to the author of the other parts, nor to any person other than those benefactors of mankind, whose title to it stands acknowledged by a perpetual chain of references—yet, in respect of the *arrangement*, which is altogether new, and the compression, which is studiously close—such is the convenience, which, it is hoped, will be found derivable from the summary, which (though for an ulterior and somewhat different purpose) is here given of it, that—even were this the only use of that summary—the labour here expended, though upon a soil already so rich, would not, it is hoped, be regarded as having been altogether unprofitably bestowed.

SECOND PREFACE TO THE FIRST EDITION.

In the Table of Contents, to wit in that part of it which regards the Appendix, the number of articles mentioned will be observed to be ten. Of these no more than four can at the present conjuncture be delivered. They have, however, been all of them written at least once over: and the fifth, which is longer than all the following ones put together, is completed for the press, and wants not much of being all printed. The rest, to fit them for the press, want nothing but to be revised.* How long, or how short soever, may be the portion of time still requisite for giving completion to the work, the purpose for which it was written admitted not ulterior delay, in the publication of such part of it as was in readiness. With

* The papers here spoken of, as not having been completed for the first edition, are incorporated in this edition.—*Ed.*

reference to the main purpose, it may, however, without any very material misconception, be considered as complete. In what is now made public will be found everything that can be considered as essential to the development of the plan of instruction. What remains is little more than what seemed necessary to give expression to a few ideas of the author's own, relative to the subjects which will be found mentioned: ideas, so far as he knows, peculiar to himself, and which had presented themselves as affording a hope of their giving, in different ways, more or less additional facility to the accomplishment of the useful purposes in view.

Time enough for their taking their chance for helping to recommend the plan, to the notice of such persons to whom, in the hope of obtaining their pecuniary assistance, the plan will come to be submitted, it has not been possible for him to get it in readiness: but, from the general intimation given of the topics in the Table of Contents, may be seen what is in view; and from the *first Preface*, together with what has just been said in this *second*, what progress has been made in it. Whatsoever assistance it may be found capable of contributing towards the accomplishment of the general object, thus much the reader may be assured of, viz. that, if life and faculties continue, everything that has thus been announced will be before the public in a few months, and long enough before the course of instruction can have placed any of its scholars in a condition to reap any benefit that may be found derivable from it.

Of this Appendix, No. I. is occupied by a paper there styled *Chrestomathic Proposal*. In concert with the public-spirited men, with whom the idea of the enterprise had originated, it was drawn up, at a time when it was thought that, by the circulation of that paper, such a conception of the plan might be afforded as might be sufficient for the obtaining such assistance as, either from pecuniary contributions, or from additional managing hands, should be found requisite. After the paper was printed in the form and in the place in which it will be seen, intervening incidents, and ulterior considerations having suggested various particulars, as being requisite—some to be added, others to be substituted—the task of drawing up a paper for this purpose, was undertaken by other hands. It will be seen, however, that *the plan of instruction* referred to being exactly the same, what difference there is turns upon no other point than some of those which relate to the *plan of management:* and even of these matters, as contained in the more recent paper in question, several will, it is believed, be found to receive more or less of explanation from the anterior paper, which, as above, will be seen reprinted in these pages.

On the length of the interval—which, between the printing of the *Preface*, and the sending to the press this Supplement to it, has elapsed—the author, though he has the satisfaction of thinking the commencement of the enterprise has not been retarded by it, cannot, on his own account, reflect without regret, nor altogether without shame. Under this pressure, his good fortune has, however, as will presently be seen, brought to him a consolation, superior to everything to which his hopes could have raised themselves.

The delay in question has had for its source the paper which, in the contents of the Appendix to this tract, will be seen distinguished by No. V. [IV.], and to which, at the top of each page, for a running title, the words, *On Nomenclature and Classification*, or *On the Construction of Encyclopedical Trees*—had been destined, but came too late to be employed. Of the number of sections which it contains, all but the 12th had been completed for the press, and all down to the 12th exclusive been delivered from the press—when, from a recent publication, a passage, of which what follows is a reprint, was put into the author's hands.

In it the reader will observe—and from an official hand of the first celebrity—a *certificate of difficulty*, indeed of something *more* than *difficulty*, applied to the very work, of which, in and by this same 12th section, the execution has been attempted. It will be found, in Volume I. of the Appendix to the new edition, termed, on the cover, the 4th and 5th, of the *Edinburgh Encyclopedia Britannica:* date on the cover, December 1815. It commences at the very commencement of the Preface, which has for its title, "PREFACE *to the* FIRST DISSERTATION, *containing some critical remarks on the Discourse prefixed to the French Encyclopedie.*"

"When I ventured," says Mr Stewart, "to undertake the task of contributing a Preliminary Dissertation to these supplemental volumes of the *Encyclopædia Britannica*, my original intention was, after the example of D'Alembert, to have begun with a general survey of the various departments of human knowledge. The outline of such a survey, sketched by the comprehensive genius of Bacon, together with the corrections and improvements suggested by his illustrious disciple, would, I thought, have rendered it comparatively easy to adapt their intellectual map to the present advanced state of the sciences; while the unrivalled authority which their united work has long maintained in the republic of letters, would, I flattered myself, have softened those criticisms which might be expected to be incurred by any similar attempt of a more modern hand. On a closer examination, however, of their labours, I found myself under the necessity of abandoning this design. Doubts immediately occurred to me with respect to their logical views, and soon terminated in a conviction, that these views are radically and essentially erroneous. Instead, therefore, of endeavouring to give additional currency to speculations which I conceived to be fundamentally un-

sound, I resolved to avail myself of the present opportunity to point out their most important defects;—defects which I am nevertheless very ready to acknowledge, it is much more easy to remark than to supply. The critical strictures, which in the course of this discussion I shall have occasion to offer on my predecessors, will, at the same time, account for my forbearing to substitute a new map of my own, instead of that to which the names of Bacon and D'Alembert have lent so great and so well-merited a celebrity; and may perhaps suggest a doubt, whether the period be yet arrived for hazarding again, with any reasonable prospect of success, a repetition of their bold experiment. For the length to which these strictures are likely to extend, the only apology I have to offer is, the peculiar importance of the questions to which they relate, and the high authority of the writers whose opinions I presume to controvert."

In the above-mentioned No. V. [IV.] the experiment thus spoken of will be seen hazarded: and, to help to show the demand for it, a critique on the *Map*, for which *Bacon* found materials and *D'Alembert* the graphical form, precedes it: a critique, penned by one, in whose eyes the most passionate admiration, conceived in early youth, afforded not a reason for suppressing any of the observations of an opposite tendency, which, on a close examination, have presented themselves to maturer age.

By an odd coincidence, each without the knowledge of the other, the Emeritus Professor and the author of these pages will be seen occupied in exactly the same task. The one quitted it, the other persevered in it: whether both, or one alone—and which, did right, the reader will have to judge. For an experiment, from which no suffering can ensue, unless it be to the *anima vilis*, by which it is made, no apology can be necessary. Having neither time nor eyes, for the reading of anything but what is of practical necessity, the above passage contains everything which the author will have read, in the book from which it is quoted, before the number in question is received from the press. To some readers—not to speak of instruction—it may perhaps be matter of amusement, to see in what coincident and in what different points of view, a field so vast in its extent has been presenting itself to two mutually distant pair of eyes,—and in what different manners it has accordingly been laboured in by two mutually distant pair of hands. To the author of these pages, in the present state of things, from any such comparison, time for the instruction being past, nothing better than embarrassment could have been the practical result: for the departed philosophers had already called forth from his pen a load already but too heavy for many a reader's patience.

On casting upon the ensuing pages a concluding glance, the eye of the author cannot but sympathize with that of the reader, in being struck with the singularity of a work, which, from the *running titles* to the pages, appears to consist of nothing but *Notes*. Had the whole together—text and notes—been printed in the ordinarily *folded* or *book* form, this singularity would have been avoided. But in the view taken of the matter by the author, it being impossible to form any tolerably adequate judgment on, or even conception of, the whole, without the means of carrying the eye, with unlimited velocity, over every part of the field,—and thus at pleasure ringing the changes upon the different orders, in which the several parts were capable of being surveyed and confronted,—hence the presenting them all together upon one and the same plane —or, in one word, *Table-wise*—became in his view a matter of necessity. But the matter of the text being thus treated *Table-wise*, to print it over again in the ordinary form would, it seemed, have been making an unnecessary addition to the bulk of the work. Hence it is that, while the *Notes* alone are printed *book-wise*, the *Text*, to which these *Notes* make reference, and without which there can be little expectation of its being intelligible, must be looked for in the *two first* of the Tables which will accompany this work—and which, out of a larger number, are the only ones that will accompany this first part of it.

Hence it happens, that, on pain of not extracting any ideas from the characters over which he casts his eye, the reader will find the trouble of spreading open the Tables, as he would so many maps, a necessary one. Even this trouble, slightly as it may be felt under the stimulus of any strongly exciting interest, will—as is but too well known to the Author, from observation, not to speak of experience—be but too apt to have the effect of an instrument of exclusion, on those minds, of which there are so many, of which the views extend not beyond the amusement of the moment. But, as above, whatsoever may be the risk attached to the singularity thus hazarded, it has presented itself as an unavoidable one.

CHRESTOMATHIA.

NOTES TO CHRESTOMATHIC TABLES.

TABLE I.

(a.) [*Chrestomathic.*] A WORD, formed from two Greek words, signifying *conducive to useful learning.* After it was framed, it was found employed in a book of the seventeenth century,* and would probably be to be found in other books.

(b.) [*Stages.*] In regard to the several *stages*, into which the proposed course is proposed to be divided, all that, in the present state of the undertaking, can be done, is—to give intimation of the *choice*, which, among the several possible subjects of instruction, has been made, and of the *order* in which it is proposed they shall succeed to one another. At this juncture, any such attempt as that of fixing the *quantity of time*, absolute and comparative, respectively to be allotted to them, would evidently be premature.

ADVANTAGES DERIVABLE FROM LEARNING OR INTELLECTUAL INSTRUCTION: viz.

I. *From learning, as such, in whatsoever particular* SHAPE *obtained.*

Advantage the First: Securing to the possessor a proportionable share of general respect. See Table I.

Advantage Second. Security against ennui, viz., the condition of him who, for want of something in prospect that would afford him pleasure, knows not what to do with himself: a malady to which, in retirement, men of business are particularly exposed.

(1.) For this sort of uneasy sensation, to which everywhere the human mind is exposed, the English language, in general, so much more copious than the French, affords no single worded appellative. The word *ennui* expresses the species of uneasiness; *désœuvrement*, another word for which the English language furnishes no equivalent, expresses the cause of the uneasiness. Ennui is the state of uneasiness, felt by him whose mind unoccupied, but without reproach, is on the look out for pleasure; pleasure in some one or more of all shapes; and beholds at the time no source which promises to afford it: désœuvrement is the state in which the mind, seeing before it nothing to be done, nothing in the shape of business or amusement which promises either security against pain or possession of pleasure, is left a prey to the sort of uneasiness just designated.

In the extent and variety of the ideas obtainable by instruction, are found security for that profit-yielding employment, commonly designated by the words livelihood and business; for the necessary security against the accidents of all sorts by which well-being may be impaired and being destroyed. For the designation of the means of securing being and well-being, the words—calling, vocation, and occupation, were commonly employed by our forefathers, meaning always, on these occasions, profit-yielding occupation, as the words—business, the means of livelihood, are employed by us their successors. The word avocation, a most incompetent and equivocal term, has of late years been vulgarly, and we may almost say commonly, obtruded upon the words calling, vocation, employment. A vocation is a *calling;* an avocation is a *calling off* Engaged in an avocation, a man is engaged in that, whereby being called off from everything, he is not left free to apply himself to anything.

In this same case, in which so efficient a security is afforded against pain in all its shapes, as well as against the extinction of all pleasures, may be seen an equally efficient and much more extensively necessary security against the pain of mental vacuity or ennui.

It is true, to a mind engaged in the toil of business, a state of repose is in the intervals of business a state of pleasure. For a time, yes; but, especially when the nature of the business includes not in it anything peculiarly toilsome, that time must be short, otherwise the pain of ennui soon succeeds to the pleasure of repose.

During the life of him who continues in business to the end of it, this pain seldom exceeds the measure of a slight uneasiness. But when remembering the anxieties, as well as toils, under which he had been labouring in the course of his business, the man of business seeks, in the absence of this source of toil and anxiety, a source of perpetual pleasure, he finds too often that the mere pleasure of repose is but a short-lived pleasure, and that its place is soon occupied by a pain of ennui which ends but with life.

To this pain of ennui, to which the man of industry is exposed only towards the end of

* An allusion, probably, to the Chrestomathia of Helladius published with notes by Meursius in 1606.—*Ed.*

CHRESTOMATHIC (a) INSTRUCTION TABLES. TABLE I.

Showing the several branches of INTELLECTUAL INSTRUCTION, included in the aggregate course, proposed to be carried on in the *Chrestomathic school:* together with the several STAGES, into which the course is proposed to be divided: accompanied with a brief view of the ADVANTAGES derivable from such Instruction: together with an intimation of the REASONS, by which the ORDER OF PRIORITY, herein observed, was suggested; and a List of BRANCHES OF INSTRUCTION OMITTED, with an indication of the *Grounds* of the omission.

N. B.—*The hard words, viz. those derived from the Greek or Latin, are throughout explained. Through necessity alone are they here employed. Under almost every one of these names will be found included objects already familiar in every family; even to children who have but just learnt to read.*

ADVANTAGES

derivable from Learning, or Intellectual Instruction: viz.

I. *From Learning as such;—in whatsoever particular* SHAPE *obtained.*

1. Securing to the possessor a proportionable share of *general respect.*
2. Security against *ennui*, viz. the condition of him who, for want of something in prospect that would afford him pleasure, *knows not what to do with himself* a malady, to which, on *retirement*, men of business are particularly exposed. (1.)
3. Security against *inordinate sensuality*, and its mischievous consequences. (2)
4. Security against *idleness*, and consequent *mischievousness* (3)
5. Security for admission into, and agreeable intercourse with, *good company* i. e company in, or from which, present and harmless pleasure, or future profit or security, or both, may be obtained

II. *From Learning, in this or that particular* SHAPE, *and more especially from the proposed course of* INTELLECTUAL INSTRUCTION.

1. Multitude and extent of the branches of *useful skill* and *knowledge* the possession of which is promised by this system, and at an early age (4)
2. Increased chance of lighting upon pursuits and employments most suitable to the powers and inclinations of the youthful mind, in every individual case. (5)
3. General strength of mind derivable from that multitude and extent of the branches of knowledge included in this course of instruction. (6)
4. Communication of mental strength considered in its application to the business chosen by each pupil, whatever that business may be. (7)
5. Giving to the youthful mind habits of order applicable to the most familiar, as well as to the highest purposes: good order, the great source of internal tranquillity, and instrument of good management. *See Stage* V. (8)
6. Possession of sources of comfort in various shapes, and security against discomfort in various shapes. *See, in particular, Stages* III and IV.
7. Security of life, as well as health: that blessing, without which no such thing as comfort can have place *See Stage* IV.
8. Security afforded against groundless terrors, mischievous impostures, and self-delusions. *See Stages* II. III. and IV. (9)
9. Securing an unexampled choice of well-informed companions through life. (10)
10. Affording to parents a more than ordinary relief from the labour, anxiety, and expense of time necessary to personal inspection. (11)
11. Unexampled cheapness of the instruction, in proportion to its value. (12.)
12. Least generally useful branches last administered; and thence, in case of necessity, omissible with least loss. (13)
13. Need and practice of corporeal punishment superseded: thence masters preserved from the guilt and reproach of cruelty and injustice (14)
14. Affording, to the first race of scholars, a mark of particular distinction and recommendation. (15)
15. Enlargement given to each scholar's field of occupation (16.)

OBJECTIONS answered.

1. Supposed impracticability. Granting your endeavour to be good, the accomplishment of it will not be possible (17.)
2. Disregard shown to classical learning, and other polite accomplishments. (18.)
3. Superficiality and confusedness of the conceptions thus obtainable. (19)
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of the proposed, to the existing great schools, universities, and other Didactic institutions. (21.)

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1. Novelty of the plan (23.)
2. Abstruseness of the subjects. (24.)

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Or circumstances, on which, as between one subject of intellectual instruction and another, the ORDER of PRIORITY in which they are most advantageously taught, depends.

1. On the part of the mind, the relative degree of PREPAREDNESS, with relation to the subject and mode of instruction in question.
2. The *natural pleasantness* (26.) of the subject.
3. The *artificial* pleasantness (27.) given to the subject, or mode of instruction.

OBSERVATIONS as to relative PREPAREDNESS.

I. *Circumstances on which such* PREPAREDNESS *depends.*

1. Corporeal ideas find the mind earlier prepared for their reception than incorporeal ones. (28)
2. Concrete, than abstract ones. (29.)
3. Ideas find the mind the earlier prepared for their reception, 1. the less they have in them of an *incorporeal* nature, 2. the less *extensive*, 3. *numerous*, 4. *various*, and 5. *complex* or *complicated* (30.) they are; and the less they include of what belongs to the relation between *cause* and *effect.* (31)

II. *Circumstances, on which such* PREPAREDNESS *does not depend.*

1. The *name*, more or less familiar or abstruse, of the *art* or *science* (32) under which the particular subject or object in question has been ranked.
2. The *antiquity* (33.) of the *art* or *science*, *i. e.* the length of time since the study of it happened to come into use.
3. The *number* of the persons who, in the respective capacities of *learners* and *teachers* (34.) happen to be, at the time in question, occupied in the art or science.

N. B.—*Before entrance*, the degree of PREPAREDNESS will, in the instance of each scholar, be ascertained by *examination. After* entrance, it may, in relation to an indefinite number of branches of instruction, and to an indefinite amount in each, happen to it to receive increase from sources *external* to the school. But of any such increase (the whole being *casual*) no account can, to any such purpose as that of modifying the course of the *school* instruction, be taken. The *absence* of all such increase is, therefore, the only supposition upon which any arrangement can be built.

INTRODUCTORY, Preparatory, or Elementary STAGE. (35.)

ELEMENTARY ARTS
1. Reading (taught by writing)
2. Writing.
3. Common Arithmetic.

And see Stage I.

STAGE I.

NATURAL HISTORY
1. Mineralogy. (36.)
2. Botany. (37.)
3. Zoology. (38.)

} exhibited in the most familiar points of view.

4. Geography (39) (the familiar part.)
5. Geometry (40) (the definitions explained by diagrams or models.)
6. Historical Chronology. (41)
7. Biographical Chronology. (42)
8. Appropriate Drawing. (43.)

STAGE II.

NATURAL PHILOSOPHY.

I. MECHANICS *at large.*

1. Mechanics in the limited sense of the word. (44)
2. Hydrostatics. (45.)
3. Hydraulics. (46)
4. Mechanical Pneumatics. (47.)
5. Acoustics. (48.)
6. Optics. (49.)

II. CHEMISTRY (50.) *at large;* including Chemical Pneumatics.

7. Mineral Chemistry. (51.)
8. Vegetable Chemistry. (52.)
9. Animal Chemistry (53.)
10. Meteorology. (54)

III. Subjects belonging to Chemistry and Mechanics jointly.

11. Magnetism. (55.)
12. Electricity. (56.)
13. Galvanism. (57.)
14. Ballistics. (58.)
15. Geography continued. (59.)
16. Geometry continued. (60.)
17. Historical Chronology continued. (61.)
18. Biographical Chronology continued.
19. Appropriate Drawing continued. (62.)
20. Grammatical Exercises, applied to English, Latin, Greek, French, and German, in conjunction. (63.)

STAGE III. (64.)

1. Mining. (65.)
2. Geognosy or Geology. (66.)
3. Land-Surveying and Measuring. (67.)
4. Architecture. (68.)
5. Husbandry (including Theory of Vegetation and Gardening.) (69)
6. Physical Economics, *i. e* Mechanics and Chemistry, applied to domestic management and the other common purposes of life. (70)
7. Geography continued.
8. Geometry continued.
9. History continued.
10. Biography continued.
11. Appropriate Drawing continued.
12. Grammatical Exercises, applied as above, continued.

STAGE IV.

HYGIASTICS, or HYGIANTICS (71) the art of preserving, as well as restoring Health, including the arts and sciences thereto belonging viz.
1. Physiology. (72)
2. Anatomy. (73.)
3. Pathology. (74)
4. Nosology. (75)
5. Diætetics. (76.)
6. Materia Medica. (77)
7. Prophylactics. (78.)
8. Therapeutics (79.) at large
9. Surgery, *i. e.* Mechanical Therapeutics. (80.)
10. Zohygiantics, *i. e.* Physiology, &c. applied to the inferior animals. (81.)
11. Phthisozoics, the art of destruction, applied to noxious animals. (82.)
12. Geography continued.
13. Geometry continued.
14. History continued.
15. Biography continued.
16. Appropriate Drawing continued.
17. Grammatical Exercises continued.

STAGE V.

MATHEMATICS. (83)
1. Geometry (84.) (with demonstrations.)
2. Arithmetic (85.) (the higher branches.)
3. Algebra (86.)
4. Uranological Geography. (87.)
5. Uranological Chronology. (88)
6. History continued.
7. Biography continued.
8. Appropriate Drawing continued.
9. Grammatical Exercises continued.
10. Technology, or Arts and Manufactures in general. (89.)
11. Book-keeping at large; *i. e.* the art of Registration or Recordation. (90.)
12. Commercial Book-keeping. (91.)
13. Note-taking (92.) applied to *Recapitulatory Lectures*, on such of the above branches as admit and require it.

BRANCHES OF INSTRUCTION *omitted;* viz. on one or more of the ensuing GROUNDS; to wit,

I. School-Room insufficient. (93.)

II. Admission pregnant with exclusion. (94.)

III. Time of life too early. (95.)

IV. Utility not sufficiently general; viz. as being limited to particular ranks or professions. (96.)

☞ In the instance of each branch, indication is given of the *ground* or *grounds* of *omission*, by the numerals prefixed as above.

I. GYMNASTIC EXERCISES. (97.)

1. Dancing. I.
2. Riding (the Great Horse.) I. III.
3. Fencing. I. III. IV.
4. Military Exercise. (98) I.

II. FINE ARTS.

5. 1. Music. I. II.
6. 2. Painting. I IV.
7. 3. Sculpture. I. IV.
8. 4. Engraving. I. IV.

III. APPLICATIONS of MECHANICS and CHEMISTRY.

9. 1. Gunnery I. II. IV.
10. 2. Fortification. I IV.
11. 3. Navigation I. IV.
12. 4. Art of War. I. III. IV. (99.)

IV. BELLES LETTRES.

13. 1. Literary Composition at large. (III)
14. 2. Poetical Composition. III.
15. 3. Rhetorical Composition. III.
16. 4. Criticism. III.

V. MORAL ARTS and SCIENCES.

17. 1. Divinity. II. III.
18. 2. Private Ethics or Morals (controverted points.) II. III. (100)
19. 3. Law (National.) III.
20. 4. International Law. III. IV.
21. 5. Art and Science of Legislation in general. III. IV
22. 6. Political Economy. III. IV.

VI. ALL-DIRECTING ART and SCIENCE.

23. Logic (by some called *Metaphysics.*) III.

N. B.—In regard to several of the branches in this list, the proposition by which the omission is prescribed, as likewise the *Ground* on which it is prescribed, may, in some way or other, be found susceptible of modification. But whatever may, in this or that instance, be thought of the *filling up*, the scheme of the outline may, it is hoped, be found to have its use.

☞ It is supposed that few, if any, existing branches of Art or Science can be found, which are not included in one or other of the Denominations inserted in this Table. In so far as this is the case, it may, in some measure, serve the purpose of an *Encyclopædical sketch.*

his career, the man of hereditary opulence stands exposed throughout the whole course of it. It is the endemical disease that hovers over the couch of him whose mind, though encompassed with the elements of felicity in the richest profusion, allows them, by neglecting them, to play a comparatively passive part. From uneasiness of this sort, the mind of him who has cultivated no more than a single branch of art or science, possesses a rarely insufficient policy of insurance. How much more complete the security of him who possesses in his own mind a richly stocked and variegated garden of art and science!

Of the value of this kind of advantage, a more striking and instructive example is scarcely to be found than that which is afforded by the case of Mr Beardmore, as reported in the Obituary of the "Gentleman's Magazine" for February 1814. "Died, Feb. 13, of a gradual decline, after having passed his grand climacteric with less visitation from indisposition of mind or body than happens to mankind in general, at his house in Owen's Row, Islington; calm from philosophical considerations, and resigned upon truly Christian principles; beloved, esteemed, and regretted by all who knew his worth, John Beardmore, Esq., formerly of the great porter-brewing firm of Calvert and Co., in Redcross Street, London. A stronger evidence of the fallaciousness of human joys, and of the advantages resulting from honest employment, can scarcely be pointed out than the life, the illness, and the death of this good man exhibited. Mr Beardmore was born in dependent circumstances, and of humble parentage, in the country. His constitution, naturally sound, was hardened by exercise; his frame of body, naturally athletic, was braced by temperance; his mind, naturally capacious, owed little to regular education. The theatre of life was his school and university, and in it he passed through all his degrees with increasing honours. For many years after his residence in London, Mr Beardmore acted as a clerk in the brewery in which he finally became a distinguished partner. When it was deemed proper to transfer the concern from Redcross Street, and to consolidate it with that in Campion Lane, Upper Thames Street, Mr Beardmore withdrew himself entirely from business, and retired to one of the houses which his brother William had left him at Islington, by will at his decease, some years before. From inclination active, and from habit indefatigably industrious, he had hitherto commanded such an exuberant flow of good spirits as made him the object of general remark among friends, whom his kindness and vivacity delighted. Early rising contributed much to the support of this happy and equable temperament. He preserved a memory richly stored with pleasant anecdotes, sprightly remarks, and useful information on a great variety of topics, derived not from books, but from living studies. He had acquired also a lively, popular facility of singing easy songs, to which a tuneful voice gave tolerable execution. For dull sedentary investigations of abstract science; for plodding mechanical, uninterrupted pursuits of didactic instruction, classical learning, or moral and theological knowledge, the gay, the heartsome John Beardmore, felt no wish, and avowed no relish. He was, as he often proudly declared, a 'true-born Englishman.' Humane by natural feelings, and charitable by a sense of religious duty, he passed through a life of honourable toil in business with an easy mind, with a light heart, and with an unsullied reputation. From the fatal hour in which he quitted business, however, he grew insensibly more and more the victim of listlessness and ennui. With high animal spirits; with a mind still active, and a body still robust; with confirmed health, independent property, an amiable wife, a plentiful table, and a social neighbourhood, Mr Beardmore was no longer 'at home' in his own house. The mainspring of action was now stopped. In all his pleasures, in all his engagements, for the day, for the week, or for the month, he was conscious of a vacuum, that, alas! his want of intellectual resources rendered him utterly unable to supply; he experienced now, perhaps for the first time, that intolerable *tædium vitæ*, which, like hope deferred, 'maketh the heart sick.' The result is soon told. Long did he bear up against the clouds that obscured his little horizon of domestic repose; at times, indeed, transient flashes of cheerfulness still gleamed athwart the gathering gloom; but the intervals between these bright seasons grew longer, and even their short duration lessened. Want of customary application brought on relaxation of activity; want of exercise brought on langour of body and depression of spirits; a train of evils ensued, comprising loss of appetite, nervous affections, debility mental and corporeal, despondency, sleeplessness, decay of nature, difficulty of respiration, weariness, pain and death."

Advantage Third Security against inordinate sensuality, and its mischievous consequences.

(2.) Against the pleasures of sense, over and above such objections as are in some cases drawn from the topic of religion, there are these grand heads of objection, that in the pursuit they are apt to lead into courses injurious to others, and, by the obstruction they occasion to necessary business, as well as by the loss of reputation, to a man's self, and that, through satiety, the consequence of full indulgence in them, they are apt to end in ennui—a pain for which they have left no cure. Not in any degree to diminish, but to increase to the utmost, the sum of innoxious enjoyment, is the object of this system. But, to secure that increase, it is necessary to render men duly sensible of the value, and to engage them in the steady pursuit of those perennial springs

of enjoyment which are the more productive the more copiously they are drawn upon, in preference to those which, in proportion as they are drawn upon to excess, yield in the shape of ennui, at the least, if not in still more afflicting shapes, pain and grief instead of the expected pleasure.

When it is by the apprehension of future evil that men are turned aside from the pursuit of present pleasure, the sacrifice, however prudent and even necessary, is still not the less a painful one. But, when it is by the expectation of still greater pleasure, whether near or more or less remote, that the diversion is occasioned, pain is not produced in any shape; the profit made is made without sacrifice, and the transition is only from a less to a greater pleasure. But, the greater the variety of the shapes in which pleasures of an intellectual nature are made to present themselves to view, and consequently the greater the degree of success and perfection with which the mind is prepared for the reception of intellectual pleasures, the greater the chance afforded of security from the pains by which sensual pleasures are encompassed, and the more advantageous the terms on which the purchase of that security is effected.

Advantage Fourth. Security against idleness and consequent mischievousness.

(3.) The connexion between mental vacuity and mischievousness is not as obvious as that between mental vacuity and sensuality; but it is not less natural and indisputable.

The notion which ascribes to inanimate nature the abhorrence of a vacuum, has been long spoken of as an ungrounded and whimsical conceit; had the notion been confined to human nature, it would not have been equally open to dispute.

A mind completely vacant, if any such there be, is a mind in which there exists neither pleasure nor pain, nor any expectation of either. But, scarcely has such a state of mind time to take place, when it is succeeded by ennui. Ennui, it has been shown, is a state of pain; and from pain in this shape, as from pain in every other shape, man seeks deliverance. That deliverance is attempted no otherwise than by the attempt to fill the vacuity with pleasures. The pleasures thereupon sought, consist in the gratification afforded to one or other of these appetites, namely, the self-regarding, the social, or the dissocial. To the self-regarding belong, as has been shown, sensuality. From gratification afforded to the social affection, not evil but good would be the result; but unfortunately, this result, in whatsoever degree beneficial, is of all of these the least natural. There remains only the dissocial class of affections. In human beings in general, and in human beings during the age of childhood in particular, what is called mischief, springs commonly either from curiosity, or love of sport; and in particular, that sort of sport, that pleasure of the imagination, of which in virtue of its novelty, whatever appears new, and affords in any shape, how indeterminate soever, the prospect of pleasure, is the natural source.

From this source it is, that mischief in the case of children, is most apt to spring. The other source is the dissocial affection, ill will or malevolence. Where love of sport is the source of action, the suffering which happens to be produced, is rather an accidental effect than a result aimed at; if it be among the results aimed at, the source of the action is not so much love of sport as malevolence.

What renders the love of sport dangerous, when not tempered or directed by that prudence or benevolence which is necessary to restrain it from seeking its gratification in actions productive of suffering, is that the love of sport exists at all times, and waits not for accident to call it forth; whereas, malevolence scarcely ever has place, unless excited by some particular incident having the effect of a provocation. A disposition to seek in the destruction of a house by fire, a gratification for revenge, is highly dangerous; but a disposition to seek in that same source, a gratification for the mere love of sport, unmixed with any portion of revenge or anger, is still more dangerous. From the former, no person has any thing to fear, excepting the comparatively small number of persons who have happened, by means of some special cause of displeasure, to have excited in the mind of the individual in question, the appetite of ill will; whereas, from the incendiary, who has been rendered such by the mere love of sport, every person has equally cause for fear who has property that stands equally exposed to destruction from fire.

If in any respect a disposition to sportive mischief is less formidable than a disposition to malicious mischief, it is because, in the first place, in the love of sport the passion is not near as strong as in the other case; and, secondly, because it is equally capable of finding gratification in results that are unattended with mischief; while the strength of malevolence is boundless, and nothing but the production of suffering can afford it gratification.

Thus it is, that weeds of all sorts, even the most poisonous, are the natural produce of the vacant mind. For the exclusion of these weeds, no species of husbandry is so effectual, as the filling the soil with flowers, such as the particular nature of the soil is best adapted to produce. What those flowers are can only be known from experiment; and the greater the variety that can be introduced, the greater the chance that the experiment will be attended with success.

Advantage Fifth: Security for admission into, and agreeable intercourse with, good company, *i. e.*, company in or from which, present and harmless pleasure, or future profit or security, or both, may be obtained.

II. *Advantages derivable from Learning in this or that particular shape, and more especially from the proposed Course of* INTELLECTUAL INSTRUCTION.

It may be of use to bring together, under one view, the advantageous results of which the proposed scheme of instruction seems to afford a promise; after that, an examination will be made of such objections as seem most likely to be opposed to it; answers will be subjoined, which will show that these objections are either inapplicable or inconclusive; and in addition, some circumstances will be stated serving to fortify the confidence with which the managers look forward to the accomplishment of the proposed objects, as well in regard to the efficiency of instruction as to the rate of progress.

Advantage First: Multitude and extent of the branches of useful skill and knowledge, the possession of which is promised by this system, and at an early age.

(4.) As to the multitude of the branches of useful instruction promised by this system, and the extent which they cover in the field of knowledge, these are points not exposed to doubt. Of this extent, the conception formed will be more and more correct and complete, the more closely the subject is examined. Whether with reference to the field of knowledge considered by itself, or with reference to whatsoever has hitherto been either executed or attempted at the most approved establishments, even in those in which the time allotted to instruction has no assigned limits, it will not be easy to find an example in which the quantity of useful knowledge, here proposed to be administered, has been equalled. Still less when consideration is had of the age, namely, fourteen years and no more, at which this mass of instruction is proposed to have been administered, and expected to have been administered with good fruit.

In relation to these points, whatsoever opposition the system may be destined to experience, will assuredly be built on very different grounds. The promise (it will be said) is too great to be accomplished; or supposing it accomplished, more evil will be produced in other shapes, than good in the shape of knowledge. Under the head of objections obviated, an answer will be given to both these surmises.

Advantage Second: Increased chance of lighting upon pursuits and employments most suitable to the powers and inclinations of the youthful mind in every individual case.

(5.) "Ah, what talents! Ah, what capabilities! Had but the opportunities and assistances necessary to the development of them, and turning them to account, fallen in his way." Under the existing system, lamentations to this effect are perhaps not much less reasonable and well grounded than they are frequent. To obviate this cause of regret, nothing is more manifest than that this system will be contributory, by the whole amount of the difference in point of variety and extent of instruction, which the lot of the pupil will exhibit, compared with what would have been his lot, had his qualities been improved by no better culture than such as an ordinary school, conducted under the existing system, can afford, or, what is but too common, been suffered to remain in a state of utter neglect up to the age of about fourteen—the age at which apprenticeship usually commences, and at which the course of instruction here proposed will have been gone through.

Advantage Third: General strength of mind derivable from that multitude and extent of the branches of knowledge included in this course of instruction.

(6.) If the objects presented in this course of instruction to the youthful mind, had no connexion with each other, no such beneficial result as that which is here announced could be expected. But amongst those objects, natural principles of order have place, and to apply those principles to the best advantage, will be the constant aim of the whole system from the beginning to the end. Every part having a natural connexion with every other, and every favourable occasion being embraced for bringing that connexion into view, every object will, by virtue of the principle of association, as often as it is presented, contribute more or less to fix every other in the memory, and thus to render the conception entertained of it so much the clearer. At the first stage, sensation and memory being the only faculties called directly into exercise, the conception may be expected to be proportionally faint and indistinct. But at each succeeding stage, not only will sensation and memory be applied to the subject matter, but the judgment will be applied to the observation of the points of agreement and diversity. In the first stage, the object will be exhibited in an isolated and quiescent state. At the succeeding stages, the same objects will be exhibited as parts of a moving scene, acting one upon another.

Advantage Fourth: Communication of mental strength considered in its application to the business chosen by each pupil, whatever that business may be.

(7.) Strengthened to so many comparatively arduous purposes, the mind of the pupil cannot be otherwise than strengthened to the purpose of the comparatively easy occupation, be it what it may, to which it is to apply itself with a view to obtain a livelihood. Between two minds equal by nature, the strength at each period of their growth, will be in proportion to the variety and extent of the ideas with which they have been impressed; and in this circumstance, may be seen the only cause of whatsoever difference there is between the mind of a well educated youth under the existing systems of education, and the mind of the Esquimaux, or the New Zealand savage at the same age.

From the immaturity and weakness exhibited by the minds of most children, under the present mode of culture, it would be wholly unjust to infer, that the imperfections would be similar under a system of culture, raised to that degree of improvement of which the human mind is capable. At present, the term of childhood is protracted, and the growth of the mind is retarded to an inordinate degree, by the state of inanimation in which it is kept. To the body, exercise of some sort, however childish, is necessary; not merely with a view to present comfort and that sort of general felicity which is termed good spirits, but with a view to future health and vigour. On the contrary, to the mind, even from the earliest period at which ideas begin to be received from surrounding objects, it is neither necessary nor useful in any way, that either the conversation, or the objects which that conversation takes for its subjects, should be of the cast commonly called childish; because, under the present system, children can have access to nothing better. When due attention is paid to adapting to the state of the youthful mind the objects which, for the sake of instruction, are presented to it, the difference between play and study is but nominal. Every task may be converted into play, if the task-master be but properly acquainted with his business.

That the minds of children, down to so late a period, continue in the sort of childish state, which at present is so general, is but the natural and necessary consequence of the sort of occupation, or no occupation, which they are left to find out for themselves, or to which they are put, and of the conversation with which they are surrounded: occupation put into their hands with no higher view than that of keeping them for the moment from being mischievous or troublesome: conversation composed of the prattling of ignorant persons of both sexes in the condition of servants. In the existing state of things, this utter absence of improving intercourse, coupled frequently with the abundance of corruptive intercourse; this hapless condition, though in every instance a misfortune, is scarcely in any instance a fault. The time of both parents is engrossed by the necessary business of the family, added to that of the shop, the counting-house, or the profession. The children, meantime, are left almost entirely to themselves, and to one another, under the casual inspection of a female servant.

By the proposed plan of instruction, the young mind will, for the greater part of the day, be rescued out of such hands.

Children, in whose minds, and thence in whose conversation, from the earliest dawn of reason, nothing of what is commonly understood as childish has had place, and on whose countenances all the time scarcely a cloud has been visible; children not less replete with vigour and felicity than with useful knowledge have fallen under the observation of several of the proposed managers.

Advantage Fifth: Giving to the youthful mind habits of order applicable to the most familiar, as well as to the highest, purposes: good order, the great source of internal tranquillity and instrument of good management. (See Stage V.)

(8.) In as far as the names of species, the names of the genera in which they are comprised, and of the orders and classes (or by whatsoever sets of names rising one above another in the scale of comprehensiveness the several groups of objects have been designated) are brought under review, in conjunction with natural history, a lesson in one of the most useful branches of logic, viz., the art of classification will have been administered—administered insensibly and without parade, but not the less effectually—and this without any additional time or trouble on the part of either teacher or learner.

In this way, and by this means, a foundation will be laid, and even at this early age, the mind insensibly prepared for the reception of a science destined for a superior stage, as being of the number of those for the attainment of which the exercise of a faculty of a higher order, the judgment, is necessary, viz., chemistry—a science in which more use is made of arrangement, and in which more importance is attached to that operation, than in any other.

When once formed, the habit of and the disposition to order, to whatsoever subjects it may have been first applied, is so easily and readily transferred to any and to every other, that it ought not to be matter of surprise, should the assertion be advanced, that by the habit thus implanted at the very opening of life, a man will find himself so much the better during the whole course down to the very close of it; and that, by what is thus gained at the day-school, the state of the house and family, whatever it may come to be, and the state of the shop, the counting-house, and the profession, whatever they may come to be, will, to a greater or less degree, be sure of being rendered better than they would otherwise have been.

Advantage Sixth Possession of sources of comfort in various shapes, and security against discomfort in various shapes. (See, in particular, Stages III. and IV.) Table I. (5.)

Advantage Seventh. Security of life, as well as health—that blessing, without which no such thing as comfort can have place. (See Stage IV.) Table I. (6.)

Advantage Eighth. Security afforded against groundless terrors, mischievous impostures, and self-delusions.

(9.) Numberless are the mischievous delusions to which a man is exposed by ignorance, against which knowledge presents the only preservative.

Of these delusions some operate to the pre-

judice of the person himself, others to the prejudice of persons in general, to an extent to which there are no limits but those by which this power of doing mischief is circumscribed.

Examples.—*Delusion* 1. *Hopes* of profit, in a mechanical establishment, from discovery of a practically applicable *perpetual motion*: *Preservative*—Acquaintance with the principles of *mechanics*. (See Stage II.)—*Delusion* 2. *Hopes* of profit, from discovery of what has been called the *philosopher's stone*: and thereby that of the art of converting less rare and costly metals into gold: *Preservative*—Acquaintance with the mineralogical branch of chemistry: (See Stage II.)—*Delusion* 3. *Hopes* of extravagant profit, from *manures*, the composition of which is kept secret: *Preservative*—Acquaintance with the *theory of vegetation*. (See Stage III.)—*Delusion* 4. *Hopes* of profit to health, by the use of *medicaments*, or modes of *medical treatment*, to which no such virtue as is believed or pretended to be believed, is attached: as in the case of *animal magnetism*, *tractorism*, &c. &c., and of medicaments in vast variety, prepared without sufficient acquaintance with, or attention to, the branches of art and science subservient to *Hygiantics*· *Preservative*—Acquaintance with those several branches of art and science. (See Stage IV.)—*Delusion* 5. *Hopes* and *fears*, derived from a supposed connexion, between the distant celestial bodies on the one part, and the well or ill being, of particular individuals among mankind, on the other part: *Preservative*—Acquaintance with *Uranology*, more frequently termed *Astronomy*. (See Stage V.)—6. *Fears*, derived from the opinion of the existence—and occasional operation or appearance—of *Ghosts*, *Vampires*, *Visible Devils*, *Witches*, and unembodied beings, of various sorts, actuated by the desire, and endued with the power, of doing mischief to mankind: *Preservative*—On the one hand, acquaintance with *Natural Philosophy* in general (see Stages II. III. IV. V.,) *i. e.* with the means by which, and the manner in which, effects beneficial and pernicious to mankind are really produced: on the other hand, in the nature of *human testimony*, in the imperfections of which, delusive notions sometimes find their *channel*, and sometimes have had their *source* in that propensity to be deceived, which is in the inverse ratio of the progress of true knowledge, and in that propensity to deceive others, which is in the inverse ratio of the progress of true morality: of these propensities, it is by *History* and *Biography* that the exemplifications, and thence the proofs, are furnished. In so far as it is from *Natural Philosophy*, that the preservative is derived, it belongs beyond doubt to the *Chrestomathic* course: in so far as it is from the principles of *Evidence*, and thence from *History* and *Biography*, the investigation and application of the remedy will, probably, according to general opinion, be regarded as belonging to a maturer and self-instructing time of life. For, on this head, the correctness, of whatsoever notions may come to be entertained, will depend—not, as in the case of *Natural Philosophy*, in a principal measure on the *senses* and the *memory*, but in a much greater degree upon the *judgment* or *judicial faculty*; and *that*, too, acting in each instance under the necessity of including, in the grounds of its decisions, collections of particulars, ample in extent multitude and variety, taken conjunctly into consideration, after having been brought all together into comparison for the purpose.

In knowledge in general, and in knowledge belonging to the physical department in particular, will the vast mass of mischief, of which perverted religion is the source, find its preventive remedy. It is from physical science alone that a man is capable of deriving that mental strength and that well-grounded confidence which renders him proof against so many groundless terrors flowing from that prolific source, which, by enabling him to see how prone to error the mind is on this ground, and thence how free such error is from all moral blame, disposes him to that forbearance towards supposed error, which men are so ready to preach and so reluctant to practise.

Advantage Ninth· Securing an unexampled choice of well-informed companions through life.

(10.) Among unfurnished minds, from the excitements it affords to sensuality, idleness, and mischievousness, company, in proportion to its abundance, is the great source of danger: hence, in the like proportion, will be the great source of security. The greater the multitude and variety of the sources of entertainment opened to his view, the greater is a person's chance of finding those which are suited to his taste; the greater the multitude of associates occupied along with him in seeking entertainment from each source, the stronger his assurance of meeting with that social co-operation from which labour receives so much relief, and pleasure so much increase.

At the end of a term of six or seven years, passed in company with so many hundred fellow-labourers and coadjutors, in occupations for which this scheme of instruction alone provides, nothing but that persevering course of bad behaviour, against which it affords a matchless security, can ever leave him at a loss for company, the agreeableness of which has been so amply provided for by the magnitude of the number open to his choice.

Advantage Tenth: Affording to parents a more than ordinary relief from the labour, anxiety, and expense of time necessary to personal inspection.

(11.) To the class of persons whose callings present an urgent demand for every moment of their time, during the hours of business, a temporary neglect of their children, if kept at home, is a misfortune, in a great degree,

unavoidable. In this state of things an expedient, not unfrequently resorted to, is that of sending the children to some day-school, however incompetent to the purpose of instruction, more for the assurance of keeping them under inspection, and thence out of harm, than for the hope of enabling them to make any considerable acquisition of useful knowledge. To all persons thus circumstanced, the particular value of an institution in which so much positive good is superadded to this sort of negative accommodation, is too obvious to need any further mention.

Advantage Eleventh: Unexampled cheapness of the instruction in proportion to its value.

(12.) That in proportion to the quantity and value of the instruction thus proposed to be administered, the cheapness is altogether without example, is a position, the truth of which will not admit of a moment's doubt. The price, say £6 per year for seven years, in all £42, for instruction in the list of branches proposed to be administered!

The cheapness of the price depends upon and is proportionate to, the quantity and variety of instruction administered in the given length of time. In this, if there be any thing to the proof of which words can be necessary, or so much as conducive, it is not to the fact or the degree of cheapness, supposing the service rendered, but to the possibility of its being rendered, and rendered in so short a space of time. Of the assumed possibility and probability, the expected causes are, therefore, the only objects which, on this occasion, can require to be brought to view.

These causes may be summed up under the following heads: 1. The use made of the Lancasterian method. 2. The largeness of the scale. 3. The care taken to adapt the species of instruction to the state of the pupil's faculties in respect of maturity.

1. As to the Lancasterian method, the efficiency of it is already matter of experience; experience so well established, that it was the very certainty and invariableness of success, to the extent to which it has hitherto been applied, that suggested the extended application of it here proposed.

2. As to the proposed magnitude of the scale, this advantage, though in its nature distinct from the peculiar method of teaching in question, is however among the fruits of it. That method may be used upon the smallest scale with the advantage peculiar to it; but it is only by the combination of expedients included in this method, that so unexampled a magnitude could be given to the scale, that instruction could be administered to so prodigious a multitude of scholars by the same person at the same time.

It is by means of the peculiar method of teaching that the number of scholars capable of receiving instruction from the same person, at the same time, is made to receive such great increase. It is from the magnitude of the number of the persons receiving instruction, under the same system of superintendence, that the sum required of each is capable of being to such a degree reduced. Being taught at one and the same time, by one and the same person, at one and the same place, various sources of expense which, on the existing plans are necessarily multiplied, are by this plan reduced to one:—one building, one general superintendent, constantly on the spot; one apparatus for warming, the same for lighting; one set of implements employed as instruments of instruction.

Moreover, many helps to instruction are easy to be procured; many helps unattainable otherwise than by that ample contribution, the burthen of which is rendered light by the multitude of contributors.

Advantage Twelfth: Least generally useful branches last administered, and thence, in case of necessity, omissible with least loss.

(13.) Of this arrangement the great practical use is, that when either the quantity of money, or of time to be spared for the purpose of instruction, is limited, instruction to the greatest amount, in regard to value, may be administered and received for a given quantity of money and of time; or, what amounts to the same thing, instruction of the greatest value is given at the least expense of money and time.

The coincidence which it is supposed will be seen to have place, and which, if it does, will be acknowledged to be a fortunate one, is, that for the most part those branches which are the most useful will be found the easiest and the pleasantest. Thus—

1. In the last stage of all comes mathematical science by itself. Of this branch considered apart and contradistinguished from mechanics, the usefulness will be found less extensive in respect to the number of persons to whom it can be of any use, and to the common purposes of life, than any other of the branches of instruction comprehended in this course. It is accordingly referred to the last stage; and hence those parents, in whose estimation the value of the instruction thus obtainable, will not afford a sufficient compensation for the time and money that can be spared for it, may stop at this point of the course.

2. In the last stage but one comes Medical Science by itself: multitude taking place of unity no otherwise than by the division of the one great whole into its component parts.

In speaking of this branch of knowledge as of less utility than any of those which it is proposed should precede it, the opinion thus expressed is rather the opinion regarded as likely to be the prevalent one, than an opinion with which the authors of the plan are themselves impressed. To the claim it makes to precedence in competition with mathematical science, they can give their support with much

less diffidence. Unless in the case of a person who, by profession, or in the gratification of a predominant taste, is devoted to the mathematics, they can affirm, without hesitation, not only that health and strength themselves are, in relation to being and well-being, of more value than abstract ideas of circles, triangles, squares, or even the highest exemplified or imaginable orders of curves, but even that the difference in respect of security that may reasonably be expected for those blessings, by means of the proffered instruction, in comparison with the degree of security of which a man, not designed for the medical profession, would otherwise be in possession, would, with a degree of persuasion proportioned to the intensity of the attention bestowed upon the comparison, be found to be possessed of the alleged superiority in point of substantial value.

This persuasion would still have place, even though the portion of time allotted to instruction in this branch of useful knowledge were accelerated; and in such sort accelerated that it should be administered antecedently to those portions of Natural History and Natural Philosophy which respectively contribute to form its basis. But, forasmuch as these introductory branches are included in the present plan, were that of medicine, stript of these supports, taught at an earlier stage, some of those other branches themselves, so constantly and indispensably useful, might to some individuals be lost. Hence, upon the whole it was thought best to postpone this branch of instruction to that stage at which it could be administered to most advantage.

3. In the third stage, and not before the above-mentioned two, come Architecture and Husbandry. Of these two branches of instruction, the utility is too obvious to be in danger of finding contradiction from any person. To the purpose of direct application to practice, the utility of them, in comparison with that of the branches which immediately precede them, is in point of extent, as measured by the relative number of persons likely to derive from them any material information, limited and narrow. Here, then, may be seen a stage at which a portion of the whole number of scholars might in case of pressure, either in respect of time or money, make a stand.

4. There remain for consideration the two first stages; and here it cannot but be confessed, and even professed, that the advantage stops. Unless it were for innoxious amusement, invigoration, and mental enlargement, without the second stage of instruction, whatsoever is contained in the first would, comparatively speaking at least, not to say absolutely, be of little value. It is chiefly for the sake of the second, and to serve for introduction to the second, and this at a time when the juvenile mind would not be ripe enough for the reception of the second, that the first stage is received into the course.

With regard to what is here said on the subject of eventual premature departure, the persuasion entertained by the authors of this plan, would be very much misconceived, if the supposition were, that in their opinion any thing less than irresistible necessity could serve as a sufficient warrant for any such relinquishment. By thus quitting the course at the commencement of a posterior stage, the loss which the scholar would sustain would be not only the whole of the instruction comprehended in that stage, but a portion more or less considerable of the mass of instruction comprehended in the several preceding stages. For, that nothing which has once been gained be lost, one of the fundamental maxims of this institution is, that whatsoever thread of instruction has once been begun upon, should be carried on to the very end. In a great measure, this, the chain whereby in the proposed course, the several branches of instruction are linked together, will suffice for the purpose of this unremitting continuance; and when this natural means fails, care is intended to be taken for supplying the deficiency by repetitions and re-exhibitions made for this express purpose.

Advantage Thirteenth: Need and practice of corporeal punishment superseded; thence masters preserved from the guilt and reproach of cruelty and injustice.

(14.) In regard to this advantage, the assurance of success stands on firmer ground than in the instance of any of the preceding advantages,—that of direct experience, as exhibited in the improved system of education under both its modifications, viz., in the one pursued by the Rev. Dr Bell, and in that pursued by Mr Lancaster. It belongs not, therefore, to the additional story here proposed to be erected on that fabric, in contradistinction to the original building; but to the whole structure together, in contradistinction to the unimproved methods followed in schools in general.

In no school conducted upon either of those plans, is any use made of corporeally afflictive punishment in any form, and in particular in that of flogging. In the Lancasterian mode, it cannot be said, that, on the occasion of punishment, the person remains in every instance, altogether unafflicted. But, in whatsoever shape punishment is applied to any part of the body, no bodily pain is produced; of the suffering, such as it is, the seat is not in the body but in the mind.

Under the Lancasterian mode, the severest punishment ever known to be inflicted is, if it can with any propriety be termed a corporeal punishment, at any rate of this mild and innoxious nature; and in Dr Bell's, nothing, it should seem, that can in any way be termed corporeal punishment, has ever been in use.

On this occasion, a singular contrast presents itself to view. During their non-age, the children of the very lowest ranks in society, are in a way to be liberated, and in no incon-

siderable number, have actually been liberated from a species of affliction and debasement to which the very highest remain subjected. Under the present plan, the exemption will, at any rate, be extended to the middle ranks; and the highest may have the benefit of it if they please. It is a question not unworthy the consideration of mothers, even in the highest rank, whether they will have their sons taught a smattering of Latin and Greek by tasks and flogging at Eton, Winchester, and the Royal School at Westminster, or in the way of pastime (without flogging) at the Chrestomathic School, within view of the august royal one.

In this aspect may be seen another advantage which, though to the proposed plan it belongs no otherwise than in its character of an extension given to the Bell and Lancaster plan, belongs to it not the less unquestionably, and that in contradistinction to the mode of instruction still pursued in the great and old established schools.

Under the system of flogging, coupled with the system of tasking, the flogging applied to the enforcement of the task-work, among the multitude of offences of which that system is constantly prolific, an incident which can never fail to happen now and then, under the most careful and irreproachable master, and is sure to happen every now and then under an ordinary master, is an act of punishment which, being by hastiness or wrong inference from the evidence really undue, is seen by the scholars to be so. As often as such an incident takes place, the imputation of injustice attaches itself to the character of the master, under whose order the punishment has been inflicted; and with a degree of strength proportionate to the severity of the infliction, the imputation of cruelty attaches itself to that of injustice.

Advantage Fourteenth: Affording to the first race of scholars a mark of particular distinction and recommendation.

(15.) What is common to all affords no distinction to any, and accordingly the more extensive the progress of this system of education, the less will be the advantage it is capable of affording in this particular shape. At the outset, however, and on the supposition that in other respects, the prospects held out by it are found to be realized, this advantage cannot but be a very substantial one. Every case in which, between a scholar of the Chrestomathic School, and a scholar of any ordinary school (not to mention a boy who has not been to any school,) a competition on any grounds has taken place, the advantage which will be possessed by the superiorly-instructed boy, is such, the estimation of which may be safely left to any one whose eyes have glanced over the preceding pages. This advantage, inseparably attached to the very nature of the case, may be considered as a premium, which in cases even of the most moderate degree of success the first comer will be sure to reap.

Advantage Fifteenth: Enlargement given to each scholar's field of occupation.

(16.) The more things he is more or less acquainted with, the more things he is fit for, and the better chance he has acquired of meeting with some *occupation*, (pecuniary-profit-yielding or not,) according to his *condition*, which shall be at once within his *power*, and suited to his *taste*.

Objections Answered.

Having considered the advantages promised by the proposed course of Intellectual Instruction, it may be of use now to consider the objections which may be urged against it.

Objection First: Supposed impracticability. Granting your endeavour to be good, the accomplishment of it will not be possible.

(17.) *Answer*. The experiment being yet to make, no answer can be deduced from experience, that is, from direct and identical experience. From analogy must be sought the only ground of assurance of which the nature of the case admits.

1. The first ground of assurance is this, viz, That the difficulties attendant on the reception of the mass of instruction in question, are not so great as it is natural that to a hasty glance they should appear to be.

One circumstance by which the difficulty will be apt to be painted in exaggerated colours is, the abstruseness of the names by which, in a number of instances, the branches of art and science are designated. This objection, having its root in prejudice, will be considered in the section allotted to the examination of opposing prejudices.

2. Another ground of assurance is constituted by the experienced strength of the newly devised instrument which will be employed, viz, the instrument composed of the helps to instruction, the assemblage of which constitutes the Lancasterian method. By this method, instruction has now, for several years, and with incontestable success, been administered in a like simultaneous manner, to a number of scholars as great as the number here proposed; indeed greater; forasmuch as, under the former plan, it being intended that of the whole number, a division should be made for some purposes, it will seldom happen that the instruction should be administered to the whole number at once.

To the branches of art and science here in question, the instrument in question was not applied on the occasion of the successful experiment; not to any of them, but, to a species of instruction which, in respect of real difficulty of reception (prejudice from novelty and unfamiliar names apart) will be found to exceed by far the species of instruction here administered at the earliest stage, by which the youthful mind will be so effectually prepared for the reception of ulterior instruction at the several ulterior stages.

Notwithstanding the earliness of the age at which this instruction is proposed to be concluded, it may be affirmed with confidence that, of all the branches of instruction here proposed to be administered, there is not one the reception of which will, at the age at which it is proposed to be administered, be attended with a degree of difficulty as great as that which attends the reception of the art of reading and writing, at the age at which they are commonly taught according to the established practice.

Of all the branches of instruction, with the exception, perhaps, of mathematics, which under the proposed system is put off to the last stage, that which is composed of the rules of grammar, especially as applied to a dead language, will be generally acknowledged to be the most crabbed and repulsive; and in that respect opposed by the heaviest load of difficulty. Fortunately, the applicability of this system, with the most complete success, to the most difficult purpose, is already put out of doubt by experience. This is proved indisputably by the testimony of a witness, whose evidence on this subject, it is presumed, every one will admit to be decisive. See Letter of Mr James Gray, Master of the High School of Edinburgh. Appendix, No. III

Objection Second Disregard shown to classical learning, and other polite accomplishments.

(18.) Under the present system, no sooner are the first difficulties surmounted that stand in the way of the art of reading, the art of writing a legible hand, and the art of vulgar arithmetic, as comprised in a few of the first rules, than the scholar is more or less instructed in the rudiments of the Latin tongue. To this accomplishment, a preference is thus given as compared with all ulterior accomplishments. Under the proposed system of instruction, ornamental and respectable as it is, and necessary as it is to raise the scholar above the imputation of vulgar ignorance, it is in a manner put aside, and placed in the back-ground.

Answer: The disregard, if any, is only comparative, not positive. Considerable will be the disappointment of the contrivers of this plan, if at the end of the proposed six or seven years' course of instruction, conducted upon the principles here explained, the proficiency of the scholar in Latin and Greek, or at least in one of these languages, will not be found to outstrip, instead of falling short of the ordinary rate.

In as far as this expectation seems to be verified by experience, this objection falls to the ground.

But even supposing, that instead of being but comparative, which is as much as to say not real and effective, it were absolute, the objection would not, they confess, appear in their eyes a substantial one. By the middle rank of life, for the use of which the proposed system of instruction is designed, useful and not merely ornamental instruction is required. Except in as far as ornamental is considered as a species of useful, or a well-grounded acquaintance with his own language is regarded as useful, to one in a situation above that of a man whose subsistence does not depend on severe toil or manual labour, no degree of acquaintance with any of the dead languages can surely be placed to the account of use;—it cannot, unless in the case where it has been but the ladder by which the scholar has been conducted to a much higher degree of proficiency, have contributed in any considerable degree to the furnishing him with the means of securing a more comfortable subsistence, or have furnished him with the means of innoxious and inexpensive entertainment during his vacant hours; whereas the proposed system promises in an inexhaustible variety of ways, to be subservient to both those incontestably useful purposes.

For the purpose of any one of the learned professions, Law, Physic, or Divinity, no doubt but that an acquaintance with the dead languages, meaning the two classical ones of Latin and Greek, may well be considered a matter even of necessity, much more of simple use. But for any youth destined to the exercise of any one of those elevated professions, this system of education is not designed; and in the instance of any person so destined, should the parents condescend to give acceptance to the sort of instruction here proffered, what remains of the quantity of time at present allotted to a course of preparation for these professions, will afford ample room for additional instruction in those relatively necessary shapes.

Though with a view to the bar or the pulpit, not to speak of the bed of sickness, the possession of a considerable acquaintance with the dead languages may, in a general view, be considered as necessary, this necessity, especially if comparison be had with the system of instruction here proposed, will hardly be regarded as having place, with relation to a yet more exalted theatre, the House of Commons. Take two men, one of them capable of rendering into English without premeditation (not perhaps that any such person ever had existence,) any sentence whatsoever, in every one of the Greek and Latin classics extant, but unacquainted with any of the branches of art and science beyond common arithmetic included in this system,—the other acquainted with every one of them, in the degree in which an average scholar may be generally expected to be acquainted with them, but unable to render into English any such sentence, which of these two men, on the occasion of the ordinary details of parliamentary business, will be likely to find himself most at home? Without much danger of contradiction, the answer may surely be, he who has passed through the proposed course of practically useful instruction The classical scholar may be better qualified for decorating his speech with rheto-

rical flowers; but the chrestomathic scholar, after a familiar and thorough acquaintance has been contracted with things, with things of all sorts, will be, in a much more useful and efficient way, qualified for the general course of parliamentary business.

As to the classical authors, Greek and Roman, to any such purpose as the present, the question is not what they knew, but what, by the study of them, is at this time of day to be learnt from them, more than is to be learnt without reading them. Such is the question, and the answer is—not anything. Among the branches of art and science included in the present system of instruction, many there are of which they had not so much as a suspicion of their existence. With no one of them had they any degree of acquaintance approaching to that which is to be obtained from modern and English authors; and if on the part of any of them, any superior degree of acquaintance really had place, still no need is there of any acquaintance with the originals; forasmuch as there is not one of them of which a translation into English is not to be found. Not even for the purpose of history, were that comprised within the present scheme, would any acquaintance with these authors in the original be of any substantial use; for of the historians, at any rate, there is not one of which translations into English are not to be found. For the purpose of poetry and oratory—yes, let it be allowed; though the most illustrious of our poets, as well as some of our most impressive and efficient speakers, are known to have been destitute of all classical learning, except through the medium of translation, and that before any translations that are now read had come into existence.

Objection Third: Superficiality and confusedness of the conceptions thus obtainable.

(19.) A smattering of many things—a thorough or useful acquaintance with nothing, such will some regard as the species and degree of instruction afforded, on whom an unfavourable impression may have been made, by the very variety of the instruction here proposed to be communicated.

Answer: That in the case of no individual the result may prove to be of this undesirable kind, is too much to be asserted. But to any practical purpose, to any such purpose as that of determining the choice of parents, as between the proposed system of instruction, and such others as would be within their reach, the question is not, whether instances may not occur in which the result would be thus unfavourable, but whether, under the proposed institution, the inconvenience in question seems likely to be greater in degree, and of more frequent occurrence, than in such institution as would otherwise be the object of their choice.

In relation to this head, what is manifest is that, as antecedently to actual experience, even on the supposition of subsequent success, nothing of the nature of demonstration can be delivered, so neither antecedently to experience, ought anything of that nature to be demanded.

That under the customary system of instruction such should not unfrequently be the effect, is no more than may be reasonably expected. Why?

1. Because in preference, if not to the exclusion of things, the subjects of instruction are words, mere words.

2. Because in as far as things are among the subjects of instruction, many are talked of, few, if any, are exhibited and brought under the cognizance of sense.

3. Because no use is made of those leading principles of order, of which, under the system here proposed, so much advantage is taken: the calling first into exercise the faculties which are the first to ripen; the proceeding from the most simple subjects to the more complex,—that is, to the more and more complex, in which the more simple are respectively included; and thence the frequent re-exhibition of the same subjects; while the points of view in which they are thus represented on the different occasions are changed.

The bringing so many, and most of them such widely extending masses of instruction, within so comparatively small a compass in point of time, will be apt to be productive of a sort of doubt and jealousy which is too natural and too plausible, and, in a certain point of view, too well grounded to be suffered to pass altogether without notice. Such a variety and multitude of things crowded together,—and to attempt to force all these things at once into the minds of such young children! One thing must drive out another, instead of their being all of them learnt, at least to any useful purpose; and what at length may stick, will be no better than a confused hodge-potch, composed of odds and ends.

The smaller a man's acquaintance is with the several subjects of instruction comprehended in the proposed plan, the more formidable will the sum-total of them be apt to appear; and thence the stronger the impression which any obstacle of this tendency will be apt to make on his mind: and the misfortune is, that the number of persons whose state of mind will thus render them unfavourable to the plan is likely to be very great,—much greater than could be wished.

In proportion, however, as attention is given to experience, to established and incontrovertible matters of fact, this prejudice must diminish. Of the branches of instruction which present the most formidable aspect, viz. of the branches of Natural History and Natural Philosophy, with their respective hard names, there is not one to which a space of time will not be allotted, several times greater than the greatest that has been respectively allotted to the same branch of instruction, in the most particular courses,

that are as yet known to have been anywhere delivered. In this instance the age of the learner will indeed be less mature than in any of those instances. But for the operation of this cause of inferiority, the allowance made will be ample. Nor ought it ever to be forgotten, however apt it may be to be forgotten, that the branches of knowledge which, by reason of the unfamiliarity of their names, present this formidable aspect, are in almost every instance less difficult to learn, than those dry and speculative grammatical rules, with their applications, and the tasks belonging to them, and the obligation that arises out of them, of penning discourses in prose and verse, in a dead language; those tasks which, because it has been the custom so to do, are without a thought about the difficulty, universally under the established system, put into the hands of children at ages less mature than the earliest of those at which, under this new system, it is proposed to apply to their youthful minds instruction in various forms, selected on account of their simplicity, and of the promise they afford of converting the sort of employment which hitherto has been the source of immediate and almost universal pain, into a source of immediate and absolutely universal pleasure.

Not less erroneous than disheartening would the inference be, if, from the observation of the smallness of the progress hitherto made in the old established branches of instruction, according to the old established methods, in the old established schools, any such inference were deduced, as that the nature of the case admitted not of any considerably more correct and complete body of instruction, or any considerably greater rate of progress. To the degree of inefficiency and slowness which, by original weakness, the result of the immaturity and barbarism of the age,—by original weakness, followed by habitual and day-by-day more firmly rooted prejudice,—is capable of being established, there are absolutely no limits. At Christ's Hospital, for example, to two or three years consumed in learning the rudiments of Latin grammar, succeed two or three years which are employed in forgetting those rudiments; while, in addition to the art of writing, the rudiments of arithmetic are endeavoured to be learnt. After the course thus completed of learning and forgetting, if a select few are applied to drawing, or reapplied to grammar, and to Latin and Greek taught by means of it; it were strange indeed, if in such a multitude, a small number were not actually found who wrote well, another small number who drew well, and another who, with or without the benefit of being sent to the university, to enjoy the provision attached to the school foundation, acquire in a greater or less degree that sort of acquaintance with the Greek and Latin classics which denominates a man a good scholar.

But from the examples of inefficiency and tardiness, were they even more egregious and numerous than they are, the inference would be not less unreasonable than discouraging if it were concluded that efficiency and despatch are impossible. It would be as if, from the abundance of snails and sloths, it were concluded that no such animal as a race-horse could have existence.

Among the great variety of subjects of instruction, comprised in the proposed system, doubtless the Lancaster exercise, and the mode of employing the pupils as teachers, are not applied to every one with equal advantage. But the conductors of the proposed system are aware of these difficulties, and alive to every practical expedient, for removing whatsoever disadvantages, as well as for making the most of whatsoever advantages the nature of each particular case may be found to afford.

Nor on this occasion should the advantage afforded by the proportioning easiness to facility, by teaching those things first which, in their own nature, are the easiest to learn, be ever out of sight. On the plan begun under an entirely different state of society, and continued by custom, the course of study being predetermined, and without regard to the state of the mental faculties, forced, or endeavoured to be forced, into the mind by terror and compulsion at its tenderest age; on this plan, measure is taken of the state of the faculties at the several different ages, and in each instance the species of instruction is fitted to it.

Objection Fourth: Uppishness a probable result of the distinctions thus obtained.

(20.) Against an accusation in itself so unsubstantial, it is no easy matter to make a substantial defence. The first thing to be done is to ascertain the meaning of the charge; and there is the difficulty. Let us hazard a conjecture. It is from the superior classes alone that such a charge can come. Coming from such a quarter, can anything but this be the meaning of it;—the superiority which in so many respects we possess over those whom we behold below us will be insufficient, and even the continuance of it will be precarious, if in respect of useful knowledge, in the several shapes in question, those who are now our inferiors should become our equals,—much more, should they become our superiors; for, continuing to receive at their hands that respect and obsequiousness which we possess at present, the wealth of such of us as have wealth, the power of such of us as have power, the dignity of such of us as have dignity, will no longer be sufficient.

On the subject of any such result, should it really be apprehended and regarded in the character of a grievance, two observations present themselves.

1. Supposing the apprehended result realized, the mischief of it does not seem very serious or explicit. Of the substantial causes of superiority, viz., opulence, power, and dignity, it does not well appear how their existence is

threatened by it. Of one cause, or supposed cause, viz., the superiority in respect of useful knowledge, the amount will indeed be lessened, but by this, security will not in any shape be shaken or diminished. And if this be true, security remaining undisturbed, the gainers being so many more than the losers, while the loss is but comparative and not positive, how any balance should exist on the side of mischief seems not easy to determine. Nor at the expense of the higher classes will any such diminution of superiority in the single point in question—any such diminution of superiority in respect of useful knowledge—have place, any further than it is their own pleasure that it should have place. To add to whatsoever proficiency their now inferiors possess in respect of useful instruction, a superiority in all those branches of ornamental instruction, of which the exclusive possession will continue their own, will always depend upon themselves. To the supposed inferiors, no branches of useful instruction will be laid open, which will not be equally open to the supposed superiors. If under the impulse of emulation, or any other spring of action, they are driven to keep pace in improvement with those apprehended rivals, so much the better for themselves: if by indolence they are kept where they are, they have themselves to thank for it.

But whether in this supposed small and imponderable diminution of effective superiority, there would be more of good than of evil, seems hardly worth inquiry—the result itself not carrying on the face of it any such complexion as that of probability. Of the matter of wealth in all its shapes, the value will remain unchanged. The power which he who has most of it, possesses, not only over things, but over such persons as have less of it, will remain just what it is at present. The need which he who has less of it finds of securing all his share of it, will continue undiminished. The quantity of food which a man requires for his stomach, the quantity of clothes he needs for his back, will not be lessened by any quantity of useful knowledge with which he may have furnished his head. The mutual propensity which the good things of this world, in their several shapes of wealth, power, and dignity, have to attract each other, united in the same recipient, will not receive any sensible disturbance from the action of an agent comparatively so weak.

The shopkeeper will not have then less need than at present to sell his wares; the artisan and the husbandman to obtain employment; the scourer to wash her room; the fisherman to catch his fish.

From any such increase in the quantity of useful knowledge possessed by the middle classes, the only manifestly natural and probable results are, improvement in respect of health, domestic economy and personal comfort; a more extensive disposition than at present to look for amusement and recreation in art, science, or literature, in preference to sensuality and indolence. In all these ways will the condition of the middle classes be made better; and it appears not how, in any of them, the condition of their superiors should be made worse.

Look to experience: as far as any evidence is to be derived from that source, the evidence afforded is not in favour of the result here apprehended. Taking England for the place in question, two other countries present themselves as subjects of comparison, viz., Scotland and Germany.

In Scotland the first rudiments of useful knowledge, viz., reading, writing, and the arithmetic of accounts, are universal; in England, comparatively speaking, they are still but rare. Inferiors; are they in general less respectful in Scotland than in England? No; but, if there be any difference, rather more so.

This, it may be observed, is not precisely the species of instruction here in question. Well, then, let us turn to Germany, viz., particularly, if not exclusively, the Protestant part of it. There, in much greater amount than in England, is the higher species of instruction here in question abundant. Numerous, indeed, in those countries, in comparison of England, are the men of cultivated minds, the men of letters and science, such as they are; and there, in conjunction with literature, poverty, and its scarcely separable companion, sensuality, are nowhere to be found. From the extension thus given to mental culture, what man among them, howsoever clothed with opulence, and power, and dignity, has ever found or fancied matter of complaint; what pride, however pampered by all or any of these elements, has ever, from any such quarter, felt a wound?

But, notwithstanding all which has now been said of so superior a school of learning, the effect, it may still be urged, will be to fill the pupils with self-sufficiency, vanity, and pride, and to cause them to look down with disdain upon those employments to which they would otherwise have applied themselves without reluctance—employments upon which their chance for subsistence will depend.

Thus, whether the plan fail or succeed, objections, as is always the case with new undertakings, lie in store for it.

As to self-sufficiency, vanity, and pride, to which many other words of a similar stamp might be added, they are a set of sentimental words, the effect of which is to set afloat in the mind so many vague and indeterminate generalities; ideas which, to the eye of every one who takes the trouble of endeavouring to find for them a determinate shape, vanish and leave nothing behind them but the shapes of the letters and the sounds that we associated with them. On the part of the individuals in question, self-sufficiency, vanity, and pride, all these weaknesses, supposing them to have

place, will find in the minds of those with whom they have to do,—with whom circumstances lead them to hold intercourse,—principles of resistance in the shape of self regarding affection and defensive pride, in which each transgression against the laws of social intercourse will find an eventual punishment; and in the apprehension of it, a check.

As to disdain for the means of livelihood on which they will be dependent for subsistence, the objection wears a face somewhat more determinate; but which, on examination, will be found not less hollow. Whatever sentiment of disdain any such individual may feel, neither the need he has, nor the need he feels, can by it receive any diminution. If, of these acquisitions, the effect be to open to him, and to place him in, a situation better in respect of subsistence than any into which he would otherwise have found his way, so far it is advantageous to him—clearly and determinately advantageous. If the effect be to leave him exactly in the same rank in which he would have found himself otherwise, he is thus far, though no gainer, no loser. But of all the conditions of life in which it is possible for him to find himself, there is not one in which, in various ways, he will not be the better, comparatively at least, if not absolutely, for the course of instruction and discipline he will have gone through. In his career through the proposed course of instruction, as has been fully shown already, he will have opened to himself sources in abundance of amusement, reputable as well as innoxious. If, in any degree, the instruction thus gained will operate as a cause of repulsion between himself and those who have not been partakers of it, it will operate as a cause of attraction between himself and those who so early with him have been partakers of it; and compared with the principle of repulsion, the principle of attraction operating in a more concentrated state, will operate with greater force. In the case of the great established schools, the agreeable and useful effect of early associations thus contracted, is universally notorious: in the instance of the proposed new sort of school, the more extraordinary, new, and distinguished the nature of it, the stronger the principle of association, together with the comforts and advantages derived from it, will be; and the individuals sharing in these benefits will be still more numerous than in any of those other instances.

As the system operates, the relative and comparative distinctions, advantageous upon the whole, or disadvantageous upon the whole, whichsoever they may be, will wear away; but the absolute one, strength given to the intellectual faculties and the whole character, will remain for ever.

As to the relative and comparative distinction, in as far as it is of an advantageous nature, the advantage it presents will be greatest and most conspicuous in the case of those whose parents and guardians are the first to put them in possession of it; and thus in this lottery, if it be to be accounted a lottery, the highest prizes will be for the first adventurers.

Relations of the proposed to the existing Great Schools, Universities, and other Didactic Institutions.

(21.) Of the branches of instruction comprehended in this plan, some of them may be observed to have been included in the system of instruction administered in the dignified institution distinguished by the appellation of Royal. Chemistry and Physiology, a branch subservient to medicine, may serve as examples. In these branches, from that elevated seat, instruction was administered, not only to the maturest, but to some even of the most richly furnished, as well as dignified and exalted minds. But from their acknowledged aptitude, with reference to these superior and extraordinary minds, it would be an inference equally groundless and pernicious, that they are unfit, or in any degree the less fit, for ordinary minds; for minds of all sorts in the middle class, or even in some degree the inferior classes which this plan has in view. One thing it will not be easy to controvert, that, whatsoever degree of usefulness may belong to that institution, an indefinitely greater degree of usefulness must belong to the one here proposed: There, it was all amusement and decoration; here, to amusement, will be added solid and substantial use; there, it was confined to adults; here, it will be imparted, and indeed confined, to children, who, by it, will be raised to the level of men; there, it was, and is, confined to a few—even of the ruling and influential few; here, it will be communicated to a large, and, it is hoped, to a continually increasing portion of the subject many,—of those whose title to regard is founded on the most substantial and incontestable of all foundations, that of numbers,—and, in whose instance, the beneficial effect of useful instruction will be seen to rise in proportion to their present need of it.

In adverting to that dignified institution, nothing can be further from the minds of the persons thus speaking, than the design to lessen the respect so justly due to its originators and supporters. Their sincere wish is for its increase; and in some degree this desirable result is already afforded; since, by the encouragement it has given, in the way of fashion, as well as by the proof it has furnished in the way of experience, it has contributed to the formation of another institution which, in whatever other respect, and in whatever other degree inferior, promises to be so much its superior in point of extent; that is, in respect of the number of persons to whom the benefit, the blessing it may surely be called, will be imparted.

Relation of this plan to that of the Great Schools and Universities.

On an occasion such as the present, it is impossible to be wholly unobservant, nor necessary to be altogether silent, on the subject of so many schools of royal and otherwise dignified foundation; topped by the two, or if Ireland be considered, by the three Universities of this land—not to speak of those of Scotland, which to those by whom ecclesiastical discipline is considered as the strongest bond of union, and diversity, on that same ground as a proper cause of separation, are proportionally regarded on the footing of foreign ones. Compare, on the one hand, the copiousness of the branches of instruction uniformly proposed to be administered; on the other, the smallness of the number customarily administered to one and the same person: on the one part, the preferable regard; on the other, the comparative disregard for immediate and extensive use: on the one part, the shortness; on the other, the comparative length of the time employed in administering such instruction: on the part of the unendowed proposed institution, the relative smallness; on the part of the antique and richly endowed institution, the largeness of the sums expended in the endeavours to produce the intended effects.

Obstacles and Encouragements.

(22.) So numerous and multifarious are the springs of action by which the members of every national community are drawn towards and repelled from each other, that scarcely in any instance can a plan of extensive utility be brought forward, much less a plan so full of promise as that which is here proposed, without appearing to be, and indeed without being, in its tendency, in some way or other, adverse to the interests of a considerable number of persons.

A plan which promises a mass of instruction, so much exceeding in quantity and value anything which has ever yet been exemplified, and that not only to the superior, by which is always meant the more opulent classes, but to the middle or less wealthy classes: not only to those whose means of living are derived from property already accumulated, but to those whose means are derived from industry perpetually employed, can scarcely fail to be an object of jealousy and envy to a multitude of persons exceeding that of those to whom it is a source of delight, and an object of hope.

To no person by whom any considerable value is set upon his own intellectual acquirements, can a continually increasing influx of young men, all of them in possession of acquirements in the same class superior to his own, be reasonably expected to be a spectacle of inward satisfaction. The greater the superiority thus manifested, and consequently the greater his relative inferiority, the more intense is the feeling of dissatisfaction that will naturally be produced. Envy and jealousy being passions by which the persons that harbour them are rendered the objects of aversion and contempt, are passions, the concealment of which is sought with proportionable solicitude. The person in whose breast these passions are concealed, will endeavour by all possible means to prevent this plan from taking effect. The apprehension, the cause of his secret suffering is, that by this school a superior degree of instruction will be obtained. But it is not by the expression of such an opinion, but by the expression of the very opposite opinion, that anything can be done by him towards the accomplishment of his purpose. The opinion which it will be his endeavour to propagate, will, therefore, be that no such superiority will, by means of the plan in question, be attained; and the stronger the persuasion with which he looks for the success of the plan, the greater the pains he will take to render other persons assured of its eventual miscarriage.

By the disguise with which it will be necessary for him to endeavour to conceal the nature of the motives by which he is actuated, and, if it were possible, the object which he has in view, the intensity of his aversion from its being in any degree repressed, will be perpetually increased.

Impracticability, uselessness, mischievousness, by the imputation of one or more of these qualities, will his attack upon it be conducted. By the two first, his endeavour will be to bring down upon it the contempt; by the other, the hatred, of the public: and the more completely he is convinced that no one of these qualities do, in any degree, appertain to it, the more strenuous will be his endeavour to produce in all other breasts the assurance that those qualities, each in the most perfect degree, do appertain to it.

Every one who has anything good to propose, always finds such men as these in his way.

The uncovering of what may be termed the nakedness of the human mind, is a most unpleasant task; but on no occasion can it be said to be an unnecessary one.

If by covering, with a veil of silence, all this body of hostility, it were in the nature of the case that the fire of it should be extinguished, or so much as slackened, silence would be no less consistent with prudence than favourable to ease and indolence. But by no such means can the passions of jealousy and envy be appeased; they admit not of any compromise; by being unmasked, and that ever so completely, they cannot be rendered more savage than they would be were the mask to remain untouched: masked they will do their utmost; unmasked they can do no more.

By the exposure thus made, it would not, therefore, be true to say that the chance of success has, in any degree, been lessened. On the contrary, since by no means is it in the nature of the case that hostility on this ground should be converted into amity, or even into indifference, the only course that presented any chance of guarding the proposed institution from its attacks, was to lay the plan as well as the cause of hostility to it open to public view.

Under all this load of discouragement, there is one source of encouragement which, when duly considered, will have, it is hoped, the effect of taking off almost completely the pressure of it. The funds necessary for the commencement of the undertaking are already provided. The persons, and the only remaining persons, whose concurrence is requisite for the commencement, are the parents or other guardians of such children whose domestic circumstances and local situation concur in putting it in their power to avail themselves of the proffered service. If by them, and with reference to their own situation respectively, it be regarded as affording a sufficient promise of proving at once practicable and useful, and if useful, useful in a greater degree than any other place of education within their reach, it is not by any insinuation which it is in the power of envy or jealousy to throw out, that they will be diverted from that course which, on this supposition, will to their eyes be a source of delight, as well as a matter of duty. By no insinuation, by no declamations or protestations, will any such persons be persuaded that, by being so much more fully replenished and furnished with useful knowledge than other children—by being so much more fully supplied with that intellectual aliment of which the tendency to moderate and calm all dissocial and otherwise unruly passion is so powerful and so incontestible, there will be any the smallest danger of their being encumbered with any such turbulent and mischievous dispositions, the existence of which is thus pre-supposed.

To them it will not appear matter of certainty, that in a school in which neither irreligion, nor heterodoxy, nor schism, nor whatever be meant by heterodoxy or schism, will be taught, all or any of those abominations will be learnt. In their eyes any such suspicion will not appear better grounded than, to those systems of thinking which it professes to protect, it is injurious ; as if the only chance of men's adherence to the most important and useful truths were an unassuageable fear and horror of all intellectual light—a voluntary, determined, and determinately perpetual blindness.

But these dissocial passions, this jealousy, this wretched envy, the prevalence of which has just been stated, (by the objection,) being to such a degree extensive, by the mere circumstance of his being a parent or guardian, will a man be exempted from their influence ?

The answer is No. But whatsoever other persons may, to a parent's eye, be objects of jealousy and envy, his own child, and especially his own child at any such tender age, is not of the number. To a parent, how lowly soever his own lot in life, in general, the all but universal wish is to see that of his child raised as high as possible. In the promotion of this wish, two principles, two most powerful and constantly operating principles concur, viz., instinctive tenderness, and the reflection, that what exaltation soever it may happen to this object of his affection to receive at his hands, is his work, and a manifestation of his own power. In whatever line of life it happens to the parent to find himself placed, in that same line it is his most natural and most frequent wish, should any adequately favourable opening present itself, to see his child raised as much above himself as possible. Of the apothecary, the ambition is to see his child a physician of the highest eminence ; of the attorney, to behold in his son a Lord Chancellor ; of the parish clergyman, to behold in his an archbishop. The Lord Chancellor More, making his reverence and begging a blessing, as, in the great hall of Westminster, he was passing by his father, then sitting as a puisne judge in the Common Pleas : the puisne judge, and not the Lord High Chancellor, is the great object of envy to a paternal breast.

Adverse Prejudices obviated : Having thus presented, under one view, the advantages to be expected from the proposed course of instruction, it may be of use to consider the adverse prejudices likely to be opposed to it. These prejudices may be comprised under two heads, viz., 1. Novelty of the plan ; 2. Abstruseness of the subjects.

(23.) In respect of selection and order of priority, the assortment of subjects proposed to be taught will at first sight be seen to be in a very high degree different from everything which custom has hitherto brought to view.

This difference is most explicitly acknowledged. It presents an unquestionable demand for satisfactory reasons ; but the reasons by which it was suggested are at hand ; and to these reasons the appellation of satisfactory ones, will not, it is hoped, be refused.

In the order here stated, as being recommended by custom, it will be seen, that originally it was equally well recommended by reason ; but that by a change of circumstances the recommendation which it originally received from reason, has been cancelled ; that custom, blind custom, is the only base on which it stands at present ; the indication of reason stands opposed to it.

Order of invention, order of utility, and order in respect of facility : between these three principles of arrangement there is no small difference. That it is by the joint consideration of the order of utility, and the order of facility, that the order of instruction ought to be determined, is sufficiently apparent. But if so, the order of invention, were it not for the custom of which it has become productive, would be a matter of accident, scarcely possessing, unless on the score of curiosity, any claim to regard.

Yet so it is, that by the order of invention, the order of instruction has, in a main degree, been determined. Nor in the coincidence is there anything that need surprise us. By the order of invention, men's thoughts were

determined to run on in that track. And failing determinate and sufficient reason to the contrary, the track in which men's thoughts have begun to run, is the track in which it is desirable and useful that they should continue.

To the proposed plan of instruction, the quality of usefulness possessed by it, in a pre-eminent and incontrovertible degree, is without hesitation attributed, inasmuch as, of all the several branches comprehended in it, there is not one that may not be found to be continually applicable to all the several purposes of common life; and that not only of the more or less elevated, but of the very humblest spheres. True it is, that when these several branches come to be mentioned by their names, these names being, in most instances, the designation of branches of instruction hitherto but little cultivated, the names, and consequently the things themselves will, to the generality of readers, be apt to be regarded as remote from common use. But when by an example or two, the practically useful application of these seemingly abstruse and hitherto formidable sciences is brought to view, and when the cause why the number of persons acquainted with them is as yet so small, is seen to be not in any deficiency in the article of practical usefulness, but in the recency of the discoveries by which they have been brought to their present state of comparative perfection, and in the accidental circumstances which occasioned a preference to be given to other less useful studies, the conception of their inutility will scarcely be long in giving way to the clearest and firmest persuasion of their pre-eminent and universal use.

(24.) If they are abstruse, it is because they are uncommon; if they are as yet uncommon, it is because it is only of late years that their general usefulness has received such increase, as to form a body of instruction capable of being announced in the character of a thing universally useful to the universality of learners.

Chemistry and mechanics, for example, are formidable names. But when once that which cannot be denied has been understood, viz., that it is from chemistry alone that a man can learn how to apply fuel to the best advantage, or how to guard himself most effectually against destruction by fire or poison; and that from mechanics alone, he can learn how to apply his labour to the best advantage, with or without the assistance of machines and other instruments; when once these things have with any tolerable degree of attention been considered, whatsoever disgust or distaste, whatsoever awe or jealousy may have been excited by their as yet unfamiliar names, may surely not unreasonably be expected to give way, not only to complacency, but to desire.

Accordingly, whatsoever practical and familiar utility is seen to belong to these several branches of scientific instruction, will be carefully looked out for, and completely and diligently held up to view; and placed in the most amusing, as well as clear and instructive, light; the design of this institution being, not to raise up a few scholastic pedants, but to breed up, in every walk of life, a numerous and continually increasing succession of intelligent and useful, and, as far as the condition of human beings in this life admits, contented and happy men; not to pamper pride, but to assist and cherish personal freedom, and general benevolence.

Let us not suffer ourselves to be either horrified or disgusted by a few words, which because less familiar than those which we are most accustomed to, are called hard names—names, without which the several branches of knowledge, which are not only among the most useful, but to a greater or less extent even the most generally familiar, could neither be distinguished from each other, nor so much as expressed. Let us not conclude, that because, without teaching, they are not, to any extent, generally understood by grown men, therefore, *by* teaching, they are not capable of being made to be understood by children.

In the sort of view, which in this first stage of instruction it is proposed to give of the several sciences comprised in it, let us but consider what there is in them respectively, that so much as to a child of eight years old, can prove difficult or formidable.

1. Botany, for example, what is it? An acquaintance more or less correct and extensive with the external appearances of the different sets of plants. Not only a working gardener, but every common labourer in husbandry, every green-grocer, every herb-woman, is, to a certain degree, and in the same way, a Botanist.

2. Zoology. Being of Greek extraction, and not in very common use, the name is a hard name. But, in the same mode as here proposed, not only every labourer in husbandry, but every man, without exception, is, in respect of such animals as have fallen in his way, a Zoologist. Every man, woman, and child, to whom there has been given the amusement of seeing a collection of birds and beasts, has received a lesson in Zoology—a lesson of the sort here proposed.

3. Mineralogy. To a certain extent, every labourer's man employed in the working of a mine, is a Mineralogist. So is every labourer in husbandry, by whom sand, gravel, loam, marl, or chalk, are dug, or lime burnt. The acquaintance which the labourer in mines has with Mineralogy, is confined to the production of his own mine. The acquaintance which, in the proposed school, a scholar, at the first stage, will have with the same science, will be less particular, though more extensive; indeed, as extensive as it can be made.

4. Astronomy. So large and so far distant from us are the subjects of this science, that the very name of it is enough to strike us with awe. But the first astronomers, it is well known, were shepherds in the regions of the

East; the clearness of the sky afforded them this relief from the pain of mental vacancy. Beyond those shepherds, the young scholars will not have to go, except in as far as it may be carried by the addition of representations to realities.

5. Geography. Of this branch of science the name is not quite so formidable as the names just passed under review. In this country few even of the labouring classes but have seen globes, and in general have heard the use of them; none who can read but have seen the use of maps. Yet, of these five branches of science, geography, even at this its earliest stage, is the most abstruse. Why? Because, except to the extent of the prospect which a man carries with him, representations are here substituted for, not added to, realities. As to the solution of geographical problems, these belong not to this proposed first stage of instruction, but to the second; in which geography is considered as belonging to Natural Philosophy, and as such coming under the cognizance of judgment, as well as of sense and memory.

General Concluding Observations.

(25.) On the one hand, the quantity of instruction raised to its maximum; on the other hand, the quantity of punishment and reward employed in the production of that effect, sunk to its minimum; in a word, profit maximized, expense minimized: such, in the instance of the inferior order of schools established in pursuance of the system invented by Dr Bell, (inferior in respect of quantity and variety of instruction, but not in respect of importance,) has been the promise made: such, as far as evidence extends, whether of the direct cast or of the circumstantial, as deducible from the working of the system, is the promise that has everywhere been fulfilled.

Such, in the instance of the superior order of schools, of which a commencement is here proposed to be made, may, with not less confidence, be, it is hoped, expected.

Thus, not only will the reign of juvenile terror be everywhere at an end, but those occupations which, till so lately, have in all schools, to almost all scholars, been a mere burthen, will be converted into pastime; and those hours which, to us and our forefathers, were hours partly of irksome labour, partly of joyless and listless idleness, will to our progeny be hours of sport and gaiety. All work and no play makes Jack a dull boy: such is the concession made, the plea pleaded, by the homely proverb, in favour of unprofitable pastime. That by all play and no work, Jack would ever be made a learned boy, is a result, to the truth of which neither proverb nor prophecy had ever dared to look. But, by Dr Bell, that fiction of the golden age, which the boldest of prophets would never have dared to prophesy, has actually been accomplished.

If by Jenner human life have been rendered longer, by Bell it has been rendered, in a still greater degree, happier: pain being banished and pleasure substituted, and that during the period when the little bosom is most sensible to both.

Compared with all other new institutions, the proposed Chrestomathic School will have this singularity in its favour, viz., that not only will its practicability have been proved, but even its success assured before it has been tried. In the application which the principles of it have already so abundantly received, all difficulties have already been overcome. As far as concerns the scholars, if the field of instruction will in this new case receive increase, yet, it may be safely and confidently asserted, that the thorniest of all fields, are those in which the success of this new species of culture has received such ample and uncontested proof; and that the new and higher portions of ground now prepared to be enclosed, and put into the corresponding course of cultivation, are, with little or no exception, not only less beset with thorns, but most abundantly adorned with flowers—flowers altogether without parallel in those lower regions. Exists there so much as a single ground for believing, or so much as supposing, that in the instance of any one of the branches of art and science proposed to be superadded, success will be less certain, or less universal, than in those cases in which the completeness and universality of that success has so long been placed out of doubt. If there be, it lies upon him in whose bosom any such doubt or suspicion has arisen, to settle with himself, and produce the grounds of it.

GROUNDS OF PRIORITY.

(26.) [*Natural Pleasantness.*] At the dawn of reason more especially, an object is the more *pleasant*, the more exclusively it presents itself to *the senses*, especially to the senses of *sight* and *hearing*; and, accordingly, the less forcibly it applies itself to the *understanding*, calling for the exercise of the *judgment*, on an extensive scale. Hence the various *sensible forms*, presented by *nature* and *art*, particularly by *nature*, are objects which, at this early period, present in general a stronger interest than is presented by *transactions*, such as are produced by the mutual intercourse amongst persons of mature age: objects of natural, or as it is called *physical*, than is presented by objects of *moral*, including *political*, knowledge. *Birds* and *Beasts* (subjects of *Zoology*) are, by themselves or their images, plane or solid, among the most pleasant and interesting objects that can be presented to the observation of children at their earliest ages.

(27.) [*Artificial Pleasantness.*] Under the new mode of instruction, a sort of pleasantness, not the less real for being *artificial*, i. e. for being the product of reflection and ingenuity, is imparted to all subjects: not excepted the most abstruse ones. But, this being the same on all *occasions*, and to whatsoever *subjects*

applied, the *natural* degree of pleasantness or unpleasantness will remain to each unaltered.

(28.) [*Corporeal—Incorporeal.*] *Corporeal*, or *bodily*: viz. *natural* substances, such as *stones, plants*, and *animals*: *artificial* substances, such as *buildings, furniture, clothing, tools*, articles of *food* and *drink*; and the *materials*, wrought or unwrought, *of* which, and the *tools* and other *instruments with* which they are respectively composed:—*Incorporeal*; such as, *interest* of money lent, *rents* issuing out of land, and other similar subjects of property; political *offices, conditions in life*, resulting from *genealogical* relations; such as those between *husband* and *wife, father* and *child, guardian* and *ward, master* and *servant*.

(29.) [*Concrete.*] From a Latin word, which signifies *grown up along with*; viz. along with the subject which is in question, whatever it be: it is used in contradistinction to the word *abstract*, derived from a Latin word which signifies *drawn off from*: viz. from the subject in question, as above. An *orange*, for example, has a certain *figure*, whereby, in connexion with a certain *colour*, it stands distinguished from all other fruits, as well as from all objects of all sorts. Take into consideration this or that *individual* orange, the ideas presented by the *figure* and *colour*, whereby it stands distinguished not only from other fruits, but even from other *oranges*—from other fruits of the same kind—are *concrete* ideas: for, they *grew up*, as it were, together in the mind, out of the individual object, by which they are excited and produced: they are amongst the *elements*, out of which the aggregate conception, afforded and presentible to us by that individual object, is formed. The orange being no longer in sight,—now, of the figure and colour observed in that individual orange, consider such parts or appearances as are to be found in all *other* oranges, as well as in *that* one. The idea thus formed is *an abstract idea*: it being a portion *drawn off*, as it were, from the *aggregate idea* obtained, as above, from the *individual object*. Being abstracted and slipt off from the individual stock, and thereupon planted in the mind, it has there taken root, and acquired a separate and independent existence. Without thinking any more of that individual orange in particular, or of oranges in general, or of so much as of *fruits* in general, take now into consideration *figure* at large, and *colour* at large: Here, at one jump, the mind has arrived at an idea, not only *abstract*, but vastly *more* abstract than in the case last mentioned. Instead of *figure* and *colour*, let us now say *sensible qualities*. Under this appellation are included not only *figure* and *colour*, but *smell, taste*, and many others: it is therefore *abstract* in a still *higher* degree.

(30.) [*Complex or complicated.*] Understand, with the exception of that species of *complexity* or *complicatedness*, which has place in the case of *concrete*, as contradistinguished from *abstract* ideas. Whence (it may be said) comes this exception? Answer: from hence; viz. that though, in other cases, the more complex the idea is, the greater the labour of mind or force of attention is, which is necessary to the obtaining the conception in a clear and correct state, *that* is not the case here. No portion of matter ever presents itself to *sense*, without presenting, at one and the same time, a multitude of *simple* ideas, of all which taken together, the *concrete* one, in a state more or less correct and complete, is composed. At the same time, though naturally all these ideas present themselves together, the mind has it in its power to detach, as above, any one or more of them from the rest, and either keep it in view in this detached state, or make it up into a compound with other simple ideas, detached in like manner from other sources. But, for the making of this separation—this abstraction, as it is called—more *trouble*, a stronger force of *attention*, is necessary, than for the taking them up, in a promiscuous bundle, as it were; in the bundle in which they have been tied together by the hand of Nature: that is, than for the consideration of the object in its *concrete* state.

(31.) [*Cause and Effect.*] On all these accounts, but especially the last, the juvenile mind will be earlier prepared for the reception of instruction, with reference to *Natural History* (Stage I.,) than to *Natural Philosophy* (Stages II. III. IV. V.): and, as between these,—forasmuch as, in each of these stages, the subjects included in it add more or less, if not to the *extent*, to the *number* and *variety* of those included in the preceding stage or stages,—it will be better prepared for the branches contained in Stage II. alone, than for those contained in *that* and Stage III. together; and so on as to the rest.

(32.) [*Name of the Art or Science.*] A cloud of perplexity, raised by indistinct and erroneous conceptions—a cloud of perplexity, and consequent difficulty of expression—seems to have been, at all times, hanging over the import of the terms *art* and *science*. A few lines, it is hoped, will not be found altogether misemployed in the endeavour to dispel it.

The common supposition seems to be, that, in the whole *field of thought* and *action*, a determinate number of existing compartments are assignable, marked out all round, and distinguished from one another, by so many sets of natural and determinate boundary lines: compartments, whereof some are filled, each of them by an *art*, without any mixture of science; others, by a *science* without any mixture of *art*: others, again, so constituted that, as it has not ever happened to them hitherto, so neither can it ever happen to them in future, to contain in them any thing *either* of art *or* science. On some such supposition accordingly, appear to be grounded questions such as the following:—*how many arts* are there? how many *sciences*? such a *thing* (naming it,) is it *an art*, or is it *a science*?—i. e. such a

word (mentioning it,) is it the *name* of *an art*, or is it the name of a *science*?

This supposition will, it is believed, be found in every part erroneous. As between *art* and *science*, in the whole field of *thought* and *action*, no one spot will be found belonging to either, to the exclusion of the other. In whatsoever spot a portion of either is found, a portion of the other may be seen likewise. Whatsoever spot is occupied by either, is occupied by both: it is occupied by them in *joint-tenancy*. Whatsoever spot is thus occupied, is so much taken out of *the waste*: but neither is there any determinate part of the whole waste, that is not liable to be thus occupied.

Practice, in proportion as *attention* and *exertion* are regarded as necessary to due *performance*, is termed *art*: *knowledge*, in proportion as *attention* and *exertion* are regarded as necessary to *attainment*, is termed *science*.

In the Latin language, *both* are with great advantage comprehended under one common appellation, viz. *disciplinæ*, from *disco*, to learn: *disciplinæ*, with which our English word *discipline* agrees in sound as well as in derivation; but, by the narrower import which has been attached to it, may probably be regarded as having been rendered unfit for this use.

In the very nature of the case, they will be found so combined as to be inseparable. Man cannot *do* anything well, but in proportion as he *knows* how to *do* it: he cannot, in consequence of *attention* and *exertion*, *know* anything but in proportion as he has practised the *art* of *learning* it. Correspondent therefore to every *art*, there is at least one branch of *science*: correspondent to every branch of *science*, there is at least one branch of art. No determinate line of distinction between *art* on the one hand, and *science* on the other: no determinate line of distinction between *art* and *science* on the one hand, and *unartificial practice* and *unscientific knowledge* on the other. In proportion as that which is seen to be *done* is more conspicuous than that which is seen or supposed to be *known*, that which has place is apt to be considered as the work of *art*: in proportion as that which is seen or supposed to be *known*, is more conspicuous than anything else that is seen to be *done*, that which has place is apt to be set down to the account of *science*. Day by day, acting in conjunction, *art* and *science* are gaining upon the abovementioned waste — the field of *unartificial practice*, and *unscientific knowledge*.

Witness *Electricity*, *Galvanism*, (see Stage II.) *Geognosy* or *Geology*, *Aerostation*, (see Stage III.) *Botanical* and *Zoological Palæology* (knowledge regarding the remains of plants and animals deposited, according to appearance, at remote times in the bowels of the earth,) a branch of science appertaining in common to *Botany* and *Zoology* (see Stage I.) on the one hand, and *Geognosy* (see Stage III.) on the other. Under an *old name*, even *Chemistry* (see Stage II.) includes an immense mass of art and science, all *new* within these few years. Of late years, *Nephelognosy* (if by this appellation may be designated the long chain of partial observations, which have recently taken the *clouds* for their subject) has become a candidate for existence. So, in the department of *morals* and *politics*, *Statistics*, a newly cultivated branch of *Geography*, having for its subject the quantities and qualities of the matter of *population*, of the matter of *wealth*, and of the matter of *political strength*— existing or supposed to exist, on the *territory*, or in the *political state* to which it applies.

While new branches of art and science have thus been starting up, and putting themselves upon the list, others have dropped out of it: the case being, that, either on the one hand something, which had been supposed to be *done*, has been found *not* to have been done, nor to be, for anything that appears, *capable* of being done; or, on the other hand, that something which had been supposed to be capable of being *known*, has been found, according to all appearance, destitute of existence, and on that account not capable of being known.

Witness *Alchemy*, or the art of transmuting other metals into gold: with or without the art of composing a medicine, fit for the cure of all sorts of disorders whatsoever: those of the most opposite nature not excepted. 2. *Astrology*, or the art of discovering future events, affecting the prosperity of individual inhabitants of the earth, by looking at the stars. 3. *Necromancy*, the art of discovering future events by conversing with the dead: to which may be added a cluster of other arts or sciences, all ending in *mancy*, and having for their objects the deriving knowledge concerning future events, from so many different sources, from no one of which is any such knowledge to be obtained.

As between *art* and *science*, in so far as they are distinguishable, *art* is that one of the two that seems entitled to the first mention, as being first and most independent—in *value*, and thence in *dignity*, in so far as dignity consists in *use*: for, of *science*, the value consists in its subserviency to *art*; of *speculation*, the value consists in its subserviency to *practice*. Of the two, *art*, when it is not itself the *end*, stands nearest to the end: with reference to this end, whatsoever of *science* stands connected with it, is but as a *means*. But if, independently of all connexion which it has with *art*, *science pleases*, then, in so far as it pleases, it is *of use*. for *use* itself has neither *value* nor *meaning*, but in virtue of, and in proportion to, whatsoever relation it has to *pain* or *pleasure*.*

* Persons to whom the account thus given of *art* fails of being satisfactory, may find a very different account of it in *James Harris's* 8vo volume, intitled "*Three Treatises*" one of which is, the whole of it, expended upon a definition of this word: without any mention (as far as memory serves) of the word *science*.

(33.) [*Antiquity.*] Between the degree of *natural preparedness*, on the part of the mind, for the reception of a branch of instruction, be it what it may, and the *antiquity* of it, as measured by the length of time that has elapsed, since instruction in it happened first to be administered—no immediate and necessary connexion can be shown to have place. *In* time indeed, but not *by* time are things done. *Experience, observation, experiment;* in these three words may be seen the sources of all our knowledge. Of these, *experience* is without effect, any farther than as it has had *observation* for its accompaniment; and, in the very idea of *experiment*, that of observation is included. Upon *observation* therefore it is—upon *observation*, that is upon *attention* applied to the subject with effect—that everything depends. Numerous and various are the natural objects, which, when once, by minds matured for the purpose, they have been *observed* and thereupon *denominated*, find the infant mind in a state of the most perfect *preparedness* for their reception; but which never happened to be taken for the subjects of *observation*, nor therefore of *denomination*, till within these few years.

To the infant mind, few objects can be more *interesting*—none are there, of which the external characters are more *readily* apprehensible—than those which belong to the field of *animated nature*. But, for the most part, what acquaintance we have with the objects which belong to this part of the field of thought and action, is of very modern date.

(34.) [*Number of teachers and learners.*] A circumstance on which the *antiquity* of a subject of knowledge has *no* influence is, as above, the *natural preparedness* of the juvenile mind for the reception of it. But a circumstance, on which that antiquity has great influence is—the *number* of the persons who, at the time in question, are engaged in the *teaching* of it, and thence the number of those who are engaged in the *learning* of it: desire to *learn* on the one part, and desire to *teach* on the other, being two circumstances which, with relation to one another, are both *cause* and *effect*. Cases to a comparatively small extent excepted, (for example, that which has place where the advantage derivable from teaching is made the subject of a monopoly,) whatsoever be the real and intrinsic value of a branch of learning, those who *have learnt* it, and those who *are teaching* it, have, each of them, an interest in magnifying it, and causing it to be cultivated to the greatest extent possible: *learners*, as well as *teachers*, lest their labour should be thought to have been bestowed in vain; *teachers*, that the number of their customers may be as great as possible. Among the known subjects of intellectual labour, not many, it is believed, can be pointed out that have less in them of intrinsic use, especially since the stock of *translations* has been completed, than the *dead* languages. Yet, of these, there are incomparably a greater number of teachers, and thence of learners, than of all other branches of learning put together, the very *elementary* ones, viz., *reading*, *writing*, and *arithmetic*, alone excepted. Why? Because the study of those keys to knowledge has continued to be cultivated from the time when, the above-mentioned elementary branches excepted, there was very little known that was worth *learning*, still less for which *teachers* could be found.

STAGES.

(35.) [*Introductory Stage.*] The branches of instruction, thus referred to an introductory stage, are the same as those which are comprehended in the course of instruction carried on in that *new method*, which, though applicable with equal advantage to the situation of the *highest*, has not as yet been applied to any other than that of the *lowest*, ranks in life.

In this introductory stage, to a degree more or less considerable, the matter of instruction cannot fail of coinciding with, and thus anticipating, the matter here allotted, for the first and earliest, of the five stages *peculiar* to the hereby proposed school. *Words*, for example, it cannot but have to operate upon: and—the words, of which, in the first of these *principal* and *peculiar* stages, the matter of instruction is composed, being such as are adapted to the very earliest age—of this sort, with at least as much propriety as of any other sort, may be the words employed in the *introductory* stage already in use. Again: *Writing* is among the *Exercises*, allotted to the first Chrestomathic Stage. But *writing* is itself but a mode of *drawing;* nor that the easiest mode. *Geometry* will, among its figures, present some still more simple, than some of the *letters*, of which *written discourse* is composed.

(36.) [*Mineralogy.*] From two words, one of which, derived from the Latin, signifies belonging to *mines* (mines being the places from which the most interesting among the subjects of this branch of science, are extracted,) and a Greek word, which signifies *an account*, or *giving an account of*. In this first stage, the subject, in so far as teachable by exhibition of *figure*, *colour*, and other sensible qualities, will be taught, without reference made, as in *Chemistry* and *Geognosy*, to *causes* and *effects* more or less remote.

(37.) [*Botany.*] From a Greek word, which signifies a *plant* or *vegetable*:—to be taught, as above, without reference to the relation of *cause* and *effect*, except in so far as indication of the manner of *propagation* comes to be made.

(38.) [*Zoology.*] From two Greek words, one of which signifies an *animal*, the other *an account*, as above:—to be taught as above.

Under *Mineralogy* will be presented to view those bodies and portions of matter, in which

no sort of life is found: under *Botany*, those which have *vegetable* life, *i. e. birth* and *growth*, as well as *death*, but, as far as appears, without *feeling:* under *Zoology*, those which have *animal* life, *i. e.* not only, as plants, *birth, growth*, and *death*, but *feeling*, as far as appears, with more or less of *thought*. On these subjects, the *Exercises*, prescribed and performed, will, as far as circumstances admit, be accompanied with the *exhibition* of *specimens;* specimens, *dead* and even *living:* as well as *draughts* or *models* of specimens. See Table II. Col. 1-3.

(39.) [*Geography.*] From two Greek words; one of which signifies *the earth*, the other *delineation* or *description:* the *familiar* or *purely geographical* branch, viz., that, for the teaching of which, *maps*, with the requisite verbal explanations, are sufficient: dismissing to Stage V. 4. the *scientific*: viz., that by which are exhibited the facts and appearances, resulting from the connexion which the earth has with the *sun*, the *moon*, and other parts of the universe visible to our eyes.

(40.) [*Geometry.*] From two Greek words; one of which, as above, signifies the *earth*, the other *measurement*. From this derivation it appears, that, among the Greeks, the first application which this branch of art and science received was, that of being employed in measuring, for the purpose of ascertaining ownership, portions of the *earth's surface:* such as Fields, Gardens, and the sites of Houses. But it is now applied to portions of apparently void *space*, as well as to *bodies* of all sorts and sizes, imaginary as well as real, in so far as considered with a view to nothing but their *figure*.

From this stage, the *demonstrations*—as requiring too *many* objects, and those not in themselves interesting, to be held at the same time in the *memory*, and too strong a *hold* to be taken of them by the *attention*, for the purpose of forming a ground for the *judgment*—will be dismissed to Stage V. and last. So likewise even the *enunciative* parts of the *propositions:* except perhaps in the instance of a few of the most simple and easily conceived. Remain the *definitions;* for the illustration of which, the most familiar specimens, such as *rules, pencils, slates, marbles, balls, tops*, &c. will be employed. As to the *demonstrations*, from the proposed postponement, no real inconvenience can, it is presumed, result. On no other subject, with so little danger of error as on that of geometry, can propositions be delivered to be taken upon trust. Be the art or science what it may, incompetence, as to the reception of *some* particulars belonging to it, affords no reason for withholding from the juvenile mind any *other* particulars, to the reception of which it is competent.

(41.) [*Historical Chronology.*] *Historical*, from a Greek word, which signifies originally *knowledge* at large; but which, in the use commonly made of it, is at present confined to knowledge, or supposed knowledge, relative to *past events:* principally to such as are of a political nature; such as *wars, conquests, changes of government*, &c. *Chronology*, from two Greek words, one of which signifies *time*, the other an *account*, as above. *Historical Chronology*: i. e. *History* in so far as exhibited by *Chronology*, considered in no other than the *familiar* point of view: consisting of indications given, of the principal events, known or supposed to have happened to mankind, mentioned, in the briefest manner, with reference to the portions of time, in which they are respectively supposed to have taken place: the mention so made not being accompanied by any of those statements or observations, relative to their supposed *causes* or *effects*, or relative to the characters of the respective actors, whereof the matter of what is generally meant by the word *History*, is composed. History, thus as it were *clothed*, will be reserved, partly for a higher *stage* in this same school, partly for a maturer *time of life*. For another branch of *Chronology*, which stands higher, and belongs to *Natural Philosophy*, see Stage V. 5.

By the difference between *to-day, yesterday*, and *the day before*, application being made of the *numeration table*, a child, at its very exit from infancy, will have been found prepared for *Historical Chronology*, as above described: the import, attached to the words designative of the several events, becoming by degrees more and more clear, correct, and complete, as the course of instruction advances.

Exercises in Historical Chronology will be afforded by *Tables, Charts*, and *Memoriter verses;* and, in return to correspondent *questions, Answers* written and repeated in prose.

(42.) [*Biographical Chronology.*] *Biographical*, from two Greek words, one of which signifies *life*, the other a delineation or *description*, as above. In this instance, as in that of *Historical* Chronology, the miscellaneous matter will for some time be dismissed, as above. *Exercises*, much the same.

(43.) [*Appropriate Drawing.*] *Appropriate*, viz. correspondent: on the one hand, to the state of the *bodily faculties*, and the degree of *proficiency* thence attained; on the other hand, to the particular nature of the branch of *art* and *science* to which, in the character of an *organic test of intellection* (See Tab. II. Col. 1, 4, 9.) application is made of this art.

As to *earliness*—the first rude essays in *drawing* cannot take place *too soon*. *Writing* is but a particular branch or application of it. Not to speak of *mineralogy*, with the right lined angles exhibited by its *crystals*,—and even *Botany* and *Zoology*, as exhibited by some of their outlines,—*Geometry* affords forms still more easily traceable upon *sand* or *slate*, than those which are produced by *writing*, under the name of *letters* and *words*.

Of the term *appropriate drawing*, the import will consequently be *shifting* at every successive stage: the *figures* delineated being, throughout, such as appertain to the branches of

learning included in the stage in question, as well as the preceding ones.

By the several Branches of *Natural History learning*, comprised in *this* Stage, is furnished the *matter*, upon which the juvenile mind will have to operate, in the course of the several *succeeding* stages. The more familiarly it has become acquainted with them, when presented in this most simple point of view, the less the difficulty it will experience, in its endeavours to comprehend the *propositions*, of which they will be taken for the *subjects*, in the course of the succeeding stages.

By the hands of *Chemistry*, the *inward* constitution and composition—the *latent* properties—of all those several *natural* modifications of matter, will, principally by means of *mixture* and different doses of combined and uncombined *caloric* (different degrees of heat and cold,) be laid open and brought to view.

(44.) [*Mechanics in the limited sense of the word.*] *Mechanics* from a Greek word, which signifies a *machine*, an *engine*, a *contrivance*. In the *limited sense of the word*; viz. in the sense in which it is employed for the designation of the several distinguishable classes of configurations, contrived principally for the purpose of gaining *force* at the expense of *despatch*, or *despatch* at the expense of *force*. These are, 1. the *lever*: 2. the *wheel*, turning upon a fixed axis: 3. the *pulley*, or *shifting wheel*: 4. the *inclined plane*: 5. the *screw*: 6. the *wedge*: to which hath of late years been added, 7. the *funicular machine*; and are now designated by the common appellation of *the mechanical powers*. This *limited* sense is the only original one: the only one attached to the word, in the language from which it is derived.

Within the last two hundred years, the species of *force*, to a compromise, as it were, amongst which all distinguishable bodies or masses of *matter* appear to be indebted, for the *quantity* of *matter*, the *form*, and the *texture* which they respectively possess, have been brought to light. These are, 1. *Attraction of gravity*, a tendency possessed, not only by all the matter of which our *earth*, but by all the matter of which any part of the visible *universe* is composed. 2. Attraction of *cohesion*, the perceptible operation of which is confined within distances too small to be distinguished by human sense. 3. *Elasticity*: i. e. a principle of *repulsion* corresponding to, and antagonizing with, the attraction of *cohesion*: 4. Attraction and repulsion, having place in the case of *Magnetism*. 5. Attraction and repulsion, having place in the case of *Electricity*. 6. Attraction and repulsion having place in the case of *Galvanism*. 7. Attraction, termed *elective*, belonging to the province of chemistry, and, from the French, commonly, though rather unhappily, expressed by the term *chemical affinity*. N. B. in regard to these *three* or *four* last species, it seems not at present, altogether determined, how far they coincide, and how far, if at all, they stand distinguished from each other.

To the head of *Mechanics*, taken at *large* (including or not including *Mechanics*, taken in the *limited* acceptation of the word, as above) seems now to be generally referred what appertains to the three first of the above seven general principles, together with whatsoever changes or arrangements are regarded as capable of being brought about, or secured, in any mass or masses of matter, without any such change in the arrangement of their undistinguishably minute constituent elements, and thence in some of their external characters, as those which it belongs to the *Chemist*, as such, to produce or bring to view. In regard to *Magnetism* and *Electricity*, in so far as the motions, which have place on the occasions on which those words are employed, are seen to extend to *measurable* distances, they seem to be considered as belonging to the head of *Mechanics*: in so far as the distance in question is so minute as to be *incapable* of *measurement*, they seem to be considered as belonging to the head of *Chemistry*.

By all the several instruments above spoken of under the head of *mechanical powers*, motion is *transferred* and *modified*; by none of them *produced*:—in all of them motion finds a *channel*; in none of them a *source*. What then are the several *sources* from which, for any purpose, and in particular for purposes of practical utility, it is producible, and accordingly produced? More shortly, what are the several *sources of motion*, and what the corresponding *prime movers*, or *primum mobiles*? Of a search, made in the latest and most approved institutional works on Natural Philosophy, the result has been—that of no such topic is any the slightest mention to be found: and thus *a gap*, the existence of which had long been matter of observation, and never without astonishment—a gap in the very heart of the science—was found to remain still unfilled up.

That, in the Chrestomathic School, a demand so urgent may not be altogether unprovided with an answer, a slight sketch on this subject has been attempted, and is inserted in the *Appendix*:—in the hope, and under the assurance, that, being thus started, the subject will not remain long without being more effectually pursued by more competent hands.

(45.) [*Hydrostatics.*] From two Greek words: one of which signifies *water*; the other, taking a *station*, *position*, or *level*.

To this head belong such of the *mechanical* properties of the portions of matter of which our earth is composed, as are the result of the propensity which, in conformity to the all-pervading principle of *gravitation*, the component particles of water, and all other bodies, in so far as they are in a state of *fluidity*, have to range themselves in such a manner as to form a surface, which to our eye appears *flat*, but which is in fact a *curve*, having its central point in this our planet.

On this property depend the means employed for ascertaining the *specific gravity* of different bodies: i. e. the *different weights* respectively possessed by the *same bulk* of each; and in particular the *weights*, and thence the *values*, of *spirituous* and other costly liquors: so likewise, in a considerable degree, the effects of *pump-work*; of *mill-work*, more particularly in the case of *water-mills*; and the efficiency of such solid constructions as are employed in resisting the *pressure* of the *water*: for example, navigable vessels, wharfs, docks, &c.

(46.) [*Hydraulics.*] From two Greek words: one of which, as above, signifies *water*; the other, a *pipe* or *tube*.

To this head belong the *mechanical* properties of liquids, as above,—in so far as, being bounded by and confined in solid channels of a determinate form, the *force* with which, and the *direction* in which, when put in motion, they act, and the *effects* of which, on that occasion, they become productive, are influenced by the internal *form* or *configuration*, of those same channels. It is therefore nothing but a particular branch or modification of *Hydrostatics*. To this belongs, for example, *pump-work*, as above, and in general the art of *conveying* water and other liquids, upon a large scale, to places in which they are wanted.

(47.) [*Mechanical Pneumatics.*] *Pneumatics*, from a Greek word, which means *air*. Coincident with, or at least included in, the import of this term, is that of the recently employed term, *Aërostatics*.

To this head belong those *mechanical* properties, as they are termed, which, in whatsoever different degrees, are possessed in common by all such portions of matter as, at the time in question, are in the *aërial* or *gaseous* state: and in particular their *weight* (the result of the *attraction* of *gravity*,) their *elasticity* (the result of the principle of *intestine repulsion*,) and that *pressure* on all sides which is the result of the sort of *compromise* that has place amongst those *antagonizing forces*.

To the head of *Chemical Pneumatics*, as below, belong those properties by which the several species of bodies, when in the *gaseous* state, are distinguished from each other.

On the above *mechanical* properties depend, for example, in a greater or less degree, the art of *mill-work*, in so far as concerns *wind-mills*; the art of constructing and navigating *navigable vessels*, in so far as *sails* are employed, and in virtue of the tendency which the same body, viz. *water*, has to pass from the *liquid* into the *gaseous* state, and back again, according to the quantity of *heat* combined or mixed with it, the construction of *Steam-Engines*.

(48.) [*Acoustics.*] From a Greek word, which signifies *to hear*. To this head belongs the property which, by its motion, *air* has, of producing in the correspondent organs of man and other animals, the perception of *sound*, in the infinitely diversified modifications of which it is susceptible. On the science thus denominated depend, for example, in a degree more or less considerable, the art by which relief is afforded in case of *deafness*; and the art by which *words* and other *audible* signs are employed in the *communication* of ideas, whether near at hand or at a distance.

(49.) [*Optics.*] From a Greek word, which signifies *to see*.

To this head belongs the property which *light* has, of producing in the correspondent organs of man and other animals, the perception of *sight* or *vision*: and thereby rendering in some sort present to them bodies, which, so far as depends upon all other senses, are separated from them by vast, untraversable, and even unmeasurable distances.

On this depends, for example, the art of employing with effect *glasses* and other bodies, so prepared as, in some cases, to *transmit* the light, in others, to *reflect* it; and by the one means or the other (besides increasing, for the purpose of *chemical* operations, the quantity of *light*, and along with it of *heat*, brought to bear upon a given point,) to *delight* the organs of vision by a variety of *images*, not otherwise perceptible; to afford *relief* to those same organs under various *imperfections* to which they are subject; to enable them to obtain perception of objects too *small* to be perceived otherwise, and of others (such as several of the heavenly bodies,) which, notwithstanding their vast bulk, are too *distant* to be by any other means effectually perceived or observed; and, by observations taken of them, to ascertain, upon occasion, with relation to the general surface of the earth, by the help of calculation, the momentary position of a *navigable vessel*, and thus afford *guidance* to it in its course.

(50.) [*Chemistry.*] From an Arabic word, which may be said to be of the same signification, allowance made for the minuteness of the stock of knowledge, possessed in relation to the subject, at the time when the word first came into use, in comparison with the vastness of the stock possessed at present.

To the head of *Chemistry* seem to be generally referred, those properties, which are either discovered in bodies, or given to them, by means of *mixture* (i. e. actual contact, produced as between bodies in a *fluid* state on the one hand, and bodies, either in a *fluid* or in a *solid* state, on the other,) or by the application of extraordinary degrees of *temperature*, (i. e. of heat or cold, or both;) on which occasions the original bodies are, commonly, in appearance destroyed; and, in the room of them, new ones, in appearance and properties more or less dissimilar, produced.

(51.) [*Mineral Chemistry.*] (52.) [*Vegetable Chemistry.*] (53.) [*Animal Chemistry.*] i. e. Chemistry considered in its application to those three different classes of bodies. Applied to mineral bodies, it is capable of producing not only the effect of *composition*, as well as that of *decomposition*, but, in many instances, that of *recomposition*: *i. e.* by putting together

bodies, such as they are in their *natural* state, it produces *new* ones;—bodies possessed of properties never before made manifest. By *decomposing*, *i. e.* resolving into their respective constituent elements, bodies such as they are in their natural state, it *thus* also produces *new* ones; and moreover, after thus resolving a body into its constituent elements, it, in many instances, is able to put them together again, in such a manner as to reproduce the very body so decomposed: a body composed of the same elements, and not, in respect of any of its properties, distinguishable from it. Applied to *vegetable* or *animal* bodies, its powers are confined to *decomposition*: neither to *composition* nor *recomposition* do they extend. Of these *organized* bodies, the formation is a process by much too secret and refined, to be copied by human art.

In the course of the instruction given in *Chemistry*, as it comes to be applied respectively to the subjects of the *mineral*, *vegetable*, and *animal* kingdoms, occasion will occur for recalling, enlivening, extending, and fixing in the memory, the information received in relation to them, in Stage I.

(54.) [*Meteorology.*] From two Greek words, the first of which signifies *aloft* or *elevated*. No sooner does a substance break free from any of those bonds, by which, while remaining in a state of *solidity* or *liquidity*, it has been confined to a determinate part of the earth's surface, than it enters into the province of *Meteorology*, and there continues, until, by any of those revolutions of which the *atmosphere** is the constant theatre, it is again brought into immediate contact with, and made to form a portion of, some one or more of those solid or liquid masses. Thus, after having been raised, by *solution* in the incumbent air, and then again *precipitated*, water, on its descent towards the dense part of the earth's surface, becomes, according to circumstances, *mist*, *rain*, *hail*, or *snow*;—remaining all the while, and until it has reached that dense part, amongst the subjects of meteorology. So likewise the *electric fluid*, when, by the magnitude of its quantity, it gives birth to those appearances, which, under the denominations of *thunder* and *lightning*, are sometimes so fatal, and, to many a timorous mind, at all times so tremendous.

(55.) [*Magnetism.*] From a Greek word, which signifies *a loadstone*: this naturally compounded species of mineral, having *iron* for its principal element, being the only body, in which the peculiar relation, in the way of attraction and repulsion, to other bodies of the same sort, or to *iron*, was for a long time observed:—though latterly, by human art, means have been found, for establishing the same sort of relation between one piece of iron, prepared in a particular manner, and another; and still more recently, between *magnets* or magnetized iron, on the one part, and, on the other, a newly discovered species of metal, called *nickel*, the like relation has been observed.

A piece of iron, when brought to a proper form, and, after having, for the purpose, been *magnetized*, as above, left free to turn itself upon a centre, points towards a star which serves for giving name to the *north*, and thence to the other divisions of the universe, and to the corresponding points of the *mariner's compass*: by which means, without view of sun, moon, or star, the situation of the spot, at which the observation is made, with relation to every part of the universe, is at all times ascertainable. And thus it is, that, for showing to him the *direction* in which he is moving, the magnetic needle is become an instrument, as necessary as it is simple, in the hands of the navigator.

(56.) [*Electricity.*] From a Greek word, which signifies *amber*. By mere rubbing, certain kinds of bodies had, at different times, been found capable of being rendered productive of extraordinary appearances, and extraordinary changes, in other bodies: *attracting* them, *repelling* them, producing *light*, producing *heat*, and so forth. Of the sorts of bodies, by means of which these appearances are producible, *amber* having been the first, in which the power of producing them was observed, hence the whole system of those effects came to be designated by the name of *electricity*; as if one should say, *amber-work*.

By degrees, it having been observed that the property of producing those effects, is a property, which, under certain circumstances, is manifested by *all* matter, it was at length discovered, (viz. by *Benjamin Franklin*,) that, among them are those, to which, when manifested upon the largest scale, the names *thunder* and *lightning* are applied.

Accordingly, to this head belong, at present, the means employed for securing person and property, from the destruction of which those changes in the atmosphere are liable to become the source.

In some diseases, *electricity* has been applied, not altogether without success, in the character of a remedy.

(57.) [*Galvanism.*] From *Galvani*, an Italian, by whom, not long before the close of the last century, effects, in many respects coinciding with, though in some respects different from, those produced by *electricity*, were found producible, without the help of friction or intercourse with the clouds, by a mere arrangement, made to take place between certain bodies in a solid, and certain others in a fluid state.

Magnetism, *Electricity*, *Galvanism*—in the hands of the chemist, the powers designated by those several names, more particularly *Electricity* and *Galvanism*, have become so

* The *atmosphere*, i. e. the miscellaneous mass of matter in a gaseous state, with which those parts of the earth's surface, which are in a *solid* or *liquid* state, are constantly encompassed.

many very efficient and active instruments: by *Electricity*, but still more particularly by *Galvanism*, bodies, which till then had been regarded as simple, having, principally under the management of *Sir Humphrey Davy*, been decomposed, and new ones, possessed of very extraordinary properties, brought, as it were, into existence.

By Magnetism, by Electricity, and in some degree by Galvanism, effects have thus been produced on other bodies, without any remarkable *change* in the *constitution* of the bodies employed as instruments in the production of those effects: and in this way it is, that these districts of the field of science appertain, in some respects, to the province of *Mechanics*. But, by the use and application made of them, particularly of *Electricity*, and most particularly of *Galvanism*, not only new properties have been observed, but prodigious *changes* have been made, in the *constitution* of most sorts of bodies: and in this way it is that they appertain to the province of *Chemistry*.

(58.) [*Balistics.*] From a Greek word, which signifies to *cast*: called also the theory of *projectiles*, from a Latin word of the same signification. The mass projected is either in a *solid* or in a liquid state: in so far as it is in a *solid* state, the art of *Gunnery* is included in it: an art, which, in so far as concerns the *motion* produced, belongs, since the invention of gunpowder, to *Chemistry*; and in so far as concerns the giving *direction* to that motion, to *Mechanics*. In so far as the mass projected is in a liquid state, the art is that of making *Jets d'eau*, i. e. *playing fountains*: a branch which, by its perfect innocence and comparative insignificance, forms a striking contrast with the other.

In detail, neither can *Gunnery*, any more than *Fortification*, or *Navigation*, present any sufficient title to admittance into the *Chrestomathic* school: but, in so far as they are, all of them, comprehended in *Natural Philosophy*, it would be leaving an incongruous gap, not to give some general intimation of the general principles on which they respectively depend.

(59.) [*Geography continued.*] In the first Stage, the instruction relating to Geography will have been confined to mere *Topography*:—the knowledge of the divisions and remarkable spots, partly natural, partly factitious, observable on the earth's surface: beginning, of course, with the country in which the instruction is administered. At this next, and other succeeding stages, the same ground will be retrodden: and in it, as relative capacity advances, information will be afforded, of that sort, which, in books of *Geography*, used to be comprehended under that name, but of late years has been referred to a separate name, viz. *Statistics*: such as that which concerns *population*; the manner and proportions in which the matter of *wealth*, the matter of *power*, and the matter of *dignity*, are distributed; quantity and quality of *military force*, &c. &c.

(60.) [*Geometry continued.*] See *Stage I.*

(61.) [*Historical Chronology continued.*] In the same manner as *Geography*, presented at first in the state of a *naked* field, receives by degrees its proper *clothing*, so will *Historical Chronology*. In the one case, as in the other, the signs will come to be repeated: and, at each repetition, an additional quantity of information will be superadded.

To the account of the great military wars and other political events, composed of battles, sieges, unions and dismemberments, acquisitions and losses of territory, changes in dynasties, and in so far as in the *Stage* and at the *age* in question, they can be made intelligible, in *forms* of *government*—to this will by degrees be added, the sort of information, designated by the term *Archæology*, i. e. *account of antiquities*: an account of the state of *persons* and *things*, in *anterior*, i. e. *former* and *earlier*, so preposterously termed *ancient*, times; including information respecting lodging, diet, clothing, military equipment, pastimes,—powers and functions—belonging to *offices*, civil, political, and religious, &c.

(62.) [*Appropriate Drawing.*] In the Chrestomathic school, the great use of *drawing* is, the giving *assistance* to, and serving as a *test*, and thence as a *cause* of, *proficiency* in the branches of *art* and *science* to which it is applicable. On this score, in so far as it is *appropriate*, it will adapt itself to those several subjects, in proportion as they are presented. But this direction receives a necessary modification, from the state of the *bodily organs* in question in respect of maturity.

(63.) [*Grammatical Exercises.*] See Table II. The objects aimed at in and by these exercises will be—

1. To render the scholar acquainted with the *structure* of language in general, and that of his *own* language in particular; and thereby, to qualify him for speaking and writing, on all subjects and occasions, with clearness, correctness, and due effect—in his own language.

2. By familiarizing him with the greater part, in number and importance, of those terms belonging to *foreign* languages, from which those belonging to his *own* are derived, and in which the origin of their import, and the *families* of words with which they are connected, are to be found—to divest them of that repulsive and disheartening quality, of which so impressive an idea is conveyed, by the appellation of *hard words*.

3. To render the approach, to the several branches of art and science, as *smooth* and *easy* as possible, by rendering that part of the language which is peculiar to them, and which is mostly derived from *foreign*, and in particular from the *dead* languages, as *familiar* as any other part.

4. To lay a substantial and extensive foundation, for a more particular acquaintance, to

the purpose of *reading*, with or without that of *conversation*, with the several foreign languages, *dead* and *living*, comprehended in the scheme, or such of them as, at a maturer age, shall be regarded as promising to be conducive to the scholar's *advancement* in life, or agreeable to his *taste*.

As to the *subjects* of these exercises, in addition to the *rules* of *Grammar*, they may consist of select portions of *History* and *Biography*, taken from the most approved works composed in the several languages.

In any language other than his own, *composition*—except in so far as *Translation* (see Tab. II. *Exercises*) or *Note taking* (see Stage V. 13.) may be considered as coming under this head—is proposed not to be comprehended in this course, but to be reserved to some other *seat* of instruction, or for *self-instruction* at a maturer *age*.

(64.) [Stage III.] At this Stage, the general information, obtained in the two preceding stages, is still repeated; and the application made of it to the exigencies and gratifications of common life, rendered more and more particular and determinate, and brought still nearer to actual and common use.

(65.) [*Mining.*] Under *Mineral Chemistry*, have been brought to view, the different sorts of *simple* substances obtained by means of this *art*, together with the *new* substances, obtained by putting them together, and *combining* them, in groups and proportions, different from those in which they are found combined by the hands of *Nature*. Under the present head, a general view (and a very general one will suffice) will be to be given, of the manner in which this art is practised. In its quality of an *art*, operating upon *materials*, rendered more or less known by precedent *science*, it matches in some sort with *Architecture* and *Husbandry*, to which it supplies a considerable part of the *materials*, which they respectively employ.

(66.) [*Geognosy.*] From two Greek words, one of which signifies the *earth*; the other, *knowledge* or *understanding*. By this name is designated what we have as yet been able to learn, concerning the manner in which the matters composing the substance of the earth, including so much of what is underneath the surface as hath been rendered accessible to us, are distributed. By *Geography*, the earth is viewed in one *direction*; by *Geognosy* in *another* direction: by *Geography*, it is considered with a view to one *set of purposes:* by *Geognosy*, with a view to *another* set of purposes. *Geognosy* is among the new fruits of *Chemistry*. To the general gratification afforded to *speculative* curiosity, *Geognosy* adds the *practical* advantage, of affording indications—presumptive and experiment-saving indications—of the presence or absence of the valuable substances, for the extraction of which the *art of mining* is employed.

By the *remains* which it brings to light of the *dead* subjects, of the *vegetable* and *animal* kingdoms—some of them known, others not known, at present in a living state—*Geognosy* includes *Archæology*, as applied to the *structure* of this our Globe.—(See Stage II. 17.)

(67.) [*Land-surveying.*] In an application made of it at Stage II. to *Mechanics*, *Geometry* found *one* of its practical uses: in its application to *Land-surveying*, it will find another. In addition to the more elementary part, *Trigonometry* (from two Greek words, one of which signifies *a three cornered figure*, the other *measuring*) is a branch of the speculative science called *Geometry*, which on this occasion will be brought into *practical* use. But in *this* instance too, as well as in that of *Mechanics*, the *simply enunciative* parts of the *propositions* will serve by themselves; still leaving to a more advanced stage such instruction, and such *exercises*, as take for their subject the *demonstrative* parts.

(68.) [*Architecture.*] From two Greek words, one of which signifies *chief* or *principal;* the other, *Handicraft work*.

For its *products*, and in that view its *subjects*, *Architecture* in general has *constructions* in general. *Constructions* may be distinguished into *principal* constructions, *i. e.* constructions of independent use, and constructions for the purpose of *communication*. Principal constructions are mostly *receptacles*. According to the nature of the *bases* on which the receptacles *rest* or *move*, they are distinguished into *terrestrial*, *aquatic*, and *aërial:* fixed buildings, navigable vessels, and air balloons.

Of *communication*, the principal instruments are, 1. Roads. 2. Canals, including *tunnels* and *drains*. 3. Quays, including *Wharfs* and *Jetties*. 4. Bridges.

Substituted to the present costly and comparatively useless stock of a *toy-shop*, *architectural* models of buildings and furniture, might, if made to take to pieces and put together again, be to this purpose productive of real and lasting use.

(69.) [*Husbandry*, including *Theory of Vegetation* and *Gardening.*] On this occasion, application will come to be made of the instruction obtained in relation to the *mineral* as well as the *vegetable* system, in Stage I.; and in relation to *Vegetable Chemistry*, in Stage II. So of the instruction obtained in relation to *Architecture*, in so far as concerns barns, drains, and other *constructions*; and in relation to *Husbandry* itself, in so far as concerns *implements*—employed, or with advantage employable, in Husbandry. How to convey and commit to the *earth* to the best advantage the *seeds* and *other germs* of its *products*,—as well as how to collect and convey to the *store* or the *market* the products themselves when ripe, or otherwise ready for use;—so likewise how to collect, convey, and commit to the earth the *manure* employed in their production—will be learnt principally from *Mechanics:* how to preserve them against corruption and combustion,—as well as how to choose, prepare, and keep the

manure—from *Chemistry*. So in *Gardening*, how to employ artificial heat and shelter in the improvement or preservation of those choicer vegetables which are the subject of that art. *Cattle*, not to speak of *Bees*, are all of them among the *fruits*, some of them among the *instruments*, of Husbandry. For what concerns the care of their *health*, reference will be to be made to Stage IV. Among the inferior animals, *Husbandry* has a multitude of *enemies*. For the most effectual modes of destroying them, reference will be to be made to Stage IV. But to this purpose it may be necessary to obtain more or less knowledge in relation to them: and for this knowledge the *foundation* will at least have been laid in Stage I.

(70.) [*Physical Economics.*] *Physical*, from a Greek word which signifies *Natural*, in contradistinction to *moral*:—*Economics*, from two Greek words: one of which signifies *a house*; the other, *management*. Of *Mechanics* and *Chemistry*,—partly in an immediate way, partly through the medium of *Architecture* and *Husbandry*,—of Mechanics as well as Chemistry, but principally of Chemistry,—application will here be made to all the various *physical* concerns of a *family*: *care* of *health* excepted, for which see Stage IV.

From Chemistry, more particularly, will be deduced and administered an all-comprehensive stock of practically useful information. *Maximization* of bodily *comfort* in all its shapes —*minimization* of bodily *discomfort* in all its shapes—*minimization* of the *labour* and *expense* applied to both these intimately connected purposes—these will the art in question have for its *ends* in view. [For *maximization* and *minimization* see Table II. *Principles*.] Articles of household *furniture*, *apparel*, *food*, *drink*, and *fuel*, these it will have among its principal *subject matters*: *warming*, *cooling*, *moistening*, *washing*, *drying*, *ventilating*, *lighting*, *clothing*, *cooking*, *preserving*, *repairing*, *restoring*—these it will have among its principal *operations*: *air*, *heat*, *cold*, *light*—substances, some in a *solid*, some in a *liquid*, some even in a *gaseous* form,—substances, indefinitely diversified in *form* and *texture*,—substances, from all three *kingdoms*, mineral, animal, and vegetable,—some natural, some factitious—some simple, some compounded,—these it will have for its *materials* and *instruments*.

(71.) [*Hygiastics* or *Hygiantics*.] From a Greek word, which signifies appertaining to *health*:—the branches of art and science which appertain to health; i. e. to the *preservation* as well as *restoration* of it.—*Medicine*, *Physic*—the words most commonly employed on this occasion—are inadequate and delusive. Under the name of *Medicines* or *Physic*, drugs are conceived as being to be conveyed into the stomach; and, to the choosing and preparing of these *drugs*, the idea of this most extensive and diversified cluster of arts and sciences is thus confined.

Of all the *bodies*, which it can be the object of this or any other course of instruction, to render the scholar more or less acquainted with,—there is not one, the state and condition of which can be of near so much importance to him as that of his *own*. At this time of life, few, it is true, in comparison, are the instances, in which the body is in any way constantly out of order: not a few, in which it scarce ever is. Partly to this cause it seems to be owing, that, in the education of youth, so important a branch of instruction has experienced so general a neglect. Several others however have likewise been contributing their share towards the production of this effect. At the time or times, in which the plan of *School* education (not to speak of *University* education) received its form, *Chemistry*—one of the necessary bases of *Hygiantics*—had no existence: and of the nine other arts and sciences, which, as below, may be stated as being subservient to it, several were nearly in the same case. In those days, the art not having any clear foundations, there was scarcely anything which—especially to a mind of the age of a school-boy's—was capable of being taught.

Very different is the case at present. When, by instruction in the several branches herein enumerated, a clear *foundation* has been laid —as in a moderate space of time it may now be laid—a few *rules* may, at a still more moderate expense of time and words, be taught and learnt to great advantage. How to guard against *disease* and *death*, considered as liable to be produced, by suddenness or excess of *heat*, *cold*, or *moisture*, by *want* of respirable *air*, by excess in *diet* or bodily *labour*. how to apply to one's self, or to obtain from friendly ignorance, the speediest as well as most effectual relief—in the case of those accidents, in which the most common disorders take their rise: a *burn*, a *scald*, a *flesh wound*, *lameness* produced by *corns*; *indigestion* in its various symptoms, pains of the *rheumatic* kind in the head tooth or ear, what is called a *cold*, in the several shapes in which that malady is most apt to make its appearance; how to operate towards the recovery of persons apparently *drowned*: in *serious* cases in general, what to do in the meantime, until *professional* assistance can be obtained; and when obtained, how to form some judgment as to its competency. To *females*, partly on account of the infirmities peculiar to that sex, partly on account of the almost exclusive share which they possess in the management of children of both sexes for several years after birth; this branch of knowledge is, in a more peculiar degree, important. In point of fact, all *Mothers*, all *Nurses*, are *Physicians*. Partly by remedies altogether unapt, partly by ill applied ones, partly by ill grounded and false theories—in uninstructed families, especially in those in which the expense of professional advice is an object of alarm, it may almost be a question—whether more mischief is not done by medicine, than sustained for want of it.

Children, in particular, are not unfrequently enslaved and tormented by unnecessary precautions and groundless fears. Great would be the value of sound *hygiantic* instruction, were it only in the character of a preservative against the certain mischief to the purse, and not improbable mischief to the constitution, by *quack medicines;* medicines of unknown composition, presented by those to whom the patient, and with him the particular nature of his case, is unknown. Various are the impositions of which the human body is liable to be made the subject: by a moderate quantity of *hygiantic* instruction, such as the course in question could not fail to afford, the mind is rendered proof against them all. It would have its use, were it only to enable a patient to make, to his professional adviser, a correct, complete, and conclusive report of his own case.

(72.) [*Physiology.*] From two Greek words, one of which signifies *nature* or natural state; the other, *an account;* an account of the several component parts of the body, as well those which are naturally in a liquid, as those which are in a solid state.

(73.) [*Anatomy.*] From a Greek word, which signifies *dissection, cutting up.* The parts of the body, to which it can apply, are of course no other than those which it finds in a *solid* state.

(74.) [*Pathology.*] From two Greek words, the first of which signifies *sensation:* an account of the *sensations* which the human frame is liable to experience, more particularly the *painful* or uneasy ones.

(75.) [*Nosology.*] From two Greek words, the first of which signifies a *malady, disease,* or *disorder:* an account of the several maladies, diseases, or disorders, which the human frame is liable to experience.

(76.) [*Diætetics.*] From a Greek word which signifies *habitual mode of life,* more particularly in respect of *food* and *drink;* whence the English word *diet:*—the knowledge of what appertains to *diet;*—of the influence which, as well in other respects as in respect of *nourishment,* substances, commonly taken into the stomach, have on the state of the animal frame.

(77.) [*Materia Medica.*] Two Latin words, which signify the *matter* of which *medicines* (substances applied to the stomach or other parts of the body, for the cure or prevention of disorders) are composed.

(78.) [*Prophylactics.*] From a Greek word, which signifies *measures of precaution.*

(79.) [*Therapeutics.*] From a Greek word, which signifies to *cure* or *endeavour to cure,* a disorder.

(80.) [*Surgery, or Mechanical Therapeutics.*] *Surgery,* from two Greek words: one of which signifies a *hand,* the other *operation. Mechanical* Therapeutics it may be called, because in so far as, in the endeavour to cure or relieve a disorder, the hand of an operator is considered as being employed,—the *means* employed belong to the *mechanical,* in contradistinction to the *chemical,* walk in the field of art and science.

(81.) [*Zoohygiantics* or *Zohygiantics.*] From two Greek words: one of which, as above, signifies an *animal;* the other, as above, *pertaining* to the care of *health:*—the arts of preserving and restoring health, considered as applied to the *inferior* animals; viz. to such of them in the health of which man is, on any account, wont to take an interest. Branches of art and science—viz. branches *condivident* or *subservient—hygiantics* thus applied, has, of course, the same, in quality and number, as when applied to the human species, as above.

Applied to the inferior animals, *Anatomy* is in use to be styled *Comparative Anatomy.* With equal propriety the term *comparative* might, it is evident, be applied to the eight other branches above enumerated.

For answering (which it does, however, but in part,) the purpose of the above word *Zohygiantics,* the only word as yet in use is—the *Veterinary Art:* whence the *Veterinary Surgeon* takes his name. *Veterinary* is from a Latin word, which signifies *to carry.* Of all the inferior animals, in the health of which it may happen to man to take an interest, the only ones to which this appellative applies are, therefore, the very few which come under the denomination of *beasts of burthen.* By its literal analogy to the word *veteran,* derived from the Latin word which signifies *old,* it has moreover the inconvenience, of presenting some such idea as that of the *Old Man's* or *Old Woman's art,* more readily than the branch of art which it is employed to designate.

(82.) [*Phthisozoics.*] From two Greek words: one of which signifies to *destroy;* the other, *an animal,* as above:—the art of destroying such of the inferior animals as, in the character of natural *enemies,* threaten destruction or damage,—to himself, or to such animals from which in the character of natural *servants* or *allies,* it is in man's power to extract useful service,—is an art, not much less necessary, than that of preserving and restoring to health, those his natural *friends.*

Animals which, either immediately or mediately, as above, are regarded as noxious to man, are commonly included under the general appellation of *vermin. The Complete Vermin-Killer* is the title of an old established book.

(83.) [*Mathematics.*] From a Greek word, which signifies *learning in general;* so inapposite and uncharacteristic, is the only word, as yet employed for giving expression to this branch of art and science.

(84.) [*Geometry.*] (85.) [*Arithmetic.*] See Stage I.

(86.) [*Algebra.*] From an *Arabic* word, the signification of which seems not to be exactly known.

By *Geometry, quantity* is considered with

relation to *form*, *shape*—or, as on this occasion it is more common to say, *to figure*;—by *Arithmetic* and *Algebra*, *without* relation *to figure*. In so far as *figure* is out of the question, *number* is the only form, in which *quantity* is susceptible of diversification. In so far as the number in question is represented by the appropriate characters, called *cyphers*, but more commonly *figures*,* the amount of it is thus, in a *direct* way, made known; and *Arithmetic* is the name employed in speaking of it: in so far as it is no otherwise expressed, than by means of some *relation*, more or less complicated and disguised, which it bears to some known number or numbers, *Algebra* is the name employed in speaking of it. For giving expression to such numbers as are yet *unknown*—(all numbers in so far as they are respectively expressed by one simple line of the appropriate characters being *known*)—instead of *figures*, other signs (such as certain *letters* belonging to the Alphabet, and commonly taken from the *close* of it) are employed. This is for *shortness*: thus, instead of saying (i. e. writing) *first unknown number*, the Algebraist says x; instead of *second* unknown number, y; and so, for a *third* z. And from time to time, for further abbreviation, other letters again, taken from the *commencement*, or some other *anterior* portion of the Alphabet, are commonly employed. For *addition*, *subtraction*, *multiplication*, *division*, *equality*, and certain other terms of arithmetic, the shorter signs (+ — × — =, &c.) being also employed, *Algebra* is thus, in respect of the *signs* employed in it, a species of *short-hand*:—of *short-hand*, applied to the particular subject of *quantity*, considered without reference to *quality*.

Can it be then (it will naturally be asked) such wonders as have been performed by Algebra—can it be, that it is by mere *abbreviation*—by nothing but a particular species of *short-hand*—that they have been performed? by the mere use of a set of *signs* or *characters*—by which the ideas in question are expressed in a less quantity of *space* and *time*, than would have been necessary, to the giving expression to them by the *signs* or *characters*, of which *ordinary written* language is composed, and by which those sounds are designated, of which the ordinary *spoken* language is composed?—Newton, Leibnitz, Euler, La Place, La Grange, &c. &c.—on this magnificent portion of the field of science, have they been nothing more than so many expert *short-hand writers*?

Answer.—Assuredly, the system of *abbreviated forms of expression* is one thing—the *purpose* to which these modes of expression are employed is another and perfectly distinguishable thing. The purpose, to which, in the instance in question, this species of *short-hand* is applied, comes, in every instance, within the description given above, viz. *by means of their relation to certain quantities that are known, the making known a certain quantity or certain quantities, which, in all other respects, are as yet unknown.*

But, for making out this relation, some contrivance in every instance—and, in some instances, abundance of very subtle contrivance—over and above the use of *short-hand* is, or at any rate originally was, necessary: and from the *short-hand* itself, the system, composed of these *contrivances*, is in itself no less distinct, than any one of the species of discourse (a *speech*, for instance, or the *evidence* of a *witness*,) which *short-hand*, commonly so called, is employed in giving expression to, is distinct from the *short-hand*—the *mode of writing*—itself.

In that No. of the Appendix, in which an exposition is given, of some ulterior *principles of instruction*, by means of which the characteristic principles of the new system may (it is supposed) be applied to *Mathematics*—and *that* with as much facility and advantage, as any with which they are or can be applied to, *Reading*, *Arithmetic*, or *Grammar*—this subject will be resumed.* In the meantime two observations may have their use.

1. The first is, that, though the *Algebraic* contrivances—the contrivances by which the algebraic *short-hand* is to the purpose in question made use of, are perfectly distinct from the *short-hand* itself; yet so prodigious is the facility which, when the *short-hand* has once been learnt, is afforded by it, that what seems probable is—that, had it not been for the *short-hand*, a very small part of those algebraic *contrivances*, which at present are in use, would at this time, if ever, have been discovered. Compared with the words, by which the same ideas are expressed in ordinary language, the *Roman numerals* are a species of short-hand: compared with these *Roman* numerals, the *Arabian* numerals, now mostly substituted to them, are a highly-improved species of short-hand—a species by which alone, independently of the *Algebraic* short-hand, much greater progress would probably have been made in Mathematics, than, in the same quantity of time, would have been made with no other instrument of abbreviation than that which is composed of the Roman numerals.

2. The other observation is, that, whether without the *short-hand*, the *contrivances* would or would not have as yet been hit upon; yet, now that they have been hit upon, being, as above, in the nature of the case, so perfectly distinct from the *short-hand*, there is nothing to prevent their being expressed without it—expressed by the words of which ordinary language is composed—no more than there is, to prevent from being written down in words at length, and so printed, a mass of *evidence*, which at a trial has been taken down in *short-*

* The use thus made of the word *figure*, in two senses thus different, and yet not so different as not to be liable to be confounded, is an unfortunate circumstance; but such is the state of the language.

* See Appendix, No. VIII.

hand; and which, but for the *short-hand*, could not have been taken down, unless a greater length of time had been allowed for the delivering of the evidence.

Hence comes the practical conclusion, viz. that, for the convenience of learners, it would probably be of no small use, if, in ordinary language—language clear from those *characters* and *formularies*, so appalling to every as yet uninitiated, (and more particularly to the uninitiated juvenile eye)—explanations were given of the several *contrivances* in question; or if, in this way, the explanation of the whole system, pursued to the length to which it has already been carried, would occupy too much space—at any rate, of such points, as, by the joint considerations of *facility* and *utility*—*facility* in *acquisition*, and *utility* in *application*—should be found recommended for preference.

(87.) [*Uranological Geography.*] *Uranological* from *Uranology*, which is from two Greek words: one of which signifies the *heavens;* the other, as above, *an account*:—an account of the heavenly bodies—more commonly termed *astronomy*:—*Astronomy*, from two Greek words: one of which signifies a *star* or *planet;* the other, *arrangement*, or to *arrange*. But in this field, the *space*, in which the bodies are considered as being in a state of *motion*, or in a state of *rest*, requires to be considered; as well as the *bodies*, which are considered as *moving* or *resting* in that *space:* and as for *the bodies*, it is not by him who is called an *astronomer*, that the *arrangement* made of them has been made. (See Stage I., and see the next article.)

(88.) [*Uranological Chronology.*] See Stage I. When that *fixation of quantities*, which is not performable but by mathematical investigation, is discarded or postponed, a very small quantity of time will suffice, for conveying a *general*, yet sufficiently instructive intimation, of what is ascertainable, in relation to such parts of the contents of the universe, as are in any way open to our observation. But if this quantity, small as it is, be grudged, it is only in virtue of its application to *Geography* and *Chronology*, that *Uranology* can present any very decided claim to admission into the *Chrestomathic* course. In Stage I. *Geography* and *Chronology* were considered in the most simple and obvious point of view; and accordingly, without reference to those relations between the *Earth* and the other celestial bodies (principally our *Sun* and *Moon*,) on which the facts belonging to these branches of science are so essentially dependent. In regard to *Uranological Geography* and *Uranological Chronology*—the practical uses, to which these two branches of *Uranology* are applied, being different—distinct names are accordingly required, for giving *expression* to them; but, considered as *subjects of instruction*, the consideration of them is inseparable. To *Uranological Geography* more particularly, belongs the division made of *space*, on the Earth's *surface;* viz. the division into *climates*, and degrees of *latitude* and *longitude:* and the influence exercised by the *Moon* on the *tides;* i. e. on the motions of such parts of the earth's surface as are in a *liquid* state; perhaps also in the *winds*, i. e. on the motions of such parts as are in a *gaseous* state. To *Uranological Chronology* more particularly, belong the divisions made of *time:* viz. the natural divisions into *periods, cycles, solar years, months, lunar years*, and *days;* together with the ulterior factitious and arbitrary, but not the less necessary, divisions into *hours, minutes*, and *seconds*.

Place and *time* being considered together, and with reference to each other, the heavenly bodies, employed as they are in the measurement of both these quantities, serve for the indication and guidance of the course of a ship at sea: and thus they are, as it were, taken up, and, in conjunction with the *magnetic needle*, employed as *instruments*, in the hands of the *Navigator*. On this occasion, by means of our organs of sight, *light* becomes a sort of instrument of *communication*, and thence of *measurement*, between this our planet and other component parts of the material universe, and, not only between those comparatively near orbs, on which the motions of our own have a perceptible dependence, and correspondent reciprocal influence; but between our own and others, such as the *Moons*, (called *Satellites of Jupiter*,) the star called *the Polar Star*, and the other stars, which, for the purpose of distinguishing them from *Planets*, are called *Fixed Stars*—the *motions* of which have for their place, a field, separated from that of our own planet, by distances, more and more extensive, till at last they stretch to such a pitch, as to bid defiance to all calculation:—the *motions;*—for it appears not that even the Stars called *fixt*, are exempt from that law of universal gravitation, of which perpetual as well as universal *motion* is the necessary consequence.

The short time necessary to a general acquaintance with *Uranology*, would not be altogether uselessly employed—would not be *unchrestomathically* employed—had it no other use than that of preserving the mind against the alarming and predatory delusions, set to work by the species of impostor called an *Astrologer*.*

(89.) [*Technology.*] From two Greek words: the first of which signifies an *art*. In the list of separately administered branches of instruction, this article may serve to close the last Stage. On this occasion, as far as time will

* Under the title of Sibley's Astrology, a work has been seen, containing no fewer than four thick 4to volumes, of very recent date. A work of such expense could never have been published, but under the assurance of a considerable number of purchasers, all of whom must necessarily have been found in the most opulent and extensively educated classes.

admit, a *connected* view is proposed to be given, of the *operations* by which *arts* and *manufactures* are carried on. The more *general* information, obtained, in Stages II. and III., in relation to *Mechanics*, and *Chemistry*, and some of their dependencies, will thus be extended farther on in the region of *particulars*. On this occasion will be to be shown and exemplified, the advantages, of which, in respect of *despatch* and *perfection*, the principle *of the division of labour* is productive.

Here will be shown how, by the help of this most efficient principle, as *art* and *science* are continually making advances at the expense of *ordinary practice* and *ordinary knowledge*, so *manufacture* (if by this term may be distinctively designated *art*, carried on with the help of *the division of labour*, and thence *upon a large scale*) is continually extending its conquests, in the field of *simple handicraft art*—art carried on *without* the benefit of that newly found assistance.

To reduce the apparent infinitude of the subject within a comprehensible compass, it will be necessary, under the direction of the Logician, to apply the *Tactics* (the art of arrangement) of the *Naturalist* to the contents of the field of the *Technologist*; to bring together and class, the several sorts of *tools* and other *implements*—and *that*, in such a manner as to show how they agree with, and differ from, each other. In its character of a *school of Technology*, the *Chrestomathic School*, though not a *place*, would thus be a *source*, of general communication—*a channel*, through which the several sorts of artists might receive, from one another, instruction in relation to points of practice, at present peculiar to each. The *Carpenter*, the *Joiner*, the *Cabinet-maker*, the *Turner in wood*, the *Ship-builder*, &c.; the *Whitesmith*, the *Blacksmith*, the *Metal-founder*, the *Printer*, the *Engraver*, the *Mathematical Instrument Maker*, &c.; the *Tailor*, the *Shoemaker*, the *Collar-maker*, the *Saddler*, &c.; the *Distiller*, the *Brewer*, the *Sugar-baker*, the *Bread-baker*, &c. Of all these several artists, the respective *tools* and other *implements*—together with the *operations* performed by means of them—will thus be to be confronted together; and a comparative and comprehensive view will thus be to be given of their points of resemblance and difference.

Not to speak of the mutual information, capable of being by this means derived from one another by the *artists* themselves, to the *scholars* the effect will be that enlivening consciousness of mental vigour, and independent power, which is the fruit of learning in general, reaped from the soil of a highly cultivated mind. As, in virtue of the *Grammatical Exercises*, in the *Language* in which the instruction is delivered, there will be no *hard names*; so, in virtue of the *Exercises*, of which the field of *art-and-science* learning, including this appendage to it, is the subject—in the whole field of useful instruction,—there will be no *dark spots*

So far as concerns the middling classes, the more extensive the view, thus obtained by the scholar, of the field of *Technology*, the more *usefully*, and to the bent, *natural* or *adventitious*, of his taste and inclination, the more *favourably*, (consideration had at the same time of his family circumstances and connexions,) will he thus find the field of his *livelihood* enlarged.

(90.) [*Book-keeping at Large.*] The *commercial* process or operation, on the subject of which, under the name of *Book-keeping*, works in such multitude have been published, is but a branch, a particular application, of an art, of the most extensive range, and proportionable importance: viz. the art of *Book-keeping at large*; the art of *Registration*, of *Recordation*; the art of securing and perpetuating *Evidence*. See Table II. *Principles*, Class III.

Correct, *complete*, *clear*, *concise*, *easy to consult*; in case of *error*, so framed as not to *cover* it, but to *afford indication* of it: *appropriate*, i. e. adapted to the particular practical purpose it has in view; the purpose, for the sake of which the labour thus bestowed is expended,—in these epithets may be seen the *qualities* desirable in a system of this kind. The new system of instruction, at any rate the original inventor's edition of it, presents to view a perfect specimen of the practice of this art, as applied to those inferior branches of instruction, which it has already taken in hand. In the Chrestomathic School, the principle thereby indicated will of course be pursued; but, proportioned to the superior extent of the *field* assumed by it, will necessarily be the extent and variety of the *application* made of it. In the practice of this most universally useful art, all those Scholars, who, from the lowest up to the highest Stages, in the character of *Teachers*, *Private Tutors*, or *Monitors*, bear any part in the management of the school, will gradually be initiated, and insensibly perfected: and, in proportion as any *Scholar* appears qualified to take any such part in it, it will be the duty and care of the *Master*, to put the means of so doing into his hands.

As, by the undermentioned *Abbé Gaultier*, the principles of the art of *Abridgment-making*, and thence of *Note-taking*, have been exhibited in a general point of view; so, between this time and the time at which the Chrestomathic population has reached its last and highest *stage*, no doubt but that some apt person will be found to perform the correspondent good office, in favour of the art of *Registration*, or *Book-keeping* at large.

(91.) [*Commercial Book-keeping.*] Commonly called, without addition, *Book-keeping*. As well in the form of *money* as in that of *money's worth*, the Chrestomathic School will, at all times, have its *receipts*, its *expenditure*, and its *stock in hand*. In its system of *Book-keeping at large*, it will, therefore, in so far, comprise and possess, a system of *Commercial Book-keeping*. But, to the Scholars, when they

go abroad in the world, it will not suffice that they are initiated in the particular system of *Book-keeping* in use in *that* establishment: to such of them, at least, as hereafter betake themselves to any *commercial* occupation, it will be matter of *advantage*, not to say of *necessity*, to be no less perfectly acquainted with whatsoever system is in use in *other* establishments, and especially in those of which *commercial profit* is the object or end in view. The *Italian* method, or method of *Double Entry*, is the name given to that system of Book-keeping which is commonly employed in establishments of superior importance. Unfortunately, old-established as it is, the *obscurity* of this method is still more conspicuous than its *utility;* and, in consequence, *generation*, instead of *correction*, of Error, is but too frequent a result. This obscurity has, for its sole *cause*, the *fictitiousness*, and thence the *inexpressiveness*, or rather the *misexpressiveness*, of the language. The *fiction* has place in two principal instances: 1. in the employing the word designative of *debt*, in cases in which no such transaction really has had place; 2. in the ascribing to objects incapable of contracting this or any other obligation—such as the several articles of which the mass of commercial stock is composed—the *capacity* and *act* of contracting that same *legal obligation*. 3. Moreover, in direct opposition to an incontestable *principle of evidence*, the original *Record-book*, the basis of all the other books, is branded with a note of worthlessness, under the name of the *Waste-book*. Meantime, for the several events and states of things, to which these fictitious denominations are allotted, it cannot be but that other denominations, clear of Fiction, and, in a direct way and to the apprehension of mankind in general, expressive of the objects requiring to be designated—are to be found; and, by any such universally apt expressions, so many expositions and explanations will be given of the correspondent fictitious and unapt ones. In this design, a little work on this universally useful branch of *Logic*, was long ago planned, and is at present in preparation.*

(92.) [*Note-taking:*] i. e. taking *Notes* or *Memorandums* of the purport of any discourse, whether delivered *from book* or *without book;* for example, as here, for the purpose of *instruction:* and in the case of *exhibitions*, with or without memorandums taken, of the appearances presented by the objects *exhibited*. The *time* during which these notes *are taking*, being no other than the time during which the discourse is delivering, and the object exhibiting, including any such *pauses* as may happen to take place; the consequence is, that, with relation to the *original* from whence they are taken, any such notes can scarcely have place in any other form than that of an *abridgment;* and *that* an abridgment made *extempore*, upon the spur of the occasion, with very little time employable in the process of *consideration*. On this occasion, use will naturally be made of a masterly little work on this subject, published in English, by the *Abbé Gaultier*.

Note-taking being, in so far as the note falls short of being a complete copy, a species of *composition*, and, as such, in some sort, a product of *invention*, and *that* product produced *extempore*, and affording, at the same time, the most correct *test* of the correctness and completeness of the conception which, as appears by the note thus taken, has been formed of the original discourse: this is the sort of *exercise*, to the performance of which the maturest state of the mind is requisite; and which, therefore, ought to be the *last* of all the exercises, performed in relation to the several subjects of instruction that have place in the whole of the aggregate course. When all the several particular courses have been gone through, *without* the benefit of this auxiliary task, then will be the time for determining which of them stand most in need of it, and thereupon to which of them it shall be afforded.

(93.) [*School-room insufficient:*] viz. space in the school itself. In most instances, *Dancing*, *Riding*, *Fencing*, for example, the objection is obviously an insuperable one. In that of the *Military Exercise*, so would it be so far as concerns the particular portion of covered space in question; but, suppose a proper spot obtainable in the near neighbourhood, *this* objection, at any rate, vanishes.

(94.) [*Admission pregnant with exclusion:*] i. e. the branch of instruction in question, such, that by admission given to it, exclusion would unavoidably be put upon others; viz. upon some one, or more, or all of them, Thus, if instruction in *Music* were admitted, the noise would be such, that, while it was going on, the requisite degree of attention could not be paid to any other. So, if instruction in relation to controverted points of *Divinity*, were admitted, whatsoever were the tenets taught, a parent to whose notions those tenets were, to a certain degree, repugnant, would not send his child to a school, which numbered among its objects and its promises, the impregnating with those tenets the minds of its scholars.

The considerations by which, in the proposed course of instruction, nothing that regards Religion is intended to be comprised, are extremely simple; and it is hoped will receive the approbation of all parties.

1. Necessity of the course thus taken.
2. Needlessness of the opposite course.
3. Innoxiousness of the course thus taken.

Any one of these considerations might have sufficed to justify it; and all of them, it is believed, will be found to have place.

1. Necessity of the course thus taken.

For the purpose of this first experiment, on which so much depends, it has been, and is, the anxious desire of the managers, to have

* Some farther remarks on this subject will be found in vol. v. p. 383, *et seq.*

the greatest number of children possible to try it upon, and that in the course of the whole length of time during which a continuance of the necessary exertion on the part of all the several numbers could reasonably be expected. The cheapness of the terms on which scholars can, in the Bell and Lancasterian systems, receive instruction; the cheapness of the terms, and, consequently, the number of the persons to whom the proposed benefit can be imparted, depends on the number capable of being instructed under one system of management, and one Head-master. In regard to the proposed mass of instruction, it has been matter of consideration to the managers, not only to what ages it was capable of being applied, but, moreover, at how small a rate of expense; and, consequently, to how large a proportion of the whole population it was capable of being administered. To this end it was, that the extent to be endeavoured to be given to the numbers proposed to be provided for in the first instance, was that which has been regarded, as the greatest for which in such a case, the inspecting eye of one and the same general master, could be made to suffice. To have put an exclusion upon any description of children, whose parents are able and willing to send them to the proposed Chrestomathic School, on the ground of Religion, would have deprived the managers of an indefinitely extensive number of children, on whom to try their first experiment; a number on which their wishes had fixed with a much stronger degree of intensity than their expectations.

2. Needlessness of the opposite course.

When, under the auspices of the National Society for the Instruction of Children in the inferior and most necessary branches of learning, a determination was taken to comprise, in the plan of their schools, the Christian Religion in general, and the Church of England form of it in particular, it could not but have been under the apprehension—nor that apprehension by any means an ill-grounded one—that to no inconsiderable proportion of the number of children so taught, if in those schools, religion, in that established form, were not to be taught, the consequence would be that neither in that form, nor in any other, religion would have been taught to them, or learnt by them at all.

But in the present case, that is in the case of the class of persons in whom, in addition to the desire of having instruction administered to their children on so extensive a field, shall be added a degree of pecuniary sufficiency adequate to the quantum of school-money, (the four guineas, or the two guineas, proposed to be required,) no such apprehensions could assuredly have place. By the omission in question, at any rate, no reasonable ground seems to present itself for apprehending that the number of scholars, sent to the proposed school, will in any degree be lessened.

By the very supposition, it could not in the case of those parents, if any such there be, to whom, in the character of a subject of instruction, religion is a matter of indifference. But in the case of those to whom it is not a matter of indifference, what objection can it form to the proposed plan,—that out of the twenty hours, six are employed in subjects other than that of religion, so long as there remains the number of eighteen hours, during any part of which, by themselves, or by their own chosen substitutes, religion, in whatsoever form is most comformable to their respective consciences, may be administered.

On this subject, a consideration highly material, and which cannot too carefully be kept in mind, is, that the proposed school is not a boarding-school,—it is a mere day-school, and nothing more. Were it a boarding-school, except during the comparatively short portions of time occupied by vacations, the scholars would stand precluded from receiving instruction on this head from any other source; and subject only to that exception, the effect of any arrangement by which the subject of Religion was excluded from the list of subjects taught in the school, would be to exclude it altogether, down to the time of his departure, from the scholar's mind.

The Music Master, the Dancing Master, the Writing Master, the Lecturer on Natural Philosophy, the Lecturer on Chemistry, the French Master, the Italian Master, no one of all these different sorts of instructors ever includes, or is expected to include Religion in his course. If, in the instruction administered by the schoolmaster by whom the dead languages, or one of them, are taught, Religion is now comprised, it is either because the school kept is a boarding-school, as in the case of the great public schools, having a set of boarding-schools attached to them; or because it has happened to the schoolmaster to belong to that particular profession from which such instruction cannot but be expected; or from some other such irrelevant and accidental cause.

3. Innoxiousness of the omission.

Notwithstanding all that has been said on this subject, one ground of possible apprehension, and hence of objection, remains, it must be acknowledged as yet unanswered. Good, says the father or the guardian: true it is during three-fourths of the child's time, (eighteen hours out of every twenty-four,) you leave me at liberty to administer to him on this most important of all subjects, instruction in what shape soever I think best; so far all is well: but of the remaining fourth part, (the space of six hours,) during which you are in possession of him, the whole time is to be employed in instruction, and the few casual moments during which alone my unavoidable avocations will admit of my administering instruction or causing it to be administered, to him, what will they avail, if so it should be that of those six hours, any part should, under your management, be employed in the administering of instruction repugnant to Religion in general,

or to that form of it which, in my eyes, is the best, not to say the only good one.

In answer to an observation, of the reasonableness of which they are fully sensible, the reply of the managers, which the writer of these pages is authorised to make, will, it is hoped, be seen to be as full, and felt to be as satisfactory, as it is short. Under their management, no instruction that is repugnant or disrespectful to Religion in general, to the Christian Religion in particular, or to any one form of it, shall ever be administered.

Parents and guardians, the persons to whom this answer is immediately addressed, are not, it is true, as the proposed managers cannot fail to perceive, the persons on whom the success of the plan depends in the first instance, and to whom, in consequence, this proposal is most immediately addressed. But, for the most part, the answer, be it what it may, which is of a nature calculated to afford satisfaction to those, whose interest in the matter is so much greater than any that can be possessed by any one else, will, it is hoped, be in general found no less satisfactory to those whose interest is of inferior magnitude ; and, in particular, to all such persons as on other grounds would feel disposed to contribute their assistance.

"Nay, but," says somebody, "it is not in the remissness of parents and guardians,—I am sorry to say the too general remissness of parents and guardians,—it is not in their indifference to this most important of all subjects, —it is not in the indifference of other people that I can find any sufficient warrant for the like indifference on my part. On the contrary, the more extensive, not to say general, this indifference, the more strongly is it incumbent on me, and on all others who join with me in worshipping God in that perfect form in which I worship, to do what depends on us towards making up for that deficiency. If, then, to the instruction which you administer on other subjects, you will add instruction on this, which is of more importance than all the others put together, and that in the particular form which, for no other reason than because it is the best, I hold to be the best, there is so much of my money for you ; otherwise none."

In a discourse to some such effect as the above, there is nothing but what every person, engaging in an undertaking such as that in question, ought to be fully prepared to expect. In the eyes of a class of persons, nor that an inconsiderable one, which always has existed, nor will ever cease to exist, Religion, not only in the Church of England form, but in every form, is seen hanging on a thread—a thread which, by the blast of this or that speech, or by the flutter of this or that pamphlet, is in continual danger of being cut, while, without the support of their arm, the power of the Almighty is in continual danger of being overborne, his intentions defeated, his promises violated. To those to whom the promises of their God afford not any sufficient assurance, it were not to be expected that any firmer assurance should be afforded by any human promises.

In answer to such apprehensions, in as far as they may be capable of receiving one, no better remedy presents itself than would be afforded by that great institution, the National Institution, by which so much, and so much good, has already been accomplished. If, in aid of the first great cause, second causes must still be looked to, there may be seen a second cause of the most potent character, and to the contemplation of which the anxious persons in question cannot, consistently or naturally, be averse ; a second cause of which, to the very purpose of calming these very anxieties, the power has so recently and so efficiently been applied.

As to the present humble attempt, why not then let it take its course ? Why not even contribute to enable it to take its chance ? If in other respects being useful, it be in respect of Religion, innocuous, it may claim, at any rate, the same sort and degree of indulgence, and even countenance, as that which has been recently bestowed upon a superior mode of raising mushrooms ; and if, contrary to the solemn and thus publicly announced and disseminated engagement,—if the proposed managers prove prejudicial to the best interests of mankind on the subject of Religion, there stands that society to which, neither consistently with situation can the will, nor consistently with experience the power, be wanting—the power to reduce to thin air all danger from such a source.

In their hands are all the springs of human action, all the sources of reward or punishment. Let them but speak the word, and an hypsopromathic national school will raise itself aloft, and the Chrestomathic, should it even, by the humble endeavours of the proposed managers, have been completely filled, will find itself much more speedily emptied. In the very nature of the case, the little finger of the National Society will, at all times, be heavier than the arm of the Chrestomathic ; and on the side on which the superiority of the weight of metal is so vast and so undisputable, could any possibility of failure be conceived how prodigious must be either, on the one hand, the indefensibleness of the cause, or, on the other hand, on the part of all but the supposed vanquished, the perversity of mankind !

With or without sharing in such apprehensions, real or pretended, as the above, there will be found another class of persons, and that a very numerous one, who, in the success of such an institution, cannot but view an injury, more or less serious, to their own particular interests. For on the part, of every person whose well-being, in any shape or degree, depends upon the continuance of any inferior mode of instruction (not to speak

of governmental, legislative, administrative, judicative opposition,) opposition to every endeavour to substitute to it a superior one, ought, on every occasion, to be expected as a matter of course. As a particular interest, standing upon the face of it, in opposition to a more extensive interest, would not, to those who are actuated by it, present any very promising chance of being adopted by any persons who, without being themselves in the particular interest, should feel themselves standing in the general one, some other consideration than the really actuating one will, therefore, in this case, be looked out for; and when will any one be found so plausible or so likely to be impressive, as the apprehension just above mentioned?

It is not for ourselves, it is not for any such ever miserable sinners, and ever unprofitable servants, that we are and ought to be afraid. God and his cause—it is for that that we are afraid. Tie up tight, then, your purse-strings, and lest, by false, however fair, pretences, you should ever, for any such dangerous purposes, be tempted to untie them, against all such pretences keep your eyes steadily averted, and your ears as inexorably closed.

Deficiency of means is commonly one of the last causes which a man is disposed seriously to oppose to a demand which, in other respects, would not be unwelcome. In this, as in any other case, a more honourable excuse cannot be found than that which is presented by conscience; and where the will, though real, is not accompanied with the means, to subject the plea to a rigorous scrutiny would be adding hardship to hardship, without use. If, therefore, in the above suggestion, any unwilling refuser should find an excuse in serviceable condition, ready made to his hands, the labour expended in the putting it in order will not be without its use.

(95.) [*Time of life too early.*] Supposing that, in the instance of the branch of instruction in question, this objection could not, if considered as applied to the time of admission, be other than a peremptory one, it would not follow but that, before the close of the aggregate course, it may have altogether ceased.

(96.) [*Utility not sufficiently general.*] In the character of a *ground of omission*, this objection can scarcely be admitted to hold good, except in so far as *admission* would have for its effect the putting an *exclusion*, either altogether or in part, upon some other branch, of which the utility is more extensive; for, at any rate, the *Advantages*, attached in common to all learning (as per Col. I.,) would be among the fruits of it.

(97.) [*Gymnastic Exercises.*] *Gymnastic*, from a Greek word, which signifies *naked*. In the warmer climates of Greece, exercises, requiring bodily exertion, used to be performed in a state more nearly approaching to *nakedness* than that in which they are commonly performed, in times and places in which, as with us, there is less heat and more delicacy.

(98.) [*Military Exercise.*] See (93.) *Schoolroom insufficient*, and (99.) *Art of War*.

(99.) [*Art of War:*] including *Tactics*, *Military* and *Naval*. Of this art, the *Military Exercise* is itself one branch. So far as concerns this branch, neither can the *utility* of it (when the female sex is excepted) be said not to be sufficiently *general*, nor the *time of life* too *early*, so far as concerns the last year or two of the proposed schooltime.

(100.) [*Private Ethics or Morals.*] Important as is this branch of art and science, admission cannot consistently be given to it in the character of a *distinct* branch of art and science. *Controverted* points stand excluded, partly by the connexion they are apt to have with controverted points in *Divinity*, partly by the same considerations by which controverted points in divinity are themselves excluded. *Uncontroverted* points will come in—come in of course, and without any particular scheme of instruction—on the occasion of such passages in *History* and *Biography*, as come to be taken for the subjects of *Grammatical* and other *Exercises*.

NOTES TO TABLE II.

I.—NOTES TO THE EXERCISES.

(a.) [*Mathetic.*] From a Greek word, which signifies *conducive to learning.* SYN. (i. e. *Synonymous terms* or *phrases*)—*Imbibitive, Acquisitive* exercises: exercises, by the performance of which, *instruction* or *learning* is *imbibed, acquired, obtained;* by which *progress is made, proficiency obtained,* or a lesson *got: simply* mathetic, to distinguish them from those which may be termed *mathetico-docimastic,* as per No. (9.) by which progress is *made,* and at the same time *exhibited.*

Correspondent, and, in its performance, *precedent,* as well as in some cases *subsequent,* to each species of exercise performed by the *learner,* is a *didactic* operation (*didactic,* from a Greek word, signifying *conducive to teaching,*) which must be performed by the *teacher.* From the general nature of the case, the nature of the didactic operation, correspondent to the mathetic exercise, will, without much difficulty, be conceived: but for greater clearness, and more particular designation, will in each instance be here given.

(b.) [*Probative.*] Syn. *Docimastic:* from a Greek word, which signifies the affording experimental proof, such as in chemistry is afforded by the case of a *test* · exercises, by the performance of which *proof* of progress or proficiency, and, if any, of the *degree* of it, is made: to this head belong the exercises, by the performance of which a lesson is *said.*

(1.) [*Orally or Scriptitiously.*] Orally, i. e. by word of mouth: scriptitiously, i. e. in writing, or in print: [*in terminis*] Syn. in the very *terms,* in the very words; in *tenor.*—*Correspondent* DIDACTIC OPERATION, *Delivery, oral* or *scriptitious,* of these same portions of discourse.

(2.) [*In purport.*] *Syn.* in words, which, however different, present the same *import, sense, meaning, signification*—the same *ideas*—are to the same *effect.*

On the difference between *tenor* and *purport* depends, (it will be seen,) in several very material respects, the nature and effect of this, and the *recitative* and *responsive* exercises, Nos. 5, 6, 7, and 8: viz. according as it is in *tenor* only, or in *purport* only, or in either indifferently, that the *recital* or *responsion* is required to be performed. See *Principles,* No. 23.

(3.) [*Sensible Objects.*] Such objects, by which ideas are presented to us, through the medium of any of our five *senses.* These are—1. In so far as *natural history* is the subject, bodies and portions of matter, in the state, whether of *rest* or *motion,* in which they are found or observed, before they have been made to undergo any change by *human* art. 2. In so far as either *experimental philosophy,* or *technology* (i. e. knowledge of what belongs to *already established arts*) is the subject, they will be found referable to one or other of four heads, viz. *operations, subject matters, instruments, and results:* 1. Operations, i. e. *motions,* produced with the view of producing the *results:* 2. Subject matters operated *upon;* 3. Instruments operated *with,* or *by means of;* and 4. Results, which are mostly *bodies,* brought into some new form; but, in some instances, *motions* produced for some special purpose. *Correspondent didactic operations*—Making *exhibition* of those same sensible objects.

(4.) [*Organic Exercises.*] Exercises, in the performance of which *bodily organs* are employed: as, in the case of *pronunciation, spelling,* and *reading,* the organs of *speech;* in the case of *drawing* and *writing,* the *hands;* and not merely, as in the case of *recollection,* the powers of the *mind. Correspondent* DIDACTIC OPERATIONS—*Prescription* and *direction,* of these same organic exercises: and, in case of *drawing* and *writing, inspection* of the several products.

(5, 6.) [*Simply Recitative Exercises.*] *Recitative,* i. e. consisting in the *reciting* or *repeating* of some portions of discourse, as delivered by *word of mouth,* or in *print* or *writing:* for which purpose it must have been *gotten by heart,* as the phrase is; and, accordingly, if delivered in *print,* said *off book,* as the phrase is, or *out of book,* or *without book, simply:* viz. to distinguish this from the *responsive* exercises, No. (7.)

(7, 8.) [*Responsive Exercises.*] *Correspondent* DIDACTIC OPERATION, *interrogative examination,* i. e. *prescription* and *direction* of this same exercise.

(9.) [*Test of Intellection.*] i e. as a *proof* of his *understanding,* or a *trial,* how far, if at all, he understands, what he has *heard* or *repeated;* for, a case, which otherwise is but too apt to happen, is that, after having *heard,* or after having *read,* and thereupon learnt to *repeat,* though it be ever so correctly and completely, the *words* of a discourse, which, for that purpose, have been *delivered* to him, the pupil,—instead of laying up in his mind the proper, i. e. the intended, *meaning,* No. (2.),

CHRESTOMATHIC INSTRUCTION TABLES. TABLE II.

Showing, at one view, the PRINCIPLES constitutive of the New-Instruction System, considered as applicable to the several ulterior branches of Art and Science-Learning (Language-Learning included) through the medium of the several sorts of EXERCISES, by the performance of which Intellectual Instruction is obtained or obtainable.

☞ *The perfection of the System consisting, in great measure, in the co-operation and mutual subserviency of the several Principles, any adequate conception of its excellence and sufficiency, especially with a view to the here proposed extension, could scarcely (it was thought) be formed, without the benefit of a simultaneous view, such as is here exhibited.*

By the figures subjoined to each Principle, reference is made to the Volumes and Pages of Dr Bell's Elements of Tuition, London, 1814, *in which that Principle is mentioned or seems to have been had in view; some of the principal passages are distinguished by brackets. The references to* Vol. II. *are put first, that being the Volume in which the explanations are given. The articles for which no authority has been found, in Dr Bell or elsewhere, are distinguished by not being in Italics.*

INTELLECTUAL EXERCISES:

in the application of which to the purpose of *Instruction, School* Management consists: viz.

I. *Mathetic* (a) Exercises.

1. Applying attention to portions of discourse, orally or scriptitiously (1.) delivered, in such sort as to conceive, remember, and occasionally recollect, and repeat them, *in terminis*.
2. Or *in purport*. (2.)
3. Applying attention to *sensible* (3) objects, to the end that, by means of correspondent and concomitant portions of discourse, their respective *properties* may so far be conceived, remembered, and occasionally recollected and repeated: viz either in the terms, or according to the purport, of such discourse.
4. Performance of *organic* (4.) exercises, in so far as performed for the simple purpose of attaining *proficiency* in the performance of those same operations, and not as per No. 9.

II. *Probative* (b) Exercises.

§ I. Universally applicable to *all* branches of Intellectual learning.

5. I. *Simply recitative* (5., 6.) Exercises, performed *in terminis*.
6. II. Ditto, *in purport*.
7. III. *Responsive* (7., 8.) Exercises performed *in terminis*.
8. IV. Ditto, *in purport*.
9. V. Performance of *organic* operations, in so far as employed as *tests* of *intellection* (9) and *proficiency*, in regard to corresponding Mathetic Exercises.
10. VI. *Note-taking* i. e. the *extempore* taking of *Notes*, or *Memorandums*, of the *purport* of *Didactic* discourses, while *orally* delivered; accompanied or not by *exhibitions*, as above, No. 3.

§ II. Exclusively applicable to *Language learning*.

11. I. *Parsing, Canoniphantic*, or *Grammatico-syntactic Relation* and *Rule indicative* Exercise.
12. II. *Single Translation* Exercise.
13. III. *Double* or *reciprocating* Translation Exercise.
14. IV. *Purely syntactic* composition Exercise, or *Clark's* Exercise.
15. V. Purely syntactic *prosodial* composition Exercise, or *Metre-restoring* Exercise.
16. VI. Prosodial *non-significant* or *Purely metrical* (original) composition Exercise.
17. VII. Purely metrical *Translation* Exercise.

PRINCIPLES OF SCHOOL MANAGEMENT: (c)

applicable to Intellectual Instruction, through the medium of those same Exercises: viz.

I.—*To all branches without distinction.*

I. Principles, relative to the *Official Establishment*: i. e. to the *quality* and *functions* of the Persons, by whom the performance of the several *Exercises* is to be directed.

1 *Scholar-Teacher employment maximizing* principle.
II. XIII. 29. 31. 33. 43. 44. 75. 79. 81. 82 87. 99. 125. 133. 134. 197 201. 210. 222. 223. 229. 237. 241. 265. 267. 362. 368. 369 370. 371. 388. 403. 411. 424. 425. 426. 427. 431. 439.
I. V. XXVI. XXX. 1 22. 23. 37. 40. 41. 48. 115 to 126.

2 *Contiguously proficient Teacher preferring* principle. II. 271.

3. *Scholar-tutor employment maximizing*, or *Lesson-getting Assistant employing*, principle. II. 90. 93. 110. 212. 220. 237. 249. 263. 299. 329 343. 344. 366. 368. 369. 399. 401.

4. *Scholar-Monitor employment maximizing*, or *Scholar Order-preserver employment maximizing*, principle. II 90. 213. 403. 439.

5. *Master's time economizing*, or *Nil per se quod per suos*, principle. II. 263.

6. *Regular Visitation*, or *Constant Superintendency preceding*, principle. II. 191 213 227. 323. 419. 420. 422 427. 431. 432. I. 126.

II. Principles, having, for their special object, the preservation of *Discipline*: i. e. the effectual and universal performance of the several prescribed *Exercises*, and the exclusion of *disorder*: i. e. of all practices *obstructive* of such performance, or productive of *mischief* in any *other* shape; and, to that end, the correct and complete observance of all *arrangements* and *regulations*, established for either of those purposes.

7. I. *Punishment minimizing*, and *Corporal Punishment excluding* principle. II. 78. 84. 124. 127. 195. 196. 208. 232. 233 236. 262. 343. 346. 389. 410. 439. I. 39. 43. 89. 90. 123.

8. II. *Reward economizing* principle. II. 262. 346. 347. 348. 349.

9. III. *Constant and universal Inspection promising* and *securing* principle. II. 237. I. 38.

☞ *To this belongs the Panopticon Architecture employing principle.*

10. IV. *Place-capturing*, or *Extempore degradation and promotion*, principle. II. 124. 134. 137. 194. [207.] 216. 235 250. 251. 254. 259. 280. 283. 286. 287. 289. 301. 314. 315. 329. 337. 343. 357. 358. 359. 360. 369. 410. 439. 442.

11. V. *Appeal* (from Scholar-master) *preceding* principle.

12. VI. *Juvenile Penal Jury*, or *Scholar Jurymen employing* principle. II 209. 214. 228. 229. 234. [236.] 261. 346. 368 402. 426 I. 43.

III. Principles, having, for their special object, the securing the *forthcomingness of Evidence*: viz. in the most correct, complete, durable and easily accessible shape: and thereby the most constant and universal *notoriety* of all *past* matters of *fact*, the knowledge of which can be necessary, or conducive, to the propriety of all *subsequent* proceedings; whether for securing the due performance of *Exercises*, as per Col. I. or for the exclusion of *disorder*, as per Col. II.

13. I. *Aggregate Progress Registration*, or *Register employing*, principle. II. 214. 228. 229. 251. [257.] [258.] 263. 273. 293. 340. 360. 363. 368. 373. 419. 420. 422. 427. 432. I. 78. 117.

14. II. *Individual* and *comparative proficiency registration*, or *Place-competition-result Registration employing*, principle. II. 230. 231. 259. 265. 275. 330. I. 30. 31. 116.

15. III. *Delinquency registration*, or *Black-Book employing*, principle. II. 214. 231. 232. 234. [235.] 261. 346. 368. 369. I. 43. 89.

16. IV. *Universal Delation* principle, or *Non-Connivance tolerating*, principle. II. 234. 236. 264. 361. 366.

IV. Principles, having, for their special object, the securing *perfection*: viz. in the performance of *every Exercise*, and that in the instance of *every Scholar*, without exception.

17. I. *Universal proficiency promising* principle. II. 46. 78. 83. 118. 127. 283. 368. 372. 386. 387. 401. I. 30. 32. 109.

18. II. *Non-conception*, or *Non-intellection, presuming*, principle, II. 255. 256. 259. 365.

19. III. *Constantly* and *universally perfect performance exacting*, or *No-imperfect performance tolerating*, principle. II. 134. 252. 253. 263. 271. 276. 279. 284. 292. 293. 294. 297. 298. 309. 313. 324. 325. 339. 340. 342. 352. 353. 354. 355. 357. 387. 439. 441. 443.

20. IV. *Gradual progression securing*, or *Gradually progressive Exercises employing*, principle, II. 308. 427. 439. 442.

21. V. *Frequent and adequate recapitulation exacting* principle. See 19. III.

22. VI. Place-capturing probative exercise employment *maximizing* principle. See 10. IV.

23. VII. Fixt verbal standard employment, and Verbal conformity exaction, *maximizing* principle. *Lancaster's Improvements*, p. 84. *Bell*, II. 440. 441. 443.

24. VIII. Organic Intellection-Test employment *maximizing* principle. II 273. 275. 289. 290. I. 25. 26. 37.

25. Note-taking Intellection-Test employment *maximizing* principle.

26. IX. *Self service exaction maximizing* principle. II. 87. 327. 328. I. 28.

27. X. *Task-descriptive enunciation and promulgation exacting* principle. II. 287. 290. 354. 363. 373. 442.

28. XI. Constant all-comprehensive and illustrative Tabular Exhibition *maximizing* principle.

29. XII. *Distraction preventing*, or *Exterior object excluding*, principle.

30. XIII. *Constantly and universally apposite Scholar-classification securing* principle. II. 82. 124. 127. 132. 209. 212. 215. [216.] 217. 218. [243.] 263. 338. 340. 345. 359. 362. 387. 395. 401. 439. 441. I. 29. 125.

V. Principles, having, for their special object, the union of the maximum of *despatch* with the maximum of *uniformity*; thereby proportionably *shortening* the *time*, employed in the acquisition of the proposed body of instruction, and *increasing* the *number* of Pupils, made to acquire it, by the *same Teachers*, at the *same time*.

31. I. *Simplification maximizing*, or *Short lesson employing*, principle. II. 194 195 202. 203. [207.] 208. 210. [223.] 224. 263. 265. 272. 275. 294. 302. 331. 351. 355. 356. 362. 363. 369. 371. 385. 410. 427. 441. 442. 439.

32. II. *Universal-simultaneous-action promising* and *effecting* principle. II. 215. 285. 287.

33. III. *Constantly-uninterrupted-action promising* and *effecting* principle. II. 252. 263. 283. 364. 439.

34. IV. *Word of command employing*, or *Audible-direction abbreviating* principle. (*Lancaster*, 110. See No. 23.) II. 250 to 254. 280. 281. 310. 360. 363. I. 30.

35. V. *Universally visible signal*, or *pattern employing*, or *Universally* and *simultaneously visible direction employing*, principle. II. 254. 270. 275. 279. 440. 443

36. VI. *Needless repetition* and *commoration excluding* principle. II. 252. 282. 288. 354. 373. 439. 442.

37. VII. Remembrance assisting Metre-employment maximizing principle.

38. VIII. *Employment varying*, or *Task-alternating* principle. II. 252. 283. 289. 290. 264.

II.—*To particular branches exclusively:*

I. To the arts of *Speaking, Reading*, and *Writing*.

39. I. *Constantly distinct intonation exacting* principle. II. 132. 299

40. II. *Syllabic lection exacting*, or *Syllable-distinguishing intonation employing*, principle. II. 267. 362 370. 412 I 27.

41. III. *Recapitulatory-spelling discarding*, or *Unreiterated-spelling exacting*, principle. II 280. 303. 304. 306. 370. 412.

42. IV. *Vituously retroactive repetition*, or *Balbutient recollection-assisting repetition prohibiting*, principle, II. 132. 240 252. 260 262 288. 354. 373.

43. V. *Sand-Writing employing*, or *Psammographic*, principle. II. 88. 89. 91. 270. 274. 276. 279. 327. 350. 370. 412. 427. 441. I. 24. 25.

II. To *Geometry* and *Algebra*.

☞ For several proposed principles of instruction not referable to this system, see the tract, printed as Appendix, No. VIII.

the *meaning* which the words were intended to *convey*, and in the *conveyance* of which consists their sole *use*—contains in his mind—has in his *memory*, nothing but the bare *words*; i. e. the *sounds*, with or without the *forms* presented to the eye by the series of the *letters*: i. e. *no* meaning at all, or some meaning more or less *improper*—more or less *incorrect* or *incomplete*. For putting him to this trial, one mode or *test* is, the calling upon him, viz. by a *question*, expressed, whether in the same words, or in different words, to deliver the *same meaning*, but expressed in *other words*. Another expedient is confined to the case, where the object of the instruction is, to teach the practice of some branch of *art*, to the practice of which the exercise of some *bodily organ* is necessary, or some branch of *science*, the *possession* of which is capable of being *proved* by the *practice* of some correspondent *art*: in this latter case, the *fact*, viz. of his *understanding* the *meaning* of the *words*, by which the instruction in question relative to the *science* was expressed, is capable of being *proved*, in some degree, by his performing some *organical operation*, by the performance of which the correspondent *art* is practised.

Thus, in so far as his *pronunciation* is correct, he affords a proof that the instructions, which have been conveyed to him on the subject of the art of *speaking*, are, in so far, not only *remembered* by him, but *understood*; in so far as his *writing* is correct, that the corresponding instructions, on the subject of the art of *writing*, are, in so far, not only remembered, but understood: if, after the description given to him of the characteristic marks of this or that species of *plant*, or *animal*, or *tool*, or *utensil*, or *mathematical figure*, he is able to give expression, and has accordingly given expression, to these same marks, by *drawing*, here, likewise, in so far as the *figure* drawn by him is correct, he has afforded a proof that that same description has not only been *remembered* by him, but *understood*. *Correspondent* DIDACTIC OPERATIONS, Prescription and direction of those same exercises; organic operations, and, in the case of *drawing* or *writing*, inspection of the result.

(10.) [*Note-taking.*] The principal and most immediate use of this exercise is to serve as a *test* of *intellection*, as per (No. 9.); especially in so far as the nature of the subject admits not the application of the sort of *organic* test therein described.

But in it is included a certain species of *composition*, and thereby a certain degree of *invention*. It is, therefore, among the *highest* species of exercise; a task, for the due and effectual performance of which, the maturest state of the minds, for which the course of instruction here in question is designed, will probably be found requisite. *Correspondent* DIDACTIC OPERATIONS, *Prescription* and *direction* of this same exercise, and *inspection* of the *notes*, which are the result of it. To one or other of these exercises, *mathetic* and *probative*, or both in one, every possible mode of instruction, applicable to *intellectual* instruction in general, will, it is supposed, be found reducible; and if it be true, as supposed, that there is not one of them which is not—and that with the full benefit of the Bell Instruction System—applicable to all the several branches of that learning, enumerated in the course of this work, the applicability of that system, with a degree of advantage equal to what has been so universally experienced in the lower order of schools, to those several branches, when taught in the proposed Chrestomathic School, will, it is hoped, be found to be placed out of the reach of doubt.

(11.) [*Parsing.*] In the exercise called *parsing*, two distinguishable operations are supposed to be commonly included: viz. 1. Indication of the grammatical *relations*, which the component words of each sentence bear to another; 2. Indication of the grammatical *rules*, by which the custom of the language, in those particulars, is expressed, and conformity to that custom accordingly prescribed.

[*Canonyphantic.*] From a Greek word signifying a *rule*, and another signifying *indication*. *Correspondent didactic operation*, Prescription and direction of this same exercise, and, if performed in writing, inspection of the result. This same description applies to the several didactic operations, corresponding to the several exercises herein aftermentioned.

(12.) [*Single Translation.*] This exercise wears a different character, and is productive of different effects, according as the *vernacular* language is or is not one of the two languages; and if yes, according as the *foreign* language in question is translated *from*, or translated *into*.

(13.) [*Double* or *reciprocal Translation.*] This exercise wears a different character according to the diversifications mentioned in the case of single translation, and according as literal conformity on the one or the other side, or on both, is, or is not, exacted.

(14.) [*Clark's Exercise.*] Advantages attached to this exercise, in comparison with translation *into*, or composition *in*, the foreign language, with the help of a *dictionary*. 1. Saving of the *time*, *necessary* to the finding out of the word. 2. Saving of the *time*, *naturally* and frequently consumed, in *inaction* or *irrelevant reading*, in the course of the search. 3. Saving of the *perplexity*, attendant on the *choice* between the several words presented by the dictionary; a choice to which, for a long time, the pupil continues irremediably incompetent.

(15.) [*Metre restoring.*] A verse being chosen by the Master, and the words thrown out of their order, in such sort that they no longer constitute a verse, this exercise consists in *restoring* them to their *order*: to which purpose some acquaintance with the nature of the *sort* of verse, and the rules of *Prosody*,

i. e. *versification*, in general, is necessary. This exercise operates therefore as a *test*—not only of *remembrance*—but of intellection, with regard to those rules.

(16.) [*Prosodial non-significant.*] In schools this is called making *nonsense verses*. Accident will every now and then give to the nonsense the appearance of ludicrous sense. To this exercise, the *metre restoring* exercise may serve as an introduction. It affords a certainty of success: and saves the *time*, that would otherwise be to be employed in the search of words. By the shortness of the time requisite, it would be, in a particular degree, well adapted to the present system. See No. (31.) *Short-Lesson* principle. Whether it has anywhere been employed cannot here be stated. The idea of it was suggested by that of *Clark's* Exercise.

(17.) [*Purely-metrical Translation.*] In this case the translation is *into* metre, and may be performed *from* other metre, or from prose: the exercise being purely metrical, the *language* is the same on both sides. One of the *Westminster School* exercises used to be—taking an epigram of Martial, or an ode of Horace, and translating it *into* some other of the species of verse to be found in the same books. Its objects are—1. familiarizing the learner with the *metre* into which he translates; 2. giving him a command of words in the *language*.

II. NOTES TO THE PRINCIPLES.

(c.) [*Principles of Management.*] Of the plan pursued in the giving of *names* to these several principles, the idea was taken from the practice of the *House of Commons*, in their *Votes*, as copied or imitated in the *newspapers*, in relation to *Bills* when spoken of on the occasion of their progress in the Houses. Any names less uncouth and more expressive, will, if suggested, be gratefully received, and gladly substituted. It is only by giving thus to *each* its *particular* name, (viz. in the form of a compound substantive or adjective,) and to *all* one *common* name, viz. *principles*, that the arrangements could be employed, by which the particular *ends* and *uses* common to each class, and the sort of *relation* borne by each principle to *every other*, and thence to the *whole system*, are, as here, brought together in one point of view; and thereby the whole system exposed in the most commodious manner to that scrutiny, by which, in proportion as it is close and intimate, the perfection of the system will, it is believed, be rendered manifest.

(1.) [*Scholar-Teacher Principle.*] The principle, which consists in employing, as *teachers* to the rest, some of the most advanced, and in other respects most capable, among the *scholars* themselves:—*maximizing* the use and application made of this principle, i. e. giving to it the utmost extent capable of being given to it with advantage—raising it to a *maximum*. In this *maximization* consists the only peculiarity, and correspondent utility, of this part of the system.—*Advantages* gained, I. *Saving in money.* Every *professional teacher* would need to be paid; no such *scholar-teacher* needs to be, or is paid. II. *Saving in Time.* Under the inspection of one *professional General Master*, the whole number of Scholars may be cast into as many classes as there are different *branches of instruction*, and different *degrees of proficiency* in each: each such class under the direction of its *Scholar-Teacher;* the instruction of all these classes going on at the same time. III. *Increase in relative aptitude.* 1. For securing the attention of a *grown* person in the character of *Teacher* to such business, especially in the case of those lowest branches, which form the occupation of children but just emerged from infancy, the nature of the case scarce admits of any other generally applying motive than *fear;* viz. the fear of losing the *situation;* i. e. the *provision* annexed to it. In it he can find neither *instruction*, *amusement*, nor, except that fear, any other cause of *interest:* his attention is perpetually called off by such *other* ideas, whatsoever they may be, in which, for the moment, it happens to him to take an interest. In the breast of the *Scholar-Teacher*, the *honour* and *power*, attached to the function, cannot fail of operating in the character of a *reward;* of a reward, the operativeness and sufficiency of which has been proved by an ample and uninterrupted body of experience. Instead of being so completely *stale* as in the other case, the *subject*, contemplated in this new point of view, is not yet become so familiar as to have lost altogether the sort of *interest*, which, particularly in a juvenile mind, is attached to *novelty:*—especially, coupled as it is with the situation of *judge*, presiding on the occasion of the contest, produced by the application of the *place-capturing* principle, No. (10.) 2. By his age and situation, the *juvenile*, and completely subject *Teacher*, is, to a certainty and constancy, rendered more tractable, than a *grown-up under-Master* can ever be reasonably expected to be. On each point, the *grown-up Teacher* is liable to have an *opinion* of his own, and with it a *will* of his own, contrary to that of his superior and employer; to which *will*, at any rate during the *absence* or *inattention* of such his principal, it is in his power to give effect. To the juvenile and subject *Scholar-Teacher*, this can never happen. The

professional under-Teacher, be his negligence or perversity what it may, cannot be subjected to any other *punishment* than that of *dismissal:* a punishment, by the infliction of which, it will frequently happen, that the *judge* would be no less a sufferer than the *delinquent*. IV. By teaching *others*, the scholar is, at the same time, teaching *himself:* imprinting, more and more deeply, into his own mind, whatsoever ideas he has received into it in the character of a *learner:* taking of them, at the same time, a somewhat new and more commanding view, tinged, as they are, with an enlivening colour by the associated ideas of *reputation*, and of that *power*, which has been the fruit of it.

The application of this principle is, therefore, not a *make-shift*, occasionally employed, as under the old system, for want of a sufficient supply of *grown-up* under-Teachers, but an *essential feature*, operating to the complete and *purposed* exclusion, of all such naturally reluctant and untractable subordinates.

But the faculty, of giving to this principle any such extension *to advantage*, depends, in no inconsiderable degree, on several *other* parts of the system, viz. on the *simplicity*, and thence on the *shortness*, of the *lessons*, as per No. (31.); on the *extent* to which the practices of *repetition* and *responsion* in *terminis*, Exercises, No. (5.) and (7.) can be applied to advantage, and thereupon to the extent to which, in the character of a *test* of *intellection*, as per No. (24.) and (25.), their *checks*, viz. the *organic* species of exercise, and the *note-taking* exercise, can be employed; and in so far as responsion in *purport* is either extracted or received, the allowance given to eventual *appeal*, as per No. (11.), from the decisions of the juvenile under-Teacher to the Master—the supreme and universal judge.

(2.) [*Contiguous proficiency principle.*] On this sort of contiguity depends, as hath just been seen, no small part of the advantage, which the case of the *Scholar-Teacher* has over that of the *grown-up Teacher:* but, the higher advanced in the line of proficiency the *Scholar-Teacher* is above his pupils, the nearer does his situation approach to that of *grown-up Teacher: honour* less, *power* less gratifying, *instruction* and *amusement*, if any, less and less. At the same time, what may not unfrequently happen, especially in the case of the lowest classes, is, that at an age, at which, in respect of proficiency in *learning*, he is ripe for the office, the Scholar is not so as yet in respect of the faculty of *discretion*, or that of *judicature*. So far as, in respect of these latter qualifications, a deficiency has place, so far *a departure* from the *contiguous proficiency* principle may be found necessary.

(3.) [*Scholar-Tutor principle.*] The Scholar-*Teacher* delivers the directions to the *whole number* of pupils in a class at once; he presides over the *probative*, and in particular over the *recitative* and *responsive* exercises, Nos. (5.) and (7.), performed *by all together*, under the spur of the *place-capturing* principle, No. (10.)—exercises, by the performance of which the several lessons are *said*. By the Scholar-*Tutor*, assistance is, in case of need, afforded to some *one* other Scholar, attached to him for this purpose in the character of a *private pupil*, during the several portions of time, allotted for the *getting* of the respective lessons. The local station of the Scholar-*Teacher* is, consequently, a distinguished and *solitary* one; that of the Scholar-*Tutor* is a *social* one, just by the side of his *pupil*. The less the degree of general capacity on the part of the *pupil*, the greater is the degree of the like capacity needful on the part of the occasional *assistant*. On this principle it is, that the operation of *pairing* is performed. Suppose, in one class, *eleven Scholars*, and to each a different degree of capacity, for this purpose, ascribed; he who has *eleven degrees* is paired with him who has but *one;* he who has *ten* degrees, with him who has *two;* he who has *six* degrees, remaining single.

(4.) [*Scholar-Monitor principle.*] Of this office—an office of indispensable necessity in all large schools upon the ordinary plan—little or no need will probably be found, on the plan of architectural construction prescribed by the *Panopticon* principle, No. (9.), by which every human object in the whole building is kept throughout within the reach of the *Head-Master's* eye.

[*Master's Time-saving principle.*] The *Managing* Master is but *one:* to the number of the *Scholar*-Masters there are no limits, but what experienced convenience dictates. Whatsoever can be equally well done by any one or more of *them*, *his* time would be very ill employed in doing or endeavouring to do. General inspection and direction is the business which *must* be done by *him*, and *cannot* be done by any one else: whatsoever time is by *him* employed on any *other* business, the danger is, lest it be taken from that which is necessary to the performance of his *peculiar* business, as above.

(6.) [*Regular Visitation principle.*] The operation of this sort of tribunal is an advantage which a school, instituted and supported by *contributions*, possesses in comparison with an ordinary school. By the schools carried on under the superintendence of the Society called the *National Society*, it may in general be expected to be possessed, in a degree more or less considerable, according to *local* circumstances. By the *Chrestomathic* School, it may reasonably be expected to be possessed in a still superior degree, the superiority of which will be proportioned to the ulterior *interest* possessed by the conductors in this case, in *addition* to that possessed by the superintendants in that other case. But the means which the visiters, be they who they may, have for the execution of their trust to advantage and with effect, depend almost altogether upon the principles, Nos. (13, 14, 15, 16,) respect-

ing *Evidence:* the good effects producible by the *judgment* which, on each occasion, they *pronounce*, and the *arrangements* which they *make* in relation to what *is to be* done, are completely dependent upon the *knowledge* which they possess, upon the *information* which they have received, concerning what *has been* done.

(7.) [*Punishment minimizing principle.*]

(8.) [*Reward economizing principle.*] Two intimately connected principles, both of them of cardinal importance, may be seen, in the idea and practice of setting up these *results* in the character of *ends* or *objects* to be aimed at: these, together with the several *maximizing* principles, Nos. (1.) (3.) (13.) (14.) (22.) (23.) (24.) (25.) (26.) (31.) (37.) and the several *promissory* principles, Nos. (17.) (19.) (30.) (32.) (33.) may be considered as so many branches of that all-pervading principle, so peculiar to this system, by which *perfection*, on every point, the idea of it having been conceived, is represented as *capable of being*, and therefore as being what *ought to be*, obtained. To give effect to these *two* principles is the *object* and *effect* of the *four others* which, in this same division, follow them.

Facility of *delinquency*, *inapplicability* of *reward*, *uncertainty* of the *forthcomingness* of *evidence*, and thence of the application of whatever of *punishment* or *reward* may be intended to be administered,—as those several quantities *increase*, so does the *quantity* (i. e. the *intensity* or *duration*) of the *punishment*, necessitated: in proportion as any of these quantities *decrease*, so (if nothing be wrong in the system of judicature) may the *quantity* of *punishment* denounced and applied: always understood, that punishment is *no* punishment unless, supposing it inflicted, the *suffering* produced by it is, in the eyes of *the person under temptation, greater*, than the *enjoyment* expected from the *offence*. By the application made of the *Inspection principle*, No. (9.) and the *Scholar-Tutor principle*, No. (3.), the *facility* of delinquency is, in all its shapes nearly done away: by the *Short Lesson principle*, No. (31.) the *pain* of *labour*, and thence the *pleasure* afforded by *delinquency* in the shape of *idleness*, is *minimized;* by the *Place-capturing principle*, No. (10.), *reward* to the well-doer is rendered, *so far*, a constant accompaniment of the gentle *punishment*, brought on the offender by the offence: by the principles respecting *evidence*, Nos. (13.) (14.) (15.) (16.), operating in conjunction with the *Inspection principle*, all uncertainty respecting *evidence* is done away.

As to *reward* but for the apparent paradoxicality and anti-sentimentality, instead of *economizing*, *minimizing* would, in this case, as in the case of *punishment*, have been inserted. For (perfectly free donations excepted) never can the matter of *reward* be obtained, to pour into *one* bosom, but at the expense of *suffering*, however remote and disguised, inflicted upon *others*. Neither in *power*, in *dignities*, in *honours*—no, nor even in simple *reputation*, will any exception be found to this rule. Therefore it is, that, in a government, though tyranny may exist without profusion, profusion cannot exist without correspondent tyranny.

(9.) [*Inspection principle.*] In the *Bell-Instruction* System in general, in virtue of the *Scholar-Teacher*, &c., principles Nos. (1.) (3.) (4.), and the *Master's time saving principle*, No. (5.), with or without *locomotion* on the part of the Master, this object, it may be reasonably supposed, is nearly accomplished: though, in so far as concerns inspection by the Master, the degree will naturally be less and less, in proportion as the *School-room* is more ample, and by that means drawn out into *length*. By the *Panopticon* principle of construction, security, in this respect, is *maximized*, and rendered entire: viz., partly by *minimizing* the distance between the situation of the *remotest Scholar* and that of the *Master's eye;* partly, by giving to the *floor* or *floors* that *inclination*, which, to a certain degree, prevents remoter objects from being *eclipsed* by nearer ones; partly by enabling the Master *to see without being seen*, whereby, to those who, at the moment, are unseen by him, it cannot be *known* that they are in this case. In the *Chrestomathic* School this plan of construction is of course to be employed.

(10.) [*Place-capturing principle.*] On the occasion of the *saying* of a lesson, whatever it be, the scholars, by whom that same lesson has been *got*, are placed, or are kept, standing or sitting, in one line, straight or curved, as is found most convenient; with an understanding, that he whose place is at one end of the line is considered (no matter on what account) as occupying, at the time, the post of greatest *honour;* the one whose place is next to his, the post next in honour; and so on. The *highest* scholar, as above, begins to *say* the lesson: in case of an error, the *next highest*, on giving indication of it, takes, in pursuance of an instantaneous adjudication, the *first place*, which the *sayer* of the lesson is, in punishment for such his delinquency, adjudged to lose: failing the next, the next but one; and so on to the lowest. By this means, the *intellectual* exercise, be it what it may, is, like most of those *corporal* exercises in which youth are wont to occupy themselves for mere amusement, converted into a *game: punishment* attaching instantaneously upon *demerit*, and, by the same operation, *reward* upon *merit*, and in both cases, without further trouble or expense in any shape.

(11.) [*Appeal providing principle.*] viz. from *Scholar-master* in any one of these his three characters, *Public-teacher*, *Private-tutor*, and *Monitor*. For this appeal, the principal, and, indeed, almost sole demand, will be found to be that which is capable of being constituted by the application of the *Place-capturing* principle, No. (10): especially where, on the occasion of the *probative* exercise to which it

is applied, either *no fixt verbal standard of reference*, as per No. (23.) is employed, or where, this sort of standard being employed, *literal conformity* to it is *not* exacted. The greater the *latitude* allowed to performance, the greater the room for *error*, and *suspicion* of error, in whatsoever Judgment may happen to have been passed upon it.

(12.) [*Scholar Jury principle.*] *Advantages.* 1. The *Master* stands hereby preserved, in a great degree, if not altogether, from the suspicion of *partiality* and *tyranny*. 2. By the necessary solemnities by which the application of the *punishment* is thus preceded, the attention of the *scholar* is more firmly fixt upon it, and the idea of it rendered the more impressive. 3. The scholars are, at this early age, initiated in the exercise of the functions of *judicature*, as well as in the *knowledge* of what belongs to *justice*, while the *love* of it instils itself into their breasts. 4. The tendency, so natural amongst persons of any age subject to coercion, to unite in a sort of *standing conspiracy* against those by whom they are kept under that pressure, is counteracted and diminished.

(13.) [*Progress Registration principle.*]

(14.) [*Comparative Proficiency principle.*] Every *lesson* being taken from some determinate *book*, the designation of every *exercise* is performed and perpetuated by *reference* made to that part of the book which has been the subject of it. On each day, of the *lessons* which, on that day, have, by the several *classes*, been *got* and *said*, together with the *organic* exercises, No. (24.), if any, which have been *performed*, the designation is given, by entries made in the *Aggregate* Register; and, at the same time, the name of each *scholar*, present or absent, belonging to each *class*, together with the *rank* which, as the result of the *place-capturing* contest, No. (10.) of *that* day, or the last on which he was present, has remained to him in his class. The *Comparative proficiency* Register contains a distinct *head* for each scholar. It exhibits, for any portion of *time*, the *class* he has belonged to, and thence, as above, the *lessons*, which in that class he has got and said, and the *organic exercises* which he has performed, and the *rank* which, putting *all* the days together, he has occupied in such his *class*. Thus his account is formed, by copying from the *Aggregate* Register, and summing up, the *numbers* expressive of the *rank*, which he has been found occupying on the several *days* included in the term: the *less* the sum, the *higher*, of course, his rank, taking the whole of the term together. If, for a certain length of time, he is at or near the *top* of the class, it will be a sign, that he is quite or nearly ripe for removal to a *higher* class; and, in the meantime, that he is, to a certain degree, qualified for lending assistance, upon occasion, in the character of *Private Tutor*, as per No. (3) to a *class-fellow*, whose degree of *proficiency*, as indicated by the same document, is, in a correspondent degree, *inferior* to his own; and, in like manner, in proportion as the sum is *large*, the correspondent and *opposite* indication is afforded. Thus it is, that this *Register* forms the basis of the application made of the *Scholar-Tutor* principle, No. (3.) as well as of the *apposite-classification* principle, No. (30.)

(15.) [*Delinquency Registration principle.*]

(16.) [*Delation exacting principle.*] By the *Aggregate Progress* Register, No. (13.), so far as concerns such *transgressions* as are of a purely *literary* cast, the *balance*, formed by the sum of the several acts of *transgression*, compared with that of the correspondent manifestations of *merit*, stands recorded; and, upon this plan of *instruction*, and *construction*, as per No. (9.), seldom, indeed, in any *other* than a literary shape, can delinquency find entrance. By a person, in whose eyes an *offence* which he feels himself under the temptation of committing, is sure to be immediately followed by a *punishment*, the sufferance of which is sure to be greater than the enjoyment from the offence, the offence will not be committed. In an *edifice*, in which nothing can be done that is not, at the same time, certainly by an *under* master, and probably by the *Head* master, seen *while doing*, scarcely will any forbidden act be committed. Punishment, eventual punishment, must, notwithstanding, be appointed; otherwise mere *sport* and *wantonness* would, as well as *idleness*, suffice for the production of offences. But, in such a state of things, a punishment of the *slightest* kind and degree imaginable, will, it is evident, suffice. The bare assurance that his *name* will, in the character of that of a *delinquent*, be made to stand upon the face of a durable and more or less extensively published *Register*, may, in the instance of almost any human being, old or young, as experience, in confirmation of theory, testifies, be depended upon, as being, *in such a situation*, of itself a sufficient punishment. At the same time, for appearance sake, bodily uneasiness, in this or that *slight* shape, may stand appointed; and with the less scruple, on account of the moral certainty of its being seldom, if ever, about to be inflicted. As to the *Universal Delation principle*, under *Dr Bell's* system, every *scholar*, especially if acting in the character of *Teacher*, *Tutor*, or *Monitor*, is *responsible* (i. e. *punishable*) for every instance of *delinquency*, of which, it having been committed in his *view*, or otherwise within his *knowledge*, he has omitted to give information to the *Master*; and, where the *heaviest punishment* that can be the result of such information is but as a *feather*, such, therefore, will this *obligation* be. Light, as under that system it cannot but be, even where the scene is an *ordinary* school-room—in a school-room in which, as per No. (9.), everything is no sooner *done* than *seen*, it will be still lighter.

(17.) [*Proficiency promising principle.*] *Performance*, it may here seem, is everything: *promise*, of itself, promise without performance,

nothing. True, if *without* performance: but it is the nature of promise to operate as a *security* for performance. Hence the laying it down as a *rule*, that *no* scholar shall be considered as *incapable* of imbibing the instruction which is administered, is itself a most important *principle*. It operates as an *engagement*, upon all concerned. True it is, that if, *without blame* on the part of the engager, the fulfilment of the engagement were liable to be defeated; or even if, *by reason of blame* on his part, it were, to a certain degree of frequency, *likely* to be defeated, the engagement ought not to be administered. But that, under the *Bell-Instruction* System, such fulfilment is, in every instance, in the *Master's* power,—is a truth, indicated by theory, and confirmed by experience. By this principle, such perfection is pointed out as a *producible*, and, therefore, *exigible*, result. So far as concerns the already established *lower* stages of instruction, it stands confirmed by every publication which the subject has produced: of its extension to those *higher* stages, which are included in the *Great Grammar Schools*, proof will be found in the *letters* of *Mr Pillans* and *Mr Grey*, mentioned or inserted in the *Chrestomathoscopia*, or its Appendix.* In the remaining principles, belonging to this division, Nos. from (18.) to (30.) may be seen the several *means immediately* operating towards so desirable an end.

(18.) [*Non-conception presuming principle.*] By this principle, as brought to view in the works of *Dr Bell*, reference is made to a practice, which, among *masters*, is so *natural*, and is said to be so *common*,—viz. to keep *repeating*, on each occasion, their instructions, instead of taking the earliest opportunity for *ascertaining* whether, by the pupil in question, these instructions have been *comprehended*. But, under the *Bell-Instruction* System, and, in particular, under the extended application here proposed to be made of it:—1. In the first place, the matter of instruction being throughout *determinate*, and *in print*, the demand for such *intermediate* discourse, on the part of the *master*, will hardly have place:—2. In the next place, no discourse in the form of *instruction* being admitted, but that the most efficient *tests of intellection*, as per Nos. (10.) (22.) (24.) such as the nature of the case admits of, are provided and applied to it,—the *danger of transgression*, and the consequent *demand for application*, will, in the instance of this rule, be proportionably inconsiderable: and, 3. The *greater the number* of the scholars, learning under the direction of *one Head-master*, the fuller the assurance that, by the perception of *impracticability*, under the warning given by this principle, he will be kept from the attempt.

(19.) [*Perfect Performance exacting principle.*] In this may be seen one of the necessary means, without which the engagement taken in virtue of No. (17.) cannot be fulfilled. It will itself be seen to have for its true principal and most immediate supporters, the *Short Lesson principle*, No. (31.) and the *Apposite Classification principle*, No. (30.) By the *Short Lesson principle*, provision is made, that the *earliest*, i. e. the *least difficult* lessons, shall be so *easy*, that the dullest capacity cannot fail of *comprehending* them, or the slowest fail of learning, sooner or later, to *perform* them; i. e. to *get* them within the allotted length of time. By that *probative* species of exercise, the uniform application of which is prescribed by Nos. (23.) and (24.) under the influence of the *Place-capturing principle*, No. (10.) it will, by means of the indication afforded by the *progress*, and *Comparative proficiency* Registration *principles*, Nos. (13.) and (14.) be seen how soon, under the spur of the *Place-capturing principle*, No. (10.) the scholar is become sufficiently *perfect* in his *performance*: and, till he is so perfect, be his age what it will, he will, in virtue of the *Apposite Classification principle*, be kept in that *same* class, without advancement to a higher; continuing to be thus *taught*, until he has *learnt*.

(20.) [*Gradual Progression principle.*] The use of this principle is, to operate as a sort of *memento*: and thence,—in the first place, on the part of the planners of the system of *exercises*, in the next place, on the part of the *Masters*, by whom they are to be applied and carried into effect,—to render the transition,—from an exercise easier, and lower in species or degree, to the next succeeding exercise,—as *gradual*, and, as it were, as *insensible* as possible. Of the degree of regard paid to this principle—of this, as of every other material circumstance—information will be given to *Visiters* as well as *Masters*, by the *Progress Register*, No. (13.) Supposing the rule transgressed, the *wider* and more *frequent* the instances of transgression, the more *manifest* will they be rendered: viz. in the first place, to the *Scholar-Teacher*, by means of the numerous transgressions manifested under the *Place-capturing principle*, No. (10.) on the *saying* of the *lesson*;—in the next place, to the *Visiters*, as well as to the *Master*, by means of the *sudden downfall* of one or more of the *scholars*, whose rank had, till this time, been among the most advanced.

(21.) [*Adequate Recapitulation principle.*] In so far as the substance of any antecedent lesson is forgotten, especially when the *remembrance* of an *antecedent* is necessary to the *intellection* of a *subsequent* lesson, the time employed in *subsequent* ones will have been expended with little fruit, and progress and proficiency will be more *apparent* than *real*. As it stands here, the *use* of the principle is—to serve as a *memento*: the *application* of it must depend, partly on the nature of the *branch of learning* in question, partly on the nature of the *exercise*. In this view, the most *favourable* state of things is that which has place, in so far as, between what has *gone*

* *Vide* Appendices III. and IV.

before and what *comes after*, the *connexion* is so *intimate*, that a *subsequent* lesson cannot be *said* or *got*, but in proportion as an *antecedent* lesson is *remembered*. For its antagonist and necessary *check*, this *memento* has that which is conveyed by a succeeding principle :—viz. The *Needless Commoration excluding principle*, No. (36.)

(22.) [*Place-capturing probative Exercise maximizing principle.*] and (23.) *Literal Conformity maximizing principle.*] On the constancy of the application made of the correspondent *probative* exercise, by which a lesson is *said*, depends all the use derivable from any *mathetic* exercise, by which that same lesson is supposed to be *got*. On the effect produced by the exciting and invigorating influence of the *Place-capturing* process, No. (10.) depends, in a prodigious degree, the effect of every *probative* exercise. In the *greater number* of schools of the *higher* class, no use at all *is* made ; nor, indeed, for want of a sufficient number of scholars in a class, *can* be made, of the *Place-capturing* process, No. (10.) : in no *one* school is the use of it *maximized*. In the *Chrestomathic* School, it *will* be maximized. But it is only in so far as it is performed with reference to a *verbal standard*—and *that* prescribed *in terminis*,—*literal* conformity to that standard being at the same time exacted,—that the process can be employed to the best advantage. In this case, the only danger is, *absence* of adequate *intellection* : but, against this danger, provision is here made by the *Organic Exercise principle*, No. (24.) and the *Note-taking principle*, No. (25.) In so far as application is made of the *Literal Conformity principle*, the function of *Scholar-Master* is capable of being exercised by any scholar, to whom the *verbal standard*, employed on the occasion, is *legible*. Hence, the more extended the application made of this *Literal Conformity principle*, the greater the extent, to which the *Scholar-Master principle*, No. (1.) is applicable with the most unquestionable *advantage*. Mr *Lancaster* seems to have been the first, if not the only person, to whom this advantage has presented itself in so strong and clear a point of view. Applied to *arithmetical* exercises, the *text* of the *verbal standard* is by him styled the *Key*. *Lanc. Improvements*, p. 84.

(24.) [*Organic Intellection Test principle.*] For the importance of *maximization* in this case, see No. (23.) While delineating the objects of the several *sciences*, with their concomitant and correspondent *arts*, the pupil, at the same time, makes *proof* of the *proficiency* he has attained in the *science*, and improves himself in the imitative *art*.

(25.) *Note-taking principle.*] By this *exercise*, no *art*, except that of *writing*, being practised, no such composite *proficiency* is produced, as in the case last mentioned. But in the character of a *test of intellection*, it is not only applicable, to an *extent*, to which, in respect to the magnitude of the *field of instruction*, there are no limits, but, wheresoever applied, it stands free from those *limitations* which apply to the *graphic* art. Even in the application to the *mechanical* part of the art of writing, it is not without its use ; being, though frequently at the expense of *beauty*, conducive to *despatch*. Being of so purely intellectual a nature—a species of extempore *composition*—it is among the *highest*, and, consequently, *latest*, exercises, which, under such a system as the present, can with propriety be exacted.

(26.) [*Self-service principle.*] This principle is, in its *nature*, the same with the *organic exercise* principle, No. (24.), but, in its *application*, extended to those operations, which, though themselves not belonging to the art in question, yet, being subservient and accessary preliminaries to the exercise of it, have been in use to be performed, by hands other than those of the Scholars themselves. *Examples* :—In the case of *writing*, *mending* the pen, *ruling* the paper ; in the case of *drawing*, *adjusting* the pencil, and other instruments employed. In ordinary schools, to save the trouble of teaching, these subservient operations are frequently performed by the *Master*, or his adult assistants. In the *Bell-Instruction* system, a point is made of including them in the system of instruction, and causing them to be learnt and performed by the *Scholars*, for themselves. But the expense produced by *spoilage*, during the teaching, is a counter-consideration, which must not be neglected. Here *instruction* and *pecuniary economy* are at variance ; and some how or other a compromise will be to be made.

(27.) [*Task Description principle.*] This principle may be considered as a particular application and exemplication of the one just mentioned. Those given under that former head belong to the class of *manual*, *this* to that of *vocal* exercises. By the practice of thus proclaiming, on the occasion of each fresh lesson, according to a prescribed rule, a description of the lesson last *said*, and of the lesson about to be *got*, one or both, reference being had to their respective places in the book from which they are both taken, the Scholar learns to fix his *conceptions* of the *objects* with which he has to do, and to give *clearness* to the *ideas* which he abstracts from them.

(28.) [*Tabular Exhibition principle.*] The all-comprehensive object is, *to maximize* the quantity of useful instruction, imbibed in this receptacle, during the allotted time. Towards the accomplishment of this object, by the aggregate of the several exercises, *mathetic* and *probative* taken together, everything is endeavoured to be done which can be done, every portion of time to be occupied which can be occupied, by the performance of *prescribed* exercises. Remain, however, some *fragments of time*, for the occupation of which no *prescribed* exercises can serve. These are, in the case of all the Scholars, the moments intervening between the *entrance* of each Scholar and the *commencement*

of the process of instruction, and the moments intervening in like manner between *conclusion* and *departure*; and, in the case of the quickest conceptions, the moments intervening between the time *actually employed* in the getting of each lesson, and the end of the whole length of time *allotted* to the getting of it. Of the sum of all these moments is constituted the quantity of *free time*. During this time, the business is, so to order matters, as to afford the best *chance* at least, that, in the instance of each Scholar, this portion of *free time* shall spontaneously be filled up, by some *occupation*, that shall be conducive to the universal *end*. For this purpose the principle prescribes the following rule—

Rule.—Whatever part of the interior of the building is exposed to the view of the Scholars, keep it covered with *the matter of instruction*, in some shape or other: viz. in the shape of *verbal didactic discourse* in print, or *graphical imitations*, or, in some instances, the *things themselves*. At the very earliest stage, *biographical charts*, *historical charts*, and *maps*, will, in this way, be coming into use. Even at this stage, tabular views of the *fields* of some of the branches of learning, exhibiting their principal divisions—*Botany* and *Zoology*, in particular—may, with advantage, be kept in view: provided always, that every occasion be taken for illustrating the *verbal* description by *graphical* imitations.

(29.) [*Distraction preventing principle.*] Neither in respect of the quantity of *regulated time*, nor in respect of the quantity of *free time*, as above, will this design of useful occupation be carried into effect, any farther than all other *sensible objects*, such as, if admitted, would afford to the moment a more *attractive*, and thence a *distractive*, occupation, stand *excluded*. For this purpose, the principle affords the following Architectural *Rule*.—By height, or otherwise, so order the windows, that, so far as such exclusion can be made consistent with the admission of a sufficiency of light, no object, *exterior* to the building, shall be *visible* in any part of it occupied by the Scholars. To this rule, attention seems to have been not unfrequently paid in the construction of *School-rooms*.

(30.) *Apposite Classification Principle.*] If the class, in which the scholar is placed, is *not high enough* for his attainments, his advancement is not so rapid as it might be; and in this shape, in this instance, *perfection* fails of being attained; if *too high* for his attainments, the case is much *worse*. Whatever be the subsequent and more *advanced* train of instruction, to his possession of which this or that article of *antecedent* instruction, which he has failed of possessing himself of, is necessary, all this is so much *lost* to him; in respect of all this, he is, by this prematurity of advancement, condemned to remain in *ignorance*. Of the *Aggregate progress*, and *Comparative proficiency*, *registration principle*, Nos. (13.) and (14.) one good effect is, as hath been seen, the furnishing, in so far as the *evidence* so afforded is looked at and applied to the purpose, the most complete security against the opposite, but widely unequal mischiefs just described.

In an ordinary school, the *number* of the *classes* being generally *fixed*, and the *boundary lines* between *class* and *class* also fixed, (being determined by the nature of the *exercises*,) *removal* from a higher to a *lower* class is regarded as a serious *disgrace*: thence as a tremendous punishment; and consequently not employed, but under the notion of serious and obstinate *delinquency*. After a certain length of stay, *non-advancement* is considered nearly in the same light: fit or unfit, having learnt everything, or having learnt nothing, sooner or later, *every* scholar is accordingly advanced. This same bad effect—will it not therefore have place under the *new* system? No; because, under this system, the *hold* which each scholar has upon the *class*, which, but for the removal, he belongs to, is, from first to last, understood to be as *loose* as the hold, which, under the operation of the *place-capturing principle*, No. (10.) he has upon the *place*, which, for the same moment, he occupies in the class. Moreover, a scholar belongs to *as many classes*, at the same *time*, as there are different *branches* in which he receives instruction: *put back* in one, he may, at the same time, be *advanced* in another: and, at any rate, the idea of degradation,—utter and complete degradation,—is not produced by his being put back in any number of those branches, short of the *whole*.

(31.) *Short Lesson principle.*] The longer the *lesson* is, the longer must be the *time* allowed—allowed to all—for *getting* it, and the less strong the assurance that it will be gotten by that time. As, in a *fleet*, the pace of the slowest *vessel*, so in a class the pace of the dullest *scholar* is necessarily the pace of the *whole*. If the lesson be of such a length that, upon calculation, *an hour* is in that way requisite for the getting it, here is a whole hour, which, by any number of the scholars, may be consumed in *idleness*, and *that* before the deficiency is discovered. If the length be no more than *ten minutes*, (and this, under the *Bell Instruction* system, is the *maximum*,) thus much shorter is the *maximum* of *idleness* for that time: not that, under the sense of the, at any rate, so nearly approaching moment for *saying* the lesson—and *that* under the spur of the *place-capturing* principle, No. (10.)—a *yoke mate*, in the character either of *scholar tutor*, or *scholar tutor's pupil*, being all the time at the scholar's side,—any such *voluntary* inaction ever does or can take place. But, between the conclusion of the time *allotted* to *all alike*, for the getting of a lesson, and the time which, by the *quickest* minds, is actually *found* needful for the getting it, there will aways (see *Tabular Exhibition principle*,) No. (28.) be an interval not occupied in any *exercise*; and,

upon reflection, it will be found that the magnitude of the *sum* of these *unoccupied intervals*, will naturally be, not *directly*, but *inversely*, as that of the *number* of the *lessons*. The *shorter* the lesson is, the easier it will be to ascertain, and thence to retrench, any *superfluity* in the quantity of the *time*, which may, in the *first* instance, have been *allotted* to it.

(32.) [*Simultaneous Action principle.*] For the use of the *promise*, see No. (17.) During the performance of the *probative* exercise, i. e. during the *saying* of the lesson, under the operation of the *place-capturing principle*, No. (10.) the *simultaneity* is the *necessary* effect of the *exercise:* while some *one* is employed in *saying* his part of his lesson, all the *rest* of the class are employed in *watching him*, for the purpose of making their advantage of his transgression.

(33.) [*Uninterrupted Action principle.*] During the whole of the school-time, the scholars are, all of them, employed, either in simply *mathetic*, in simply *probative*, or in *organic* (i. e. *mathetico-probative*) exercises—in *getting* lessons, *saying* lessons, or in *drawing* or *writing* the subjects of lessons. In passing from one such exercise to another, no *interval* worth mentioning need, or will take place: the *organic* exercise will be *performed*, and the *transition* from one exercise to another *effected*, under direction, given by *words of command*, as No. (34) or *visible signals*, No. (35.)

(34.) [*Word of Command principle.*]

(35.) [*Visible Signal principle.*] The application of *words of command* to *school* instruction, appears to have been the invention, and that a highly useful one, of *Mr Lancaster*. [Bernard, p. 171.] As saving *noise*, the *visible* sort of signal, in so far as applicable, is manifestly preferable. It is only, however, by *audible*, and not by *visible* signs that, in such a situation, *perception* and *attention* can always be made sure of.

(36.) [*Needless Repetition prohibiting principle.*] Being obstructive of *despatch*, the imperfection thus designated, belongs to this place. In the character of a *memento*, the principle may serve as an *antagonist* to, and *check* upon, the *recapitulation principle*, No. (21.)

(37.) [*Memoriter Metre principle.*] In affording assistance to the *memory*, the use of *metre*,—whether (according to the nature of the language) with or without *rhyme*,—is pointed out by theory, and amply confirmed by experience. No *reason* can be assigned why this assistance should be refused to any branch of learning. The cause why as yet it has been confined to *language-learning*, and principally, if not exclusively, to the *dead* languages, is,—that, on the *revival of literature*, instruction being nearly confined to those, at that time, most instructive languages, the ingenious men, who, for the use of non-adult and *non-self-directing* minds, afforded their assistance to *language-learning*, were not in a situation to carry it any farther. But, according to the persuasion, by which the *present* plan has been governed, there exists not that branch of *useful intellectual learning*, which may not, with full as good effect as *language-learning*, be administered to the juvenile mind, long before its arrival at the *self-directing* state.

(38.) [*Employment varying principle.*] In proportion as exercises are varied, each affords relief, and operates as a sort of recreation or play, with relation to every other. In the Bell Instruction System, confined as in its application to art and science it has hitherto been, within such narrow limits, the indication of the advantage attached to such a diversification, might require to be held up to view in the way of Memento. Under any such extension as the one here proposed, it will take place of course.

(39.) [*Distinct Intonation principle.*]

(40.) [*Syllabic Lection principle.*]

(41.) [*Unreiterated Spelling principle.*]

(42.) [*Stammering—Repetition prohibiting principle.*] The names here ventured to be assigned to these several principles, will, it is hoped, contribute something, if not to the *conception*, to the *remembrance* at least of their import. For more particular explanation, room cannot be afforded here. By *Dr Bell's* works, not to mention those of his followers, no demand for it has been left. By *balbutient* is meant a species of *stammering*. Every such disorderly *repetition*, being considered as a *transgression*, is, of course, *punished* as such, and thus presently *corrected*, under the spur of the *place-capturing principle*, No. (10.)

(43.) [*Psammographic.*] From two Greek words, one of which signifies *sand*, the other *writing* or *belonging to writing*. The advantage attached to the use of *sand* consists, not merely in its *cheapness*, but also in the *facility* with which characters may be traced in it, at an age too *early* for the use either of *pen* or *pencil;* add the superior *magnitude* which may conveniently be given to the *characters*, and the *alacrity* produced by the comparative *freedom* which it affords to the feeble and as yet untaught hand. (See Bernard, p. 170.)

The *principles*, if such they may be called, belonging to this division, *Dr Bell* distinguishes from the rest by the less imposing name of *Practices*. *Inferior* to *all the other* principles, in one sense of the word, *extent*, viz. as designative of the *number* of the *branches* of *instruction* to which they are applicable, they are, in relation to *some* of those principles, *superior*, in a still more important sense of that same word, viz. as designative of the *number* of the *persons*, to whom the benefit of that instruction is capable of being imparted. The use of the word *principle* is, to serve as a common appellative, and thence as a common *bond of connexion*, for every *efficient cause*, by the operation of which, it is supposed, that the accomplishment of the *common end*,—*the communication*

of useful intellectual instruction,—may be promoted. With the word *exercise* it is here connected, by exhibiting, in the character of a *principle*, the intention to employ, or bring to view as capable of being with advantage employed, as a *means* to that common end, this or that species of *exercise*: so many species of *exercise*, so many *principles*, over and above those which have no such immediate application to *exercises*. As to the *operations*, to which, as above, the common name of *practices* has been attached by *Dr Bell*, they seem to consist of certain improved *modes* of performing the sorts of *exercises*, by the performance of which, the arts of *pronunciation*, *reading*, and *writing* are acquired. If this be so, as many of these modes as are distinguishable from each other, so many correspondent articles may, in this way, be added to the catalogue of *principles —intellectual-instruction serving principles*.

In relation to several *particular* branches of *art* and *science*, several such *principles*, (chiefly consisting in the suggestion of as many *exercises*,) besides those of which intimation is given in the course of this Table, have, at different times, presented themselves to the author ; and among them some, the expected utility of which has received confirmation from private trials. But the time (it seemed) was not yet arrived, in which they could, with propriety, be added to, and, as it were, put upon a level with, the contents of a whole *system of principles*, the utility of which has received such ample confirmation from experience.

APPENDIX.

No. I.

Chrestomathic Proposal: being a proposal for erecting by Subscription, and carrying on by the name of the Chrestomathic School, a Day-School for the extension of the new system to the higher branches of Instruction and ranks in life.

I. *Occasion of this Address.*

THE matchless excellence, as well as novelty, of the *New Instruction System*, is a matter too universally recognised, to need mention in any other way than that of simple allusion. Of its applicability to the higher, not to say the highest, branches of intellectual instruction, the fullest persuasion is, over and over again, expressed in the works of its illustrious inventor, whose anticipations have, in every point, received such ample and undisputed confirmation from experience.

In common with so many others, the proposed conductors, or superintendents, undermentioned, had for a long time been entertaining the wish, not unaccompanied with the expectation, of seeing, in some mode or other, and by some means or other, so desirable an extension carried into effect ; meaning, of course, on the ordinary *terms*, and by *professional* hands ; and *that* too, in respect of the *extent* of the field of instruction, upon such a scale as would be suited to the efficiency of the *novum organum*, now placed within the reach of human industry, and the amplitude of the prospect opened by it to the public view.

Upon a more attentive consideration it appeared, however, to several of them, that, for a *first* experiment of this kind, more requisites were necessary, than could naturally be looked for in any single hand, or even in any number of hands uniting together upon any such ordinary ground ; and of this conception the result has been an Association entered into by them for this purpose.

II. *Proposed Conductors,—Who.*

Not to speak of probity and pecuniary responsibility—qualities, of which, though both are so indisputably requisite, yet neither can, in such a case as the present, be spoken of as appropriate ; a commanding acquaintance with the whole field of that intellectual instruction, the communication of which is the object of this design ; a detailed acquaintance with the several distinguishable component elements and sources of public welfare (the great and universal end to which all *art*, all *science*, all *language*, is, or ought to be directed ;) husbandry, manufactures, trades, money, and in particular with the practical details of trade as carried on in that vast metropolis, from which almost exclusively the destined partakers of the proposed benefit can, for some time, be expected : *all* these various endowments will at first view present themselves, if not as being in every instance indispensably necessary, at any rate as being eminently desirable. All these endowments, in common with the whole public in the most essential instances, and with an ample portion of it in every other instance, the Members of the Association, the proposed Conductors, had the satisfaction of seeing united in their whole body ; a satisfaction which, upon inquiry, or without need of inquiry, an ample share will be received by every individual, who, either in the character of proposed patron of the institution, or parent, or guardian of a child to which the benefit of it is proposed, feels any interest in the design.

The person by whom, without the communi-

cated desire of any one of them, and without the privity of any more than one, this paper has been drawn up and sent to the press, has not, nor can have, the honour of being of the number: he may, *therefore*, with the less difficulty and reserve, speak of the title, which on this occasion, and to this purpose they will, every one of them, be found to possess, to the requisite public confidence.

III. *Primary requisite, a SCHOOL-HOUSE: proposed to be built by Subscription.*

In the nature of the case, the first requisite, on which everything depends, and in the non-existence of which the chief cause of retardation may be found, is a *School-house*, an appropriate School-house, and *that*, in its dimensions, of an amplitude suited to that magnitude of scale on which, not only in respect to *cheapness* and *extent*, but in respect of *efficiency*, the *New Instruction System* so essentially depends.

For the attainment of this requisite, a pecuniary *advance*, and *that* to no inconsiderable amount, was obviously necessary; and for this purpose the proposed Conductors all presently agreed to become contributors, in such proportions as should be suited to their respective circumstances and convenience at the time of the commencement of the expense: an agreement which was the more readily entered into, by reason of the assurance they all saw reason to entertain, that whatever should be there bestowed would be no more than *an advance*, of which the reimbursement (which was all that by any of them has ever been looked for, or will be accepted,) might not unreasonably be depended upon, on condition of a few years patience.

It is for the completion of the sum requisite for this purpose that the present *proposal* is put into circulation.

IV. *Proposed Field and Plan of Instruction.*

This proposal has for its accompaniment a collection of papers, drawn up by a friend to the proposed Institution, who, though declining to take any part in the management, has in this manner, as well as by his contributions, manifested his desire to see it carried into effect.

These papers have for their general *title*, *Chrestomathiá*; and for their *design*, the giving a view of the field and means of Instruction, proposed for the proposed Chrestomathic Day-School.

Partly for the sake of compression, partly for the accommodation of any persons who may be disposed to look into it with attention, the main body of this Sketch is comprised in two Synoptic Tables, digested into the form of *Text* and *Notes*.

In Table I. the matter is arranged under the following general heads: viz. ADVANTAGES, from *Learning* as such, as well as from Learning in the *particular shapes* here in question; STAGES of INSTRUCTION; GROUNDS of PRIORITY, in relation to the branches herein included; and GROUNDS of OMISSION in relation to Branches *not* included.

In Table II., under the two following: viz.

I. PRINCIPLES constitutive of the *New Instruction System*, considered as applicable to the several ulterior Branches of *Art* and *Science*-Learning (*Language-learning* included.)

II. EXERCISES, by the performance of which, such learning is obtained or obtainable. In the instance of these *principles*, by means of the *simultaneousness* of the view, which, as above, is given of them, the connexions and dependencies of the several parts of the admirable whole, will, it is hoped, be the more readily observed, and correctly and completely comprehended.

On these considerations, in the instance of this last mentioned Table, (this happening to be the first of the two that was completed,) the whole matter, *Notes* as well as *Text*, was, in the first instance, brought together, and compressed into one side of a single sheet; and in this form copies, to a considerable number, have been printed off. Observations, however, having been made, that, while by the unavoidable closeness, added to the smallness, of the type, it could not but have been rendered afflictive to many an eye, it was by its still unavoidable bulk rendered in no inconsiderable degree unwieldy and formidable, another impression has since been printed off, in which the *Text* alone is in the *Tabular*-form, the accompanying *Notes* being in the ordinary *Book*-form; and in this manner alone—viz., *Text* in the *Tabular*, *Notes* in the *Book*-form—has Table I. been printed.

To the principal matter as contained in these two Tables, other papers are added in the form of an *Appendix*. The contents have for their object, partly a statement of some of the promises of ulterior success which are already known to have been furnished by experience,—partly a view of some ideas, which to the hope of *utility*, are supposed to add in some degree the character of *novelty*, and which, such as they are, the present design has been the means of calling forth.

V. *Site for School House secured.*

A requisite, the procurement of which might naturally have presented still greater difficulty, than any that is expected to attach upon the raising of the comparatively moderate sum necessary for the expense, was a *spot of ground*, sufficiently adapted, in respect of *situation* as well as *extent*, to the purpose of serving as a site for the erection. But this difficulty they have the satisfaction of declaring to be already removed.

VI. *Females proposed to be received,—Why?*

Their wish being as above, to give to so great a benefit, and *that* in every direction, the utmost extension in their power, the *female*

sex could not fail of being comprehended in their views.

In the whole of the proposed field of instruction, as marked out in the above-mentioned paper, scarcely will there be found a spot, which in itself, custom apart, will not be, in respect of the information presented by it, alike useful to both sexes: some parts (and more especially those which concern *Domestic Economy*, and the care of health, as applied to the more delicate sex, and to both sexes, at the time of life during which they are almost exclusively subject to its care,) will even be found *more* useful to females than to males. By an experienced as well as eminently intelligent disciple of Dr Bell's,* it is mentioned as a "well-known fact, *that girls are more docile and attentive than boys;*" and that accordingly, in that part of their school-time, which remains after subtraction of that which is applied to occupations appropriated to their sex, the degree of proficiency which, at the end of the year, they have attained, is not inferior to that which, in the whole of that same school-time, has, within that same period, been attained by the boys.

In the case of the *middling* classes, to whatsoever other branches of instruction the labour of female children be applied, *needle-work* will certainly not be regarded as one that can be omitted; and though, for the practice of this art, there would remain several hours of the four-and-twenty, yet what may naturally be expected is, a general wish to see some portion of the *school-time* allotted to such works.

Dancing, Music.—By these fascinating words are presented two accomplishments, the possession of which will, by all that belong to the *higher* classes, be regarded as indispensable; and, by many of those that belong to the middling, as being, if not indispensable, at the least desirable. For neither of these, it is evident, can any place be found in the proposed school. For uniting its benefits with those accomplishments, there remain therefore but two expedients; viz. the deferring of the accomplishments, either to a later *hour*, or a later *age*.

VII. *Number proposed to be built for.*

Under the *National Institution*, the number built for in the *Westminster Free School* is observed to be 1000; viz. for males 600, for females 400. The same total, viz. a thousand, is, in case of a sufficiency of funds, the number here proposed to build for; in case of a deficiency, the number built for must of course be proportionably reduced.

As to expense, £5000, they observe to be stated as the expense of *that* building; furniture, as well as lodging, for Master and for Mistress included. That same sum, it is presumed, may be made to serve equally well for the here proposed school-house.

According to the indications afforded by experience, the above number of 600 is understood to be generally regarded as the greatest number that, in one and the same *school-room*, can be taught under the constant inspection of one and the same Master. But, on the plan on which it is here proposed to build, it will be evident, that, whatsoever be the dimensions of the apartment, in which that number can be sufficiently inspected by one person, several such apartments, containing, each of them, as much room as in *that* case, will in *this* case be inspectable by one and the same person, and *that* in a manner still more perfect than in that *other* case.

Moreover, in this same place, though no part of the room allotted to *females*, will, unless at some special *time*, or by special recorded order, and for special reason, be open to the view of any person stationed in the part allotted to *males*; yet, by means of a slight alteration, any *redundancy* in the quantity of room allotted to either sex may be applied to the supply of any *deficiency* which, in consequence of an increase beyond the calculated demand, may be found to have place in the quantity originally provided for the other.

Considering that, in the case of the Westminster Free School, a *thousand* was, in the judgment of the National Society, as large a number as it was advisable to build for; and *this*, although the class of scholars in view composed so much larger a portion of the juvenile population than that from which any scholars could be looked for to the proposed Day-School, a conclusion which may be liable to be drawn, is, that, in and for the here proposed School, no number so large, or nearly so large as the above, can reasonably be expected.

But, in the case of that *Free School*, free as it was and is, limits were set to the probable number of scholars, by several circumstances, none of which will, in the present instance, be found to have place. On the part of the parents, insensibility to the advantages of intellectual instruction, inattention to the future and lasting welfare of their children, inability to spare the time necessary to the conducting of the children, for the first part of the time, to and from the school, especially in the case of those whose abodes are in a considerable degree *distant* from it.

In the present instance, to obviate, as far as may be, the latter difficulty, an expedient, which the proposed Conductors have in view, is to comprise in *one* sitting the whole quantity of the school time; and by that means reduce to its *minimum* the time and attendance, consumed in the passage between school and home. In the Westminster Free School, the total quantity of school time,—in the season of longest light, *six* hours, in the season of shortest, light, *five*,—is divided into *two* portions, with an interval of one hour between the two. In

* Village School Improved, by J. Poole, M.A., 1813, p. 16.

private schools, however, instances are not wanting, in which, without any interval, the children are kept under instruction for so long a time as six hours. To so great a length, the proposed Conductors are somewhat afraid to stretch it ; but to such a length as *five* hours they expect not to find any conclusive objection.

One circumstance they look to, as a source, though not of *immediate*, yet in case of success, of *erentual*, increase to the population of the proposed school. Against any such undertaking as that of a *Boarding School*, to be carried on, or commenced, under *their own* management or even superintendence, their determination is decided. But, in case of success, a result, which they cannot regard as by any means an improbable one, is, that parents, situated at too great a distance to admit of their sending their children from their own residences, may, for the purpose of taking benefit of the instruction there, and there only, to be obtained, find for their children, in the residence of some relative or other particular friend, or even of some person who may be disposed to afford the accommodation on the ordinary commercial terms, a residence sufficiently near to the School-House to admit of their receiving the instruction which it affords. On this plan it is, that, to the great public schools, scholars are sent from the remotest parts of the three kingdoms : and, should it appear that, in the proposed new school, useful instruction in much greater variety, as well as quantity, is to be had, than in any of those old established ones, and that too in much less *time*, and by *every* scholar without exception, instead of by no more than a portion more or less considerable of the whole number, they see not why, in the present instance, an equal, if not superior afflux, may not sooner or later be expected.

A circle of about *two* miles radius, having the site of the school for its centre, is the space, from the whole of which, on condition of keeping the length of school-time undivided, they regard themselves as entitled to look for scholars ; and *that* without any change made for this purpose in their place of residence.

VIII. *Ages, looked for, at Entrance and Departure.*

Fourteen is the age at or before which they hope to see their intended course completed, by the scholars in general, in all its branches ; and this too, upon the supposition that *seven*, and no earlier, is the earliest age at which children will be sent to take the benefit of it ; *fourteen*, that being the age at which it is common for *apprenticeships* to commence ; for, though no such views are entertained, as that of confining the benefit to such children as their parents may have destined to apprenticeships, yet it would be altogether repugnant to their wishes, if any child so destined should, on any account, find himself excluded from it.

The *seven years*, reckoning from *seven* to *fourteen*, is the length of time, within which, as above, they expect to see the aggregate course completed ; and, as a ground for that expectation, one of their endeavours has been to collect from the various education and intellectual-instruction establishments, in which instruction on any of the proposed subjects of the proposed scheme of instruction is administered, Public Schools, Universities, Hospitals, Public Institution-rooms, and Private Lecture-rooms not excluded—an account of the number of *hours* actually occupied in each ; and this, to the end that the sum of the times so expended in all of them together, may be compared with the sum of the times capable of being allotted to the same subjects, in the proposed school ; and though, of the information desired on this ground, the whole has not as yet been obtained, yet enough *has* been obtained to enable them, and with the requisite degree of confidence, considering the experienced force of the new instrument with which they will have to work, to speak of the above proposed length of time, as being fully sufficient, viz. for the aggregate of all the courses, according to the plan exhibited in the accompanying sketch ; matters being, at the same time, as far as may be, so arranged, that, at several different stages, the scholar may take his departure, without leaving his instruction imperfect, in relation to any subject, in which he has begun to receive it.

When *seven years* was thus looked to as the probable duration of the aggregate course, the occupation had, however, for its basis the supposition that, at *that* age, in the situations in life in question, scholars might in general be found already in a sufficient degree instructed in those branches to which, in the free schools at present established, the *New Instruction* system is applied. But, consistently with that principle of universal comprehension, which they could not but adopt, no child whose parents, being desirous of obtaining for it a share in the benefit, were able and willing to pay for it at the necessary price, could, by the conditions of the undertaking, be excluded.

By this consideration it is, that they have been led to the persuasion which they entertain, of the necessity of comprising in their plan those arts of primary necessity and continual and universal application, (viz. reading and writing, and common arithmetic,) which are comprehended in the *New Instruction* system, in so far as already brought into practice. To this determination, an ample confirmation has been observed to be afforded by the observation made and repeatedly brought to view by Dr Bell himself (and which is no more than upon an attentive consideration of the case, might from the first have been previously expected,) viz., that in any of those arts, an imperfect degree of proficiency, obtained by instruction, administered in the ordinary mode, operates rather as an obstacle, than as a help

to, an useful foundation, for instruction administered in this, incomparably more advantageous mode: *learning*, in the improved mode, having to an undefinable degree, for its necessary preliminary, the *unlearning* what has been learnt in the other ordinary, and ordinarily imperfect, mode.

Of one rule the necessity is, by the bare mention of it, rendered indisputable, and *that* is, not to admit or continue to receive any child who, whether on account of immaturity of age, or on any other, is so circumstanced as to require, in the school-room, more care and attendance than the quantity of each, which is at the command of the Establishment, can supply. As on so many other occasions, so on this, a rule which, while it thus bears on the face of it its own reason, and thereby its own explanation, is applicable with equal propriety to every individual case included in it, they cannot but regard as preferable to any rule, in which, by means of fixt and inflexible quantities, invariable provision is, in the *Procrustes* style, made for indefinitely varied exigencies.

In the *Barrington School* at *Durham*, at an age as early as *three* years, the *New Instruction System*, as is to be seen in the instructive and interesting account for which the public is indebted to *Sir Thomas Bernard*, has been found applicable with advantage;* and if, at an age still earlier, any child should be offered to the reading and writing form of the Chrestomathic School, there seems no reason why it should be rejected, on any other ground than that of an exclusion put upon it by the irrational rule just mentioned.

IX. *This but an Experiment—expected Sources of Continuance and Extension.*

The proposed undertaking being but an experiment, the period which the proposed Conductors look to, as that of the *completion* of the experiment, is the time at which the whole of the proposed field of instruction, as marked out in the *Chrestomathia*, shall have been travelled over, by the whole number of such of the scholars, as have gone through the aggregate course. At that time, if not earlier, the expectation of the proposed Conductors is, that such of them as are then alive, will have the satisfaction of beholding a number of fit persons willing, and in every respect well qualified, each of them by himself, to take the whole of the business out of their hands. Well may it be—and this was the very consideration by which the association was produced—well may it be, that, at present, any such undertaking is too great, considerably too great, for any single individual. Accordingly, the engaging in no inconsiderable number, as well as variety, a set of Masters, for the administering of the instruction in the several branches, is among the measures, the necessity of which is in full view.

But, at the period here in question, scholars, by dozens and by scores, may not unreasonably be expected to have *learnt*, in the Chrestomathic School, all the things whatsoever that will have there been *taught* Viewing the matter at large, whatsoever it be, that a large number of persons have themselves *learnt*, supposing it well learnt, some proportion or other of the number will, by that same time, be not altogether unqualified to *teach*. But, at the period in question, under the New Instruction System, the scholars—no inconsiderable proportion of them—not only may reasonably be expected to be qualified to teach what they have learnt; but, during a length of time, more or less considerable, antecedent to that of their departure from the school, will *actually* have been employed in this same all-comprehensive work. At this time, if, in point of legal maturity of age, as well as in all other points, any one of them should be found competent to such an undertaking, so much the better. But even if, in respect of those requisites, the school should not happen to afford any individual who was, at that time, competent; yet, if so it were, that in point of intellectual maturity, as well as appropriate proficiency, any *one* such scholar should be found sufficient, the temporary legal deficiency might, as under the care of the already established Societies, find an adequate supply in the assistance of some trust-worthy friend.

X. *Terms of Contribution, &c.*

For the erection, fitting up, and furnishing of the School-house, with the necessary outbuildings and other out-works, the following are the terms and conditions on which the contributions of well-wishers are solicited:—

1. Contributions to be in shares of £10 each.
2. By any person any number of such shares may be subscribed for: several such shares are subscribed for by each of the above proposed Conductors.
3. For every such share, interest, at the rate of 5 per cent. shall eventually be allowed, as per Article 13.
4. Of the money, received as per Article 7, after defraying charges, as per Article 7, together with House expenses, and pay to Master, Mistress, and paid Teachers, the whole surplus, except such as shall be deemed necessary to be kept in hand for the contingencies of the year, shall, in the first month of every year, be invested in Government Securities, to serve as a sinking fund for the reimbursing to Subscribers, in equal proportions, the money respectively advanced by them: such reimbursements to be made, each time, by instalments of 10 per cent., so soon as the aggregate of the money so applicable shall have risen to that amount.
5. Any sum, of less amount than a share, will, if offered, be thankfully received: but, whether by itself, or added to the amount of a whole share, on no such additional sum will

* The Barrington School, London, 1813, p. 59.

it be understood to be expected, that *interest*, or unless required at the time of the advance made, *reimbursement money* shall be paid.

6. Upon the amount of their respective contributions, the proposed Conductors of the Institution reserve to themselves, in the shape of interest and reimbursement money, the same advantages as, and no other than, those which, as per Articles 3 and 4, are promised to all other Contributors.

7. Of the School-money to be required, the exact amount cannot as yet be fixed. Four pounds is at present looked to as a *minimum*, *eight* as a maximum. The amount must, of course, be different, according as, in the terms of the undertaking, the expense of slates, pens, books, ink, paper, maps, charts, and other implements of instruction, together with the *hire* of such as need not, or cannot, be purchased, is or is not included. In general, parents would, it is presumed, be desirous of seeing themselves at a certainty, in regard to this and every other expense.

8. With or without subscribing for shares, another mode in which encouragement may be afforded is—by an engagement to send to the School, for and during a specified length of time, in the event of its being opened, one or more Scholars. In this way, with or without sending a child of his own, any person of opulence may, by engaging for the child of another, confer, at one and the same time, a public and a private benefit, at one and the same expense.

9. To afford to *Contributors*, and eventually to *Parents* and *Guardians*, the assurance, that the undertaking will not be hastily abandoned, —for the term of the first three years, to be computed from the time when the Parents or Guardians, of any number of scholars not less than fifty, shall have signed an engagement to pay, at such rate as shall at that time have been fixed, for and during such time as shall have been fixed, for the schooling of their respective children, the proposed Conductors engage, jointly and severally, to carry on the proposed School, and in case of loss, to charge themselves with such loss.

10. For this purpose, so soon as the School-house, with the appurtenances, shall be in readiness for the reception of scholars, notice of such readiness will be given by advertisements in the London daily papers. A space will be provided, in which, without interruption to the business, subscribers and parents of scholars, being recognised as such by recollection of their persons, or by transferable tickets, which will be given for that purpose, will have a perfect view of the whole business of the School as it is going on. If, from any persons at large, any admission-money be accepted, the amount will be no more than may be judged necessary to keep out noisomeness and mischievous wantonness; and will be applied to the use of the Institution, as above, Article 4.

11. Of all moneys received, and the disposition made of them, accounts will be published yearly, or oftener, and at any rate within the first week of each year, in some one or more of the London daily papers.

APPENDIX.—No. II.

Successful Application of the new System to Language-learning, in the case of the Great School, called the High School, Edinburgh: as reported in a Letter to Mr Fox, from James Pillans, Esq., Rector of that School. From the Report of the British and Foreign School Society, Anno* 1814, p. 57.

"You will not expect that I should detail the difficulties I encountered in establishing and applying the Monitorial System to the business of my class, nor the steps by which I have been rising, up to the present moment, from one degree of efficiency to another. To do so would extend my letter to an immoderate length; and though it might be interesting, and not unimproving to a person engaged in the same occupation, it would be a fitter subject for *viva voce* communication with him. Since I entered on my office, scarce a week has passed without suggesting some improvement in my arrangements, all tending to one point, viz. to stimulate and employ to purpose the various faculties of two hundred boys, differing widely both in acquirement and capacity; to insure attention, by excitements at once strong and honourable; and to exclude that languor and listlessness, arising partly from want of motive, and partly from the physical misery of being so long in a sitting posture, which most of us may remember to have been the great sources of the unhappiness we experienced at school.

"The branches of knowledge taught in my Class, the boys of which are in general somewhere between twelve and fourteen years old, are Latin, Greek, and Ancient, mixed with a little Modern Geography. The Greek and Geography are happy innovations of my predecessor; for the School, by its foundation, is entirely for Latin, and Dr Adam's introduction of elementary Greek in 1772 was violently opposed by no less a man than Dr Robertson the historian. I mention this circumstance, because it will account for the unreasonably

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* In this School the number of the scholars has usually been between five hundred and six hundred. The School is divided into five classes: each class occupies a separate room. The head class, which is the most numerous, is under the immediate charge of the Head Master, styled *Rector*. To each of the others there is a separate *Master*, who is independent, or nearly so, of the *Rector*.

From one of these *Masters* an account not less encouraging, in relation to *his* class, will form the matter of the next article.

small proportion of time given to these two important objects.

"In the *Latin* Class, which meets at nine every morning, consisting of very nearly two hundred boys, the general business of the day (subject to variation, according to the period of the season and progress of the pupils,) is as follows:—A portion of a Latin poet, from thirty-five to forty-five lines of Virgil, Horace, &c., and a nearly equal portion of Livy, Cicero, or Sallust, are to be parsed and translated: a portion of Dr Adam's Grammar, alternating daily with his Antiquities, is examined upon: these lessons have been all prescribed; that is, the last word mentioned, but no assistance given, the day before. The order of business is this: immediately after prayers at nine, the whole class forms into twenty divisions, under their respective Monitors, in the Great Hall, and the Cicero and Horace lessons are construed by the nine boys of each division; the duty of the Monitor being, 1. To take care that every boy shall construe a portion of the new lesson; 2. To see that his division understand the syntax and construction of the passage; 3. To take care that the right meaning be always given to the passage in all its parts; and, 4. To mark on a slip of paper the names of the boys who fail in saying. The Grammar lesson is also said to the Monitors. The boys of each division, on the other hand, are instructed to note any false interpretation which the Monitor may allow to pass, and reserve it for an *appeal* afterwards. When this construing and saying have been got through, the signal for removing into the Class-room being given, the Divisions, which have hitherto been arranged in the recesses of the windows of a large hall, move in regular and rapid order up stairs, and take their seats in the general Class, where, whatever is said, is addressed to all the boys. I then proceed to ask if there be any appeals, *i. e.* if there be any boys who think they can prove that the Monitor has allowed an erroneous translation to pass uncorrected in the Division. From four to a dozen boys generally rise in succession; and if they make good their point, they take place, each in his division, of those who have not observed the blunder, and the Monitor himself loses a place. This system binds both Monitor and pupil to careful preparation at home; the former, from the fear of detection and exposure by a boy far below him in the class; the latter, both by the infallible certainty of his being called on to say, and reported if he fail; and by the honourable desire of rising in the class, and proving that he knew the lesson better than the Monitor. Further advantage of the liberty of appeal is, that it generally brings forward into discussion the difficult passages (for it is these of course that are appealed upon;) and they being settled beforehand, a more perfect understanding of the lesson is secured, and the necessity of saying it over very frequently is avoided. Sometimes I vary this mode, by making the Monitors themselves, *i. e.* the twenty highest boys, construe one or both lessons, each to his own Division, who are all on the alert to detect a blunder, with a view of making an appeal. Whether the Monitor or Division is to construe, is always a secret till the moment before they begin, when I give out from the pulpit the order of business. After the appeals are concluded, the lessons are construed to me by boys whom I call at random, generally by some of those who have failed below stairs. These I know from the bills or slips of paper, which, by this time, are collected from each Monitor, strung on a wire, and subjected to my inspection. In this translation, questions are put by the Master on points of Geography, History, Antiquities, derivations of words, and niceties of construction and expression; and a freer and more elegant version is required. Every opportunity is also taken, suggested by the classical passages, to give useful information, and to insinuate moral and religious instruction. This, with the examination on Adam's Antiquities, which I always reserve for the general business, occupies the remaining time till eleven, when there is an interval of an hour, and is resumed from twelve till a quarter or twenty minutes past one, when the Divisions form to construe the lessons again, with this difference, that, instead of a literal, a free translation is expected; and all the information and illustrations, which have been given in the course of the day, are expected now to be forthcoming at the question of the Monitor, and the places depend upon their aptitude in answering. The *written exercises*, of which there are generally two per week, are of various kinds, chiefly translations from Latin into English, and from English into Latin, which are also examined and corrected by the Monitor, who makes his remarks, and adds his initials, that he may be responsible. The best and worst are shown up, and places determined accordingly. The exercises for the higher parts of the Class are Latin verses, occasionally English verses, Analyses or Abridgments of what authors they have read in the class, in English and in Latin, &c., and these are shown up to the Master directly, and corrected by him. Select passages of the classics are said by heart on Saturdays, to the Monitors in the first instance, that every boy may be called on, and they report the failures. In the business of the Division the Monitor has the power of putting a boy up or down, according to the figure he makes, always subject to an appeal from his decision to the Master, if the boy thinks himself aggrieved.

"The Greek class, according to the arrangement I found in the School, met only three hours a-week. I have lately contrived to assemble it an hour every day, except Saturday. The business here is more elementary, consisting of accurate saying by heart of a

portion of Greek Grammar, and minute parsing of a short lesson in Dalzel's Analecta Minora. The more advanced part of the Class read Homer and Xenophon. In order to remedy the inconvenience of having so short a time for Greek, it is proposed, as a voluntary exercise to the higher boys, to read and show up every second Monday what are called Private Studies; that is, if a boy, after preparing all the lessons thoroughly, finds he has still some leisure time, he employs it in reading Homer without a translation, making out what he can; and what he cannot, marking as difficulties to be resolved. On the day appointed he mentions the number of lines he is ready to be examined on, and states his difficulties for solution, which is given either by the Master, or by some of his school-fellows who have conquered them. In this way, and with no other stimulus but having the number of lines read by each publicly mentioned, and obtaining an hour's play, there are boys now in the Class who are in the habit of showing up from nine hundred to twelve hundred lines within the fortnight.

"The Greek class consists of about one hundred and forty-five, and the lessons are said here too by Divisions. The Greek Monitors generally remain for twenty minutes at eleven; and it being then ascertained that they are masters of the lesson, they hear and report on their Divisions from two till half after two, when the lessons are heard up stairs, and the Monitors dismissed sometimes a little before three as a reward.

"The *Geography* class meets on Tuesdays and Thursdays at two o'clock. The course of instruction in this branch is, 1st, to give some illustrations of the general facts with regard to the Solar System; then to go over pretty rapidly the geography of the four quarters, taking merely the outlines; and, lastly, to descend to minute and particular descriptions of the countries bordering on the Mediterranean, from Gibraltar, by France, Italy, Greece, shores of the Baltic, Asia Minor, &c., back to the Straits: then the British Islands. Ancient and Modern Geography are united. A sketch or outline of each country is drawn by the Master on a black board with white chalk; the mountains are represented in green, and the rivers in blue. In this state the board is first presented to the pupils, and the Master, with a rod, explains the physical features of the country, points out and names the leading ranges of mountains, and the rivers that fall from them. The board as yet presenting so little detail, the eye, and the mind through the eye, readily takes in and retains the information. At this stage, also, the length, breadth, longitude, latitude, and boundaries are fixed. The next lesson presents the towns, (drawn thus ‡‡ in pink chalk,) which are to be found on the rivers already learned, descending from the source to the mouth. These towns are demonstrated by the Master in the same way, care being taken to mention at the time some striking facts respecting the situation, inhabitants, history, or neighbourhood of each, which may be associated with its name and position on the board. Having thus made out a sort of skeleton or frame-work of the country, by presenting, in striking relief, without those details which confound the eye in maps, the great *physical* features, the next object is to mark out in dotted lines the *artificial* divisions: and when these are well fixed, the remaining towns of importance, whose position is not indicated by rivers, are referred to the province or shire, and associated again with those already known. The situations of great battles are pointed out by a cross in red chalk. The object being to make a strong impression on the eye, and to set the imagination and conception to work, the chalks being of different colours is a circumstance not to be despised. When the board-draught is thus completed, maps are directed to be so constructed as to be as nearly as possible copies of it; that is, all the positions, &c. accurately laid down, but no names given. The drawer of the map must be quite *au fait* in naming every place in his own sketch; and if it be thought deserving of that honour, it is mounted on thick pasteboard, and hung up in view of his schoolfellows. He is employed, too, as Monitor, to teach the geography of his own map to other boys who have either done worse maps, or none at all; and thus, in many ways, the information he has got is riveted in his memory. The book used for the Geography class is Dr Adam's Summary: but as, from its size and multifarious contents, it is better adapted for reference than committing to memory, I have printed for the use of the Class a few pages of Outlines, containing a mere list of names, arranged on the plan I have explained; and this being in their hands serves to recall the information conveyed."

APPENDIX.—No. III.

Successful Application of the New System of Instruction to Language-learning, in the case of one of the Classes of the High School, Edinburgh, as reported in a Letter from Mr James Gray, Master of the Class, to Edward Wakefield, Esq., 28th Dec. 1813.

"The following details will, I fear, be found uninteresting; but their results are so important, that I trust you will excuse a little dulness, while I endeavour to develop the plans of tuition lately adopted by some of the Masters of the High School, Edinburgh. It will be unnecessary to state, that the practices alluded to are founded on the system of Mr Lancaster, modelled according to the circumstances of our Seminary. The essential part

of that gentleman's discovery is, I apprehend, that by which the more advanced or cleverer boys are employed in teaching or in assisting in their tasks their inferiors in years or in knowledge; and *this principle is acted upon here in its fullest extent.* Many misconceptions have gone abroad in regard to this celebrated plan, which it is of vital interest to have removed. 1. The first and most pernicious of these is, that it is only applicable where great numbers of the lower classes of children are to be taught by the same master, gratis, or at a low rate. 2. Another is, that where schools have been previously established, either by law, as the parochial schools of Scotland, or on a foundation, changes are not only unnecessary, but might be dangerous. It is besides unfortunate, that many schoolmasters seem to consider the Lancasterian system as an innovation, which they ought to regard with a jealous eye. Till these prejudices are eradicated from the minds of parents and teachers, the advantages derived from the plan will be partial and inconsiderable. In my opinion, many more beneficial consequences will result to the interests of education, from introducing it into the schools already existing, than from establishing new ones; for it is not to be dissembled, that evils have long existed that admit of no other cure. I shall take as short a view as possible of the practices in common use, contrasting them with the new. I ground my remarks on a full and impartial experiment; and in making them to you, I have no other view but the interests of the youth of my country. For many years past, these have been the subject of my nightly dreams and my daily meditations; to them I have more than once sacrificed my health, and even risked my life; and nothing shall deter me from speaking the truth.

"Suppose a class to consist of a *hundred* boys, which I shall take as the average number, though *in our school it is under the truth.* In the old way, one boy was called upon to repeat a small portion of the lesson, to whom all the rest were understood to be listening. Thus we proceeded, till every boy in the class, or as many as could be overtaken, were examined: and this plan would have answered well enough, had it been possible to fix the mind of every individual upon the same subject at the same moment; but such is the volatility of the youthful mind, that I have ever found this impracticable. You may confine the body to a seat; you may, perhaps, fix the eye to a book, but you can never be certain that it is not an unconscious gaze; and it is not unlikely, that while the boy ought to be mentally construing his lesson, his imagination is chasing a butterfly, or robbing a bird's nest. On this system I have experienced two unavoidable evils. 1. The one is, that the upper boys, who gain a knowledge of the lesson soon after they enter the school-room, cannot be kept still while the master is employed in teaching the under boys; and as example is contagious, the restlessness soon becomes universal. 2. The other is, that while the upper boys are construing, the under ones are generally trifling, and when the lesson comes round to them, are totally ignorant of it. They not unfrequently calculate upon the chance of escaping altogether, from the impossibility there is for any one man thoroughly to examine a hundred boys in two hours; for we never continue longer in school at any one time; and next meeting brings a new task. Thus both the upper and the under boys are injured. The one do not gain all the profit which they might from a more judicious management; the other make little or no progress, and, from the habitual neglect of their duty, contract a dislike both to their tasks and their teachers. In many cases it would be well if the evil ended here; for there is reason to fear, that the hours that ought to be employed in the acquisition of useful knowledge will be spent in habits dangerous to virtue; that indolence will shed its mildews over the blossoms of early talent, which may wither never to bloom again; or that the man will have to struggle hard to supply the deficiencies of the boy. I am far from saying that the evil is universal. According to the present system, many boys spring forward in the pursuit of knowledge, with an alacrity and success that is quite astonishing; but if, of an hundred boys, twenty fail in the object for which they are sent to the school, any scheme that might ensure their success ought to be eagerly embraced. This may be done effectually on the new system, by which I have been enabled so to arrange my class, that every boy is employed every minute of the time he is in school, either in the acquisition or communication of knowledge. The fifteen highest boys are monitors. The first thing to be done after the meeting of the class, is to see that they have their lessons distinctly. When this is ascertained, the whole class goes into divisions. In this way fifteen times as much work can be done in the same space, and, I can say with confidence, fifteen times better. From this contrivance, instead of the languor and restlessness that too frequently prevails, all is activity and energy. More noise, indeed, is heard; but the sounds are sweet, for they are the sounds of labour. Every one studies, because by the exertion of his talents, he finds himself equal to every task; and ignorance is more shameful, where the account is to be rendered to one of his own years, than to a man. It seems, indeed, that boys are better qualified to teach boys, than men: they enter more readily into their feelings; they are more sensible of the difficulties which they themselves have just mastered; and will adopt more simple and familiar modes of illustration. Nor have I ever had cause to suspect the diligence or fidelity of a monitor. To attain this station, is an object of rising ambition to the whole class: and where any one has risen to it, he

is too much afraid of losing it, to risk the disgrace by his own misconduct. I have never once found it necessary to degrade a monitor for inattention to his division. To this there is a double check. An appeal is open to the division against the monitor, as well as to him against the division ; and when every boy has gone over the whole, not a portion of the lesson, I examine a number of them promiscuously, and the lessons are said with so much more promptitude and accuracy than in the old way, that I am frequently enabled to examine as many as if no time had been spent in divisions at all. Thus I have united the advantages of both methods. By this means, every boy in the class, besides the benefit accruing from saying over the whole of every lesson till he has satisfied his *monitor*, is separately examined *by me* two or three times a-day. The superiority of this mode over the other is incalculable, as it tends to store the mind with useful knowledge, to infuse a love of learning, to form habits of industry, and to render the whole economy of a school delightful both to scholars and master. Of my present class, that has been conducted on this plan, all have gained a more extensive knowledge of the Latin language than I have known on any former occasion ; and not a single boy has failed. This, till now, I did not think possible. For many years it had been a subject of melancholy reflection to me, why so many boys *failed in* acquiring a competent knowledge of *classical learning*, while they *succeeded in everything else*. This objection to our classical schools may now be easily obviated. I do not say that every boy will be *equally* successful. Nature has made strong and marked distinctions in the extent of capacity ; but I will venture to assert, that every one may be made to turn his talents to the best account. One of the most important of the objects of a good education, is to inspire a literary taste ; and I know no way in which this can be done so effectually. What deters many boys from the prosecution of ancient learning is its *difficulty*. By aid of the Lancasterian system, asperities may be smoothed, the boy may be gently led over the threshold of the temple ; and when he is once introduced, he cannot fail to be charmed by its beauties. I have never, indeed, known a young man who pursued learning, that did not love it. This bias to literature is of more value than all the knowledge he earns from school. It is the shield of the young mind against the ruinous inroads of vice. In a school so regulated, it is impossible for any boy to spend his time idly. He must exert himself. He readily does what he finds he cannot escape ; and what may have been irksome at first, soon becomes pleasant. He is happy, from a consciousness of doing his duty ; and habits are formed, that will be useful through life. To the master, the task of superintending such a school is delightful. He is merely the helmsman that steers the bark, under perpetual sunshine, while every man on board is at his duty. Corporal punishments are abolished. This practice is equally degrading to the scholar who suffers, and to the master who inflicts punishment ; and I firmly believe has done more mischief to our classical schools than all other causes whatever. The boy soon considers the man, whom he sees in the daily use of the torture, as a tyrant, and his greatest enemy ; and all his ingenuity will be exerted in inventing the means of retaliation. A great objection to this mode of discipline is, that from its very nature the master applies to it with reluctance ; and for one fault that is punished, twenty escape. Thus the hope of impunity begets disorder, which, when it comes to a certain height, in its turn brings punishment. On the new method, the boys are kept in constant good humour, and no irritation is ever excited in the mind of the master. There exists between them only a reciprocity of kindness and docility. To animate a whole school with one spirit, to make them advance in the intellectual career with the same march of mind, to stimulate them to exertion by the enlivening power of emulation, to exalt them in their own opinion, has always been my object in the discharge of my public duties ; and Mr Lancaster has put into my hands an instrument, by which I have been enabled to realize my fondest visions in my most sanguine mood. This is a testimony that I think due, and I cannot withhold it.

I have the honour to be,
Dear Sir, yours faithfully,
JAMES GRAY."

APPENDIX.—No. IV.

ESSAY ON NOMENCLATURE AND CLASSIFICATION.*

Nomenclature of the main Branches of Art and Science—its Imperfections—with proposed Remedies. Systematic Table, prefixed by D'Alembert to the French Encyclopedia—its Imperfections—Specimen of a new one.

SECTION 1.

Plan of this Essay.

Deplorable it surely is, and, to a first view at least, not less extraordinary, that, for some of the most extensive, and most frequently mentioned, divisions of the field of Art and Science, even at so advanced a stage as that to which the human mind has already reached in its travels on that field, no tolerably expressive denominations should be to be found in the appropriate part of language.

Of language :—meaning, of course, the one which is here made use of ; and which will

* For a list of the contents of the Sections, see the general contents of Chrestomathia at the commencement.

not be denied to be one of the best cultivated languages which the present time affords ; nor, in this particular, will the present state of any other language be found, it is believed, much more favourable.

That this unaptness has really place in the language, that real and practical inconveniences are among the actual results of it, and that, although not perhaps completely susceptible, it is, however, not altogether unsusceptible, of a remedy : such are the positions which it is the object of the following pages to present to view.

But, on the part of the intellectual subject or object in question—viz., the nomenclature of the aggregate body of the arts and sciences, in other words, the system of Encyclopedical nomenclature—this unaptness, in what does it consist?—Answer. In this : viz., that the nomenclature in question is not, either in the degree in which it is desirable that it should be, or in the degree in which it is capable of being made to be, subservient to those useful *purposes*, to which an instrument of this sort is capable of being rendered subservient.

In respect of any such useful purposes, to what immediate cause will any such failure, on the part of the subject in question, be to be attributed ?—*Answer :* To its being deficient, in respect of one or more of those *properties*, which, ere it can be in a complete degree rendered subservient to those same useful purposes, it is necessary that it should possess.

In so far as, in any degree, it fails of being possessed of those same *properties*, and thereby of being capable of being rendered subservient to those same *purposes*, it will be found chargeable with certain correspondent imperfections, or points of imperfection.

To these several imperfections, if in the correspondent *purposes*, there be anything capable of entitling them to any such appellation as that of *useful*, it cannot but be desirable, that correspondent *remedies* should be applied. What then are they respectively, those *purposes*, those *properties*, those *imperfections*, and, if any such there be, those *remedies* ? To find such answers as can be found, for this string of connected questions, is the object of the ensuing pages.

To a disquisition of this sort, inserted in such a work as the present, one very obvious objection presents itself. This is—that it is too abstract and abstruse ; too logical ; too metaphysical ; or by whatever other epithet, for the purpose of condemnation, it may happen to it to be designated—too abstruse for the generality of readers, even of those by whom a course of education of the literary cast, carried on upon any of the customary plans, has been completed.

For this objection, however, an answer—which (it is hoped) will be found neither in point of fact incorrect, nor in point of argument irrelevant—is in equal readiness ; at the conclusion of the Chrestomathic course, it will not be too abstruse for the comprehension of a Chrestomathic scholar.

What is there in it that, even to these striplings, should render it too abstruse ? Is it the nature of the subject ? Those parts excepted, which respectively regard general Ontology and Pneumatology—subjects, which for reasons already intimated, it has been found necessary to forbear including in the course—no one of all the subjects touched upon in it can be pointed out, which will not have been rendered altogether familiar to their view.

Is it then the language, from which, for giving expression to some of the leading ideas, words have been borrowed ? Not to speak of its being the language constantly and universally drawn upon for such purposes, long before the scholars are arrived at this concluding stage, this same language will, in their eyes, have been stripped of all its terrors. Of those appellatives, for which *custom* has concurred with abstract convenience in resorting to a dead and foreign language, the interpretation will here be found all along subjoined ; and in this very interpretation may the scholars, long before the conclusion of the course, have found matter for one of their *exercises*. True it is, that, as there has so often been occasion to observe, a *hard word*—a word belonging to a family of words, of which no other member is as yet known, constitutes, in every field over which it hangs, a *dark spot ;* a spot, to which no eye, among those in which it excites the notion which that word is employed to express, can turn itself, without giving entrance to sentiments of humiliation and disgust. But, at the time in question, to the eye of a Chrestomathic scholar, in no part of the whole expanse of the field occupied by this sketch, will there be any such thing as a *dark spot :* to the original darkness, light will, in every instance, have been made to succeed.

Such is the objection, and such the answer. Here, however, if not before, comes another question : Of such an exhibition where is the *use* ? But, to a question of this sort, in the present instance at least, the answer will obtain a much better chance for being satisfactory, if postponed till after the thing itself has been brought to view, concerning which it is asked, what is the use of it ?

Section II.

PURPOSES *to which a denomination given to a branch of Art and Science may be applied*—viz., *Ordinary* and *Systematic :* PROPERTIES, desirable in it with a view to these purposes.

Ordinary and *Systematic*, applied to the purpose which, in the giving a denomination to a branch of art and science, has been in view, these adjuncts will, it is supposed, be found tolerably explanatory of themselves. *Ordinary* purpose, the presenting to view the contents of the particular branch which it denominates. *Systematic*, the purpose which is in

view, where the denomination in question is one of a number of denominations, brought together in such manner as to exhibit to view certain *relations*, which the several branches so denominated, and thereby their respective contents, bear to each other: relations, for example, of *agreement* and *diversity*, or relations of *dependence*.

Accordingly, for the designation of the purpose, just described by the name of *the ordinary purpose*, the term *non-systematic* might, with equal propriety, be employed.

From the *purposes* to the accomplishment of which it is directed, follow the *properties* which it is desirable it should possess.

I. On the part of the denomination in question, for both the above-mentioned *purposes*, the two following *properties* may be stated as requisite.

1. Of the contents of the branch of art and science which it denominates, it should present to view—to the view of as many persons as possible—a conception as *clear*, *correct*, and *complete*, as by, and in the compass of, a single denomination,* can be afforded.

2. By this means, in relation to every less extensive branch of art and science that can be proposed, it should obviate the question—whether, within the compass of the more extensive, such less extensive branch is or is not included: it should obviate this question—i. e. in case of doubt, it should furnish the means of removing it, or, (what is better,) prevent the rise of any such doubts.

II. For the *systematic* purpose, the following is an additional property which presents itself as requisite.

It should (i. e. the denomination should) be so constructed, as, in and by its conjunction with other denominations, to display upon occasion, and *that* in as *clear*, *correct*, and *complete* a manner as possible, the several *relations* which it bears to the several other branches of art and science included in the same system: the *relations*, viz. in respect of *identity* of properties, on the part of the respectively contained particulars, on the one hand, and *diversity* of such properties on the other: that so, in the instance of every branch of art and science, comprehended in the system, it may, to the greatest extent possible, be apparent in what particulars they respectively agree with, and in what they differ from, each other.†

By these means, and by these alone—on these terms, and on these alone—is any conception that has been framed, delivered, received, or entertained of the whole system of arts and sciences, the whole *encyclopædical* system, as it is called, capable of being rendered a clear, correct, and complete one.

Thus, and in this way is shown, not only *identity*, in so far as identity, but *diversity*, in so far as diversity, has place. In this way, therefore, is performed, in regard to each branch of art and science, *that*, and more than *that*, which is performed by *algebra*, in regard to numbers. The wonders exhibited by that mysterious art, by what means is it that they are wrought? Only by showing, in each indi-

* (*Single denomination*). For both these purposes the thing to be wished for is—that, in so far as possible, the denomination should be comprised in the compass of a single word: viz. of course, a *noun substantive:* and this, not merely for shortness, but to avoid the embarrassment which has place, in so far as the appellation is a compound one, composed of two words or more. If, in addition to the noun substantive, there be but one other, that other will be a *noun adjective*: and, by this means, the denomination will be disabled from receiving without inconvenience any other adjunct; the place of the adjunct being already occupied by the adjective, which is one of the elements of the compound denomination thus composed. If it be composed of more than two, the inconvenience will be still greater: for in this case, all the words which enter into the composition of this long-winded substitute to a single substantive, will, in the texture of any sentence, of which that substantive would have constituted but one component part, be liable to be confounded with its other component words: in such sort that, in relation to each of them, it will be matter of difficulty—momentary difficulty at any rate—to determine, to which parcel of words it bears grammatical relation. viz. the sentence at large, in which the appellation, had it been a single-worded one, would have officiated in the character of a substantive, or the fragment of a sentence, composed of the words of this compound substitute to a proper substantive.

Such are the circumstances by which, to all purposes and on all occasions, this simplicity—this single-wordedness—is rendered desirable. But it is only on the occasion of ordinary discourse, that, as will soon be seen, the nature of the case admits of it. In the case of a *systematic table*, for the denomination of each branch, two words at least will be found requisite: one, to mark the *genus* to which the species in question belongs; the other, to give intimation of the *characters*, by which it stands distinguished from the *other species* of that *same genus*.

In what way it is that, as the number of subdivisions increases, the many-worded systematic name grows longer and longer, more and more complicated,—and an equipollent single-worded name more and more difficult to frame,—may be seen in the sample of an *Encyclopædical Diagram* or *Table*, § 8, and the explanation of it which follows, § 9: as likewise in the diagram, called the Porphyrian Tree, hereunto annexed.

† These relations of identity and diversity of properties—thence of *agreement* and *disagreement*—important as they are, are not the only ones which, in the present instance, are so. In a practical point of view, a set of relations, still more important, are relations of *connexion* or *dependence:* viz., those which have place, in so far as a person by whom this or that art is practised, or science studied, has, in respect thereof, need of an acquaintance, more or less intimate, with this or that other branch of art and science. Instances of this sort of relation may be seen in Table I. But of this sort of relation, between branch and branch, no indication, it may be seen, can in general be afforded by their respective names.

vidual instance, the identity which has place, as between the import, conveyed at the outset by those *extraordinary* signs, which, as the instrument of its discoveries it employs, and some one or other of the always manifest imports, conveyed by those *ordinary* signs, of which common arithmetic makes use.

By the mutual lights, which these words are thus made to reflect upon the import of each other—by this means is, and by this means alone can be conveyed, in relation to the subject which they are employed to bring to view, the *maximum* of information: the greatest quantity of information capable of being brought to view, in and by the number of words thus employed:* the maximum of information in the minimum of space.

Section III.

Imperfections incident to a denomination of this sort: viz. 1. *Unexpressiveness;* 2. *Misexpressiveness.*

Correspondent to the *properties*, which it is desirable that a denomination attached to any branch of art and science should possess, are the *imperfections* of which it is susceptible. An imperfection will be imputable to it, in so far as, by failing to possess any one or more of the above-mentioned *properties*, it fails of being applicable with advantage to one or more of the above-mentioned *purposes*.

Imperfections, exhibited by this or that one, of the several denominations, considered by itself; imperfections, exhibited by the whole assemblage of them taken together, considered as a whole—to one or other of these heads will all such imperfections, it is believed, be found referable.

Unexpressiveness and *Misexpressiveness*—to one or other of these two heads, it is believed, will be found referable all such imperfections, of which any such denomination, taken singly, and considered by itself, will be found susceptible.

The *purposes*, to which it is desirable that a denomination of the sort in question should be capable of being made subservient, have just been brought to view: in so far as it simply fails of being subservient to those purposes, it is *unexpressive, simply* unexpressive.

Of the name, employed for the designation of any branch of art and science, the design and use is, to convey a conception, as correct and complete as by so narrow an instrument can be conveyed, of the *nature*, and, to that end, thereby of the *subject*, or *subject-matter*, of that same art and science: and this, in such sort as, when and as often as, in relation to any subject that happens to be proposed, a question shall arise, whether it does or does not belong to the branch in question, to suggest a true and clear answer, either on the affirmative or on the negative side.

If, instead of simply failing to convey any such instructive conception, it does indeed present a conception, but that conception altogether foreign to the subject, and thereby, in so far as it is actually entertained, erroneous and delusive, then it is, that, instead of being negatively and simply *unexpressive*, it is positively *misexpressive*.

Be the subject in its own nature what it may—and, on the other hand, the name applied to it, what any one will—true it is, that, in the course of time, the name, how completely unexpressive so ever, and even misexpressive, will become expressive.

To this observation no denial, or so much as doubt, can be opposed; and hence it is that, by names in the highest degree, not merely unexpressive but misexpressive, the functions of names are performed, the purposes which are in view in the use of names to a certain degree answered.

If the misexpressive name in question be a name, by which, when first brought to a man's view, the branch of art and science in question is presented—much more if it be the only name by which it is ever presented to him—on this supposition, a question (it must be confessed) altogether natural is, of this supposed original misexpressiveness, what, if any, is the inconvenience? At first mention (continues the argument) true it is, that the conception it presented was, by the supposition, an erroneous one: but moreover by another part of the supposition, the conception which has at the long run come to be conveyed by it, conveyed to the very person in question, is a correct one: for, by this name it is, that whatsoever conception he has cause to entertain of the subject, has been conveyed to him; and, in point of fact, by names originally as unexpressive as can easily be imagined, have conceptions no less correct than those which have been conveyed by the most expressive names, actually, as it will be easy to show, been conveyed.

Plausible as it is, to the objection opposed by this question, an answer, which it is believed will be found no less plain and clear, than decisive and satisfactory, presents itself.

1. In the first place, by the supposition, a length of time there is, during which, instead of the subject, of which it is desirable that it should convey the conception, the subject which it actually presents is a different one. So long as this state of things continues, every proposition, in the composition of which the misexpressive name in question has a place, is a self-contradictory one. So long then as this self-contradictoriness, and the confusion, of which it is essentially productive, continues, so long the inconvenience, nor is it an inconsiderable one, continues to be felt: and it is only after a lapse of time, more or less considerable, that, the new conception having at length in a manner

* For a more particular account of the uses of a systematic sketch of this sort, and more particularly of a systematic Table, see § 9, 10, 11 and 12.

wormed out the original one, the inconvenience ceases to be felt.

2. In the next place, of the sort of name in question, another use, it has been already observed, is, to obviate doubts in relation to the *extent* of the field belonging to the branch of art and science in question: i. e. whether such or such a less extensive district, in whatsoever manner designated, especially if it be a newly discovered, or newly distinguished district, be included in it. In this case, by what rule or mark shall the answer be guided and determined? By the *name*, considered in itself, i. e. considered in its *original* import merely, no true light, but instead of it a false light, is afforded; and, as to the light afforded by mere usage, by the supposition, no light of this sort hath as yet begun to show itself.

Attached to the use made of misexpressive names, here then are two inconveniences; two distinguishable and undeniable inconveniences, which will be found to have place, in so far as, for the designation of any of the leading branches of art and science, any such improper and unfortunately chosen denominations continue to be employed.

Natural History, Natural Philosophy.—It will presently be seen, in how flagrant a degree both these denominations, both of them names, by which two *main* branches of art and science are wont to be designated, names in constant and almost universal use, are misexpressive.

By this imperfection, if any credit be to be given either to experience or to report, the amount of the inconvenience produced is by no means inconsiderable. Great is the length of time, during which it is not without extreme difficulty, nor till after great perplexity, that, in the mind of the beginner, especially if he be a very young beginner, the connexion between the misexpressive general name, and any of the particular matters meant to be designated by it; viz. the subordinate branches included under it, or any of the subjects appertaining respectively to those branches, can be formed.

So likewise as to the other inconveniences: to this likewise the like observation will be found applying with equal truth. This or that less extensive branch, is it to *Natural Philosophy* that it belongs, or to any, and what other more extensive head? No criterion, no source of guidance, being to be found in the name itself—viz., in its original import—mere *accident* determines. But in the instance of different persons, the determinations made by *accident* are different. Accordingly that less extensive branch, (*Chemistry* for example,) which in the view and language of some persons, *is* a branch of *Natural Philosophy*, in the view and language of other persons, is *not* a branch of it.

Thus it is that, the boundaries of the main compartments being indistinct, the conception entertained of the whole field of art and science is, in the instance of every mind, more or less inadequate, and either indeterminate or erroneous.

Thus much as to the imperfections, incident to the denomination of any branch of art and science, considered by itself. Now as to such imperfections, as do not apply but to the case, where the whole multitude of them, or a considerable part of that multitude, are collected together, and considered together, in the character of an aggregate.

As often as they are thus considered in conjunction and with reference to one another, the purpose for which they are thus considered may be termed a scientific, or *Encyclopedical* purpose; and with reference to this extraordinary purpose, all others may be distinguished by the appellation of *ordinary*.

In so far as it is to an *Encyclopedical* purpose that these several objects, the several branches of art and science, are considered, it is for the purpose of obtaining and communicating a view, as clear, correct, and complete as possible, of the whole field of *thought* and *action*, and therein of the whole field of *art* and *science*; and, to this purpose, a view of the several characters, i. e. characteristic circumstances, by which the several component branches of that ideal whole, are on the one hand assimilated to, on the other hand distinguished from, each other.

Learners and teachers (shall we say) or *Teachers and learners?* for, on the occasion of the mention now to be made of them, it seems not altogether easy to say, which of these two correspondent classes should be put foremost. Be this as it may, to the situation of both these two correspondent and contrasted classes it is, that in the framing of a sketch for the purpose in question, in a word, for the framing of *an Encyclopedical sketch*, the attention of the operator should be directed. As far as any separation can in practice be made, it is by the situation of *learners* that the principal demand for attention is presented: for all teachers must in the first place have been learners; nor, at any subsequent period can teachers exist without learners; whereas learners *may* exist, and, in so far as individuals are self-taught, *do* exist, without teachers; and, where both classes have place together, and at the same time remain distinct from one another, the class of *learners* may, and naturally will, be much more *numerous* than the class of *teachers*

Nor will the class of persons, to whom, in the character of *learners*, an apposite and expressive system of Encyclopedical nomenclature may be of use, be found to be so narrow as might at first sight be imagined. To any one, whose subsequent pursuits were destined to be confined within the limits of ever so narrow a branch of the field, if not the whole, various other parts of such a system will be found, of which a conception more or less detailed will not be found to be altogether useless. Of no one part can a man's conception fail of being the stronger and the clearer,

the stronger and clearer his conception is of such or such other parts, which, by means of those properties, whereby they are respectively assimilated to it, and contrasted with it, contribute to reflect light upon it, and by this means place it in the clearer point of view.

To this class (to speak more particularly) will be seen to belong all those persons, by whom the benefit of the proposed system or course of Chrestomathic education will have been partaken of. With few if any exceptions, initiated, as they will be, in every useful branch of art and science,—strange would be the inconsistency, were any such determination taken, as that of forbearing to present to their view those relations of mutual agreement and distinction, by means of which these several branches receive each of them light from, and reflect it upon, every other. For, it is thus, and thus alone, that the mind can be endowed with, and rendered conscious of, that animating vigour, by means of which it feels itself able, with an assurance of success and mastery, to enter and operate with effect, upon any and every part of it, towards which the course of its pursuits may at any time happen to be directed.

But, on the proposed plan, along with the class of *learners* will be augmented the class of *teachers:* and *that* in a much larger proportion, than any which till of late has been in view. For, in the instance of every one of the branches of science thus taught, so it is that, by a very considerable proportion of the class of *learners*, the function of *teachers* will, even before their own term of learning is in respect of that same branch fully expired, be taken in hand and exercised: so that, to the extent of this large portion of the whole number of learners, the only line of separation between the two classes, is that which will have been drawn by the hand of *Time*.

Of the imperfections, of which a system of nomenclature for the various branches of art and science may be seen to be susceptible, when considered with a view to none but the *ordinary purposes*, as above explained, a conception may presently be formed, and has accordingly been already endeavoured to be conveyed. But, of the imperfections, of which the like system may be seen to be susceptible, when considered with reference to *Encyclopedical purposes*, as above explained,—no conception can be formed, till a conception has been formed of the particular form, which it is necessary a system of this sort should be made to wear, in order to possess—and *that* in the highest possible degree of perfection—those properties, a general intimation of which has just been given: viz. that in which, in relation to each branch, are brought to view the circumstances, in respect of which it *agrees* with, and those in respect of which it *disagrees* with, every other.

Of a system of this sort will here be given a general idea; and that followed by an exemplification, which, though particular, will be a very extensive one,—not embracing merely, but outstretching, the whole of the proposed field of Chrestomathic education. But, in the meantime, that the nature and existence of the demand, for a reform of some sort, in the nomenclature employed upon the subject, may be the more distinctly perceptible,—an exemplification will be given of its inaptitude, even with reference to the purposes, above distinguished by the name of *ordinary* purposes:—viz. in the instance of those names which are in most frequent use.

Section IV.

Inaptness of the appellatives Natural History, Natural Philosophy, *and* Mathematics.

1. The branch of art and science for the designation of which the compound appellation *Natural History* is as yet the only one in use, is that which has for its subject *matter*, in general, including bodies of all sorts, considered in respect of those modifications, which are found exemplified by it, before any operation has been performed upon it by human *art*, under the direction of human *science*:* or in other words, (if, for familiarity's sake, notwithstanding the unapt floridness of the expression, it should be deemed advisable to employ, as usual, the name of the well-known fictitious personage, *Nature*,) in the condition in which it has been found placed by the hands of *Nature*—uncontrolled and unassisted Nature.

Of these bodies—i. e. of *matter*, in all such of its forms with which we have in any way or degree any acquaintance,—the aggregate is composed in the first place of our *Earth*, in the next place of all the other bodies, of which our *World* is composed: of our Earth in the first place, no others being of any importance to us, otherwise than with reference to that, "in which we live, and move, and have our being."

Of this earth of our's, the matter is either in the form of matter altogether *lifeless;* matter endowed with life, but *without feeling;* or matter endowed with *life and feeling* both. In and by the several appellatives, *Mineralogy*, *Botany*, and *Zoology*, all of them single-worded—all of them in familiar use,—the primary divisions of the branch of art and science here in question, are aptly enough expressed. And if, for the designation of that remaining branch of the art and science in question, which has for its subject the remainder of those modifications of matter with which we have any acquaintance, the term *Uranology*, as above,† or even the term *Astronomy*, be employed,—in either case, to the nomenclature thus bestowed

* See Table I. Note 32, supra, p. 36.

† See Table I. Stage V. Notes 87, 88, supra, p. 38.

upon these primary branches of the stock of art and science in question, no considerable objection presents itself as opposable.

Not so in the case of the whole aggregate, of which these are the divisions. Of the two words,—the first an adjective, the other a substantive,—of which the compound appellation *Natural History* is formed,—it found, at the time of its formation, the substantive *History* already appropriated to the designation of a branch of learning, having for its subject those *states of persons and things* of all sorts, and those *events* of all sorts, that have been known or supposed to have had place in times *past*: present time either being altogether excluded, or its history being but as it were a point, in comparison with the time of history which it closes. Adding the word *natural*, say *Natural History*, the result is, that, for the import, designated by this appellative, antecedently to the establishment of that usage from which it has received an import so widely different, *we have this*, viz. the *natural* account of those *states of persons and things*, and so forth, and of those *events*, and so forth, which had place in times past.

Now, with what propriety, to any one of the above-mentioned so aptly denominated divisions, of the branch of art and science itself thus unaptly denominated,—with what propriety, to Mineralogy, to Botany, to Zoology,—can the term *Natural History*, consideration had of its original and proper import as thus developed, be applied?

II. The branch of art and science, for the designation of which the compound appellation *Natural Philosophy* is in use, is that which has, for its *subject*, *matter* in general, considered in respect of such modifications as it has been made, or may be expected to be made, to undergo, by human *art*, under the guidance of human *science*: with the addition, perhaps, of such properties, as, by means of changes made in it by the application of that same mental instrument, have been discovered to have been already belonging to it.

Taken by itself, *Philosophy* is *the love of wisdom*. Adding the word *natural*, say *Natural Philosophy*, and, for the import designated by this appellation, antecedently to the arbitrary usage, established in this case as in that other,—we have *this*, viz. *the natural love of wisdom*.

That either in the study of *Mechanics*, or in that of *Chemistry*, or in the study of any of those *particular* branches of art and science, which are formed by the application of these *general* and *theoretical* branches to the various *practical* ones to which they are subservient, is there any want of capacity to afford gratification to an affection so laudable as that of *the love of wisdom*,—is not here by any means meant to be asserted, or so much as insinuated. But, not to speak of *Oratory*, *Poetry*, or any of the *Fine Arts*,—in the study of the art and science of *Legislation*, or in the study of the art and science of which *Private Morals* is the subject, is there any less room for the manifestation of the *love of wisdom*, or of *wisdom* itself, than in the study of *machines*, or in that of the various methods of compounding, decompounding, and recompounding, the matter, of which *stones*, *plants*, and *animals*, are respectively composed?

III. The branch of art and science, for the designation of which the term *Mathematics* is in use, is that which has for its subject *quantity* in general, considered with or without relation to *form* or *figure*: quantity in general, that is to say, as well *matter* as *void space*, they being considered respectively in relation to *quantity*, with or without relation to *figure*: *void space*—that is, space considered as void, or rather without consideration had of its contents: for, as to any determinate portion of space, determined by determinate boundaries,—and, within those boundaries not containing any the least particle of matter whatsoever,—an example of any such object would not, it is believed, be very easy to find.

Taken in its original import, *Mathematics* denotes anything that is *learnt*, or considered as capable of being learnt. It therefore *is*—or at least in that its original import *was*, capable of being, with no less propriety, employed in the designation of any one of those existing, or those about to exist, branches of art and science, comprehended or not, in the most comprehensive and copious Encyclopedia,—than in the designation of the particular branch, to which, by long and learned usage, it has thus, in these later times, become appropriated:—of the art of *legislation*, or the art of *push-pin*, no less than of *Geometry* and *Algebra*.

Upon all the above-mentioned three denominations, will not only the imperfection of *inexpressiveness*, but, in the instance of the two first of them, that of *misexpressiveness*, be found chargeable.

Running on in perpetual contradiction to the original import, a false account of the subject is the account, which the two appellations, *Natural Philosophy* and *Mathematics*, are, both of them, continually giving of it.

But, though in all these instances the proposition involved in the appellative is equally false, yet the falsehood so involved is not, in all these instances, equally pregnant with practical inconvenience.

In the instance of *Mathematics*, no very considerable practical inconvenience seems observable.

To such persons as are altogether unacquainted with the primary *general* import of the word, it conveys not any import at variance with that which, in the instance in question, it has acquired from *particular* usage; and, even to the eyes of persons acquainted with such its primary import, that *general* import

has to such a degree been covered as it were, and by degrees even pushed aside, by the *particular* import attached to it by particular *usage*, as to be scarcely ever in use to present itself.

In the case of *Natural Philosophy*, the inconvenient effects of *unexpressiveness*, coupled as it is with *misexpressiveness*, have manifested themselves in a manner much more conspicuous and incontestable. To the same branch of art and science to which some attach the name of *Natural Philosophy*, others attach the name of *Experimental Philosophy*. In the present instance, both these terms being, as above, misapplied, are they—in the modern import of the former of them,—are they, or are they not, synonymous with each other? In relation to the *subject* to which they respectively apply, no intimation being given by either of these appellatives,—this being the case, to a question to the above effect, who shall undertake to furnish an answer?—thus much being pretty clear, viz., that for no such answer are any *data* afforded by the primary import of either of these appellatives.

Astronomy—though, properly speaking, it should in part be considered as referable to *Natural History* (viz., in so far as it consists in simple *observations*, unaccompanied with those observations and *calculations*, which, as in the case of *Chronological Geography* and *Uranological Chronology*,* are applicable, and actually applied, to practical use,) seems commonly to be considered as referable to *Natural Philosophy*, and to that alone. Be it so; but is it then referable to *Experimental Philosophy*? The *light* that issues from them, yes; but the *stars* themselves, are *they*, like the *star-fish* named from them, are they taken, can they be taken, for the subjects of *experiment*?

Chemistry, this branch of art and science does it, or does it not, belong to the domain of *Natural Philosophy*? Yes, say some; for, under that appellation they include it. *No*, say others; for, under that appellation *they* do not include it.

Belonging, or not belonging, to *Natural Philosophy*, does it not at any rate belong to *Experimental Philosophy*? In the whole of *Chemistry*, not to say any more, taken from beginning to end, is not there full as much of experiment as in any part of *Mechanics*?

Once more, does it, or does it not, belong to *Natural Philosophy*? On any such ground as that of *reason* and *analogy*, the question is manifestly unanswerable, and any dispute produced by it interminable. Why? Because, while one of these names—viz., *Natural Philosophy*, is not only *unexpressive* but *misexpressive*, the other, *Chemistry*, is also unexpressive. By *Chemistry*—an Arabian word, of which the origin has always been covered by a cloud—no intimation whatever, either of the *subject-matter*, of the sort of *operator*, or of the nature of any *operations* performed, is afforded.

By some Institutionalists, *Chemistry*, as above observed, is *not* considered as included in *Natural Philosophy*. Why? Because, before *Chemistry* had begun to find *teachers*, before any more than a few scattered fragments of the art and science could be so much as said to have existence, *Natural Philosophy* had, for a long time, been in use to be taught. Therefore, when *Chemistry* came to be taught, this new branch was considered as a branch of *art* or *science*, wholly distinct and independent, not included in that old one.

Section V.

Cause or Origin of this Inaptitude.

Of the thus extensively prevailing inadequacy, should the *source* be asked for, it may be found, it is believed, at no great depth beneath the surface. It may be descried in the difference between the respective extents of the several divisions of the field of art and science, —*i. e.*, of the respective masses of their contents,—in the state in which they *now* present themselves to view, as compared with the extents respectively possessed by them when, for the first time, the degree of cultivation, which they had respectively received, suggested the convenience of employing a certain name, for the purpose of binding together in the mind such of their contents, with which at that time an acquaintance, more or less correct and extensive, had been formed. In each instance, numerous, insulated, and dispersed, must have been the particular observations and experiments made, before it occurred to any one to give to the aggregate assemblage of them a common name of any kind, and thus to bind together the contents of that aggregate by one common tie. Even when this instrument of connexion and elucidation came at length to be employed, it would at first be either altogether uncharacteristic of the objects which it served to designate, or, if amongst them there were any, at all, to which it bore any such natural relation, the number of them would, in comparison with the number of those to which it bore not any such relation, be very small.

Take, for instance, that branch of art and science which still bears the name of *Electricity*. Of the word *Electricity*, the root or basis is a Greek word, which signifies *amber*: had it been from the Latin that the word had been derived, it would have been *Amberism*. Why *Electricity* or *Amberism*? Only because, of such a multitude of sorts of substances as that by which, at present, upon the subjecting them to the same sort of operation (viz., rubbing,) the same appearances (viz., the causing light bodies first to move towards them, and then to recede from them) are exhibited, *amber* happened to be the first, in which the existence of this property was observed.

Even *Magnetism*, though to the purpose of

* See Table I.

calling to view, by means of its original signification, the phenomena, for the designation of which it has now for a long time been employed,—though to this purpose it is so much less inadequate than *Electricity*, has had its original boundaries far outstretched by observations made at various later dates. By the import originally attached to it, the intimation given is, that the properties, of which it takes cognizance, belong exclusively to the *naturally* existing mineral, termed, in Greek and Latin, *Magnes*, and, in English, *the Loadstone*.

Since those days the same properties have, however, been found to be capable of being given to *iron*,—a simple metallic substance, which is but one of two or more ingredients of which the loadstone is composed,—and to belong naturally to *nickel*, another metallic substance, which, with the exception of this property, and those that are common to all metals, has not been found to have anything in common with either of those two other substances.

In the instance of these two branches of art and science—both of them included in the domain so unexpressively denominated by the compound appellative *Natural Philosophy*—we have two names, which, however imperfectly, are still in a certain degree characteristic and expressive; designative of a portion, though not of the whole, of the contents of the branch of art and science which they are respectively employed to denominate. In the instance of *Galvanism*, the sign is altogether uncharacteristic, with relation to every one of the objects which it is employed to signify. By an Italian of the name of *Galvani*, within the memory of multitudes now living, observation was made of certain phenomena, in which no analogy to any other class of phenomena was for some time discovered. No other object, to which they could be said to bear any particular relation, being known,—at the same time that the person, by whose sagacity and ingenuity they had been in part observed, and in part discovered, being known,—it was from him they took their name. *The phenomena observed or discovered by Galvani*, and presently, for shortness, *Galvanism*, was the name given to them by the Natural Philosophers of that day.

This imperfection is not peculiar to the *physical* branch of art and science:—in a large proportion it is shared with it by the *ethical*.

From like causes proceed everywhere like effects. Hence, in the field of Government, the multitude of *Offices*, by the names of which not any the slightest intimation is conveyed of the nature of the operations performed by the possessors.*

Section VI.

Course to be taken for framing the most perfect and instructive System of Encyclopedical Nomenclature that the Nature of the Case admits of.

The nature of the *subjects* themselves, and the nature of the *words* or *terms* employed in giving to the aggregate mass of them, in all its diversifications, a system of *nomenclature*, and, by means of such nomenclature, a set of *divisions*, and thereby a scheme of distribution and arrangement—on these two circumstances, it is believed, will the aptitude of the work, with reference to its purposes, be found to depend.

I. As to the *subject*, for the particular purpose here in question, it is only in so far as concerns its primary and most extensive divisions, that an acquaintance with it will be found to be very material: with its details no other acquaintance will be found necessary, than that, by the want of which a man might be led into misconceptions concerning the general nature of the compartments and divisions in which they are comprehended: viz. in such sort, as, by means of some ill-chosen appellative, to ascribe to this or that one of the contents, this or that property, of which in reality it is not possessed.

In the choice made of the *words*, will be found to be included, two intimately connected indeed, but perfectly distinguishable particulars: viz. in the first place, the choice of such appellatives—single-worded and many-worded together—as, by the *extent* respectively belonging to them, shall be suited to the purpose of giving expression to all such divisions or parts of the subject, or aggregate, as, at each step in the progress of the division, shall be proposed to be marked out; in the next place, the *tongue* or *language*, of which choice shall have been made, for the furnishing the assortment of words required for the supply of that demand.

1. As to the *extent* covered by the respective appellatives, it will, in the ensuing sketch at least, for all but the last step taken in the course, be such as, when they are arranged one after another, in appropriate order, will be seen to give to the mode or scheme of division marked out by them, the character of an *exhaustive* one, and *that*, in respect of the number of the parts produced by each act of ideal division of the aggregate, considered for that purpose as a divisible whole,—the sort of scheme, which has been styled sometimes, from the Greek, *dichotomous;* sometimes, from the Latin, *bifurcate;* literally rendered in English by the word *two-pronged*, as applied to a *fork:* for, as will be seen, it is in and by this mode, and this alone, that all the purposes, which, on this occasion are of a nature to afford a practical use, can be accomplished. As to the considerations by which the choice made in

* Take, for instance, the Offices respectively designated by the names *Chancellor, Secretary of the Petty Bag, Clerk of the Pells, Clerk of the Hanaper, Clerk of the Pipe, Surveyor of the Green Wax.*

favour of this mode was produced, a view of them will presently be given: but, that they may be the more clearly apprehended, it has been deemed advisable to bring to view, in the first instance, an exemplification of the sort of work to which they will have to make reference.*

Small, it is true, is the number of steps to which, accompanied with a correspondent system of nomenclature, this transcendently instructive and useful scheme of division can, consistently with any net balance on the side of advantage, be pursued: the number of words being so great, and not only the labour necessary to the forming of such a system, but even the labour of following it up when made, being such, as, after a comparatively small number of steps taken in this career, to threaten to become intolerable. But, against the carrying it on to whatever length it is capable of being followed up to with clear advantage, every impracticability, that may be found to attach upon an ulterior pursuit of it, will not be found to oppose any reasonable objection: and a task, for which neither the mind of the writer, nor the mind of the reader, may be ripe at one period, may find both minds sufficiently prepared for it, at a more advanced point in the line of time.

As to the *language*, the *Greek* presents itself as being, upon the whole, beyond comparison, the best adapted to this purpose: and this so clearly, as to be the only one which, on this occasion, there can be any use in holding up to view.

Reason and *Custom*—*Reason*, in this instance, the parent of *Custom*—join in the affording of this assurance. Of all known languages, the Greek is assuredly, in its structure, the most plastic and most manageable. To such a purpose as the present, upon a scale of any extent, it is the only language which it has been customary for men to draw upon for this purpose: customary, not only in the English language, but in the language of every other nation forming a part of the European system: or, in a word, as, to this purpose, may be said for shortness, and without any very material injustice, in the language of every well-instructed nation upon earth.

Of the sort of work proposed to be executed, the *subject* has already been brought to view, and its limits marked out, it is hoped, with that degree of precision which the nature of the case admits of: viz. of the whole field of *thought and action*, that part which constitutes the field of *art and science*: the *field* itself, or, what comes to the same thing, (both expressions being necessarily *figurative*, names of *fictitious entities*,) the aggregate of its *contents*.†

Of the *division* to be made of this *field*, or, (what comes to the same thing,) the *distribution* to be made of its *contents*, where shall we look for the *source*?—the primary source, by the choice of which the choice of all ulterior sources, should any such be added, will naturally be influenced at least, if not determined? Where, but in the different natures of different *parts* of this *field*—of different portions of its *contents*?—in a word, in the nature of the *subject*—the common *subject* of all these branches of *art* and *science*—and in the different natures of the several different parts of that subject, on which these several branches have to operate? So far as it is from this source that the division is made—the *principle of division* deduced—correspondent to each branch of the *subject* is the branch of *art* and *science*, by which it is operated upon: and, conversely, correspondent to each branch of *art* and *science* is that branch of the *subject* on which it operates.

In the preface, written by D'Alembert, and prefixed to the French Encyclopædia, under the title of *Système figuré des Connoissances Humaines—Figured System of Human Knowledge*,‡ a systematic Table or Map is given, accompanied with a paper, entitled, *Explication détaillée du Système des Connoissances Humaines*.

In that sketch, what is the declared *subject* of the work?—Art and Science in conjunction?—No: but *sciences* alone, to the exclusion of arts; for surely, under the French word *connoissances*, *arts* are no more included than under the English word *knowledge*, or the English word *science*. Yet in the Table itself the words *Art* and *Arts* occur in many places.

Again, the *source* of division, or, to begin with the first division which presents itself—the source of that leading division—what is it? Is it the nature of *the subject*—the different natures of the several different branches of the subject—on which the corresponding branches of art and science have to operate?—No: but the nature of the *faculties*, by means of which the subject, in its different parts, is (it is supposed) operated upon.

Lastly, the plan or *scheme* of *division*,—considered in respect of the number of branches, which are respectively the results of the several successive acts of *partition* or *distribution*, performed upon it,—what is it? Is it, as above proposed, *regular* and *bifurcate*? the number, at the first step, two, and at every step the same?—No: but at the first step *trifurcate*: and, after that, the number at each step varying, to the number of half-a-dozen or more.

Such is the scheme, or plan of division, pursued in that justly celebrated work: in these may be seen a part, and but a part, of the whole number of its incongruities: and, of some of the practical *inconveniences* resulting from some of these *logical* incongruities,—if, on the ground of science, *confusion*, and on the one part *misrepresentation*, and on the other

* See § 8. † See Table I. note (32.)

* *Knowledges* would be the word, if, in English as in French, the substantive *knowledge* had a plural number.

part *misconception*, belong to the category of inconvenience,—it will be the endeavour of the next section to give a view.

Section VII.

D'Alembert's Encyclopedical Map or Tabular Sketch—its Imperfections.*

Of the sketch given by *D'Alembert*, the leading principles are—as he himself has been careful to declare, taken from that given by *Lord Bacon*. Had it been entirely his own, it would have been, beyond comparison, a better one. For the age of *Bacon*, Bacon's was a precocious and precious fruit of the union of learning with genius: for the age of *D'Alembert* it will, it is believed, be found but a poor production, below the author as well as the age.

Prudential considerations suggested to the French Philosopher the precaution of seeking shelter under the mantle of the foreign sage. But of this perhaps in another place.

Ingenious as, in several parts, and in several respects, it would, upon a particular examination, be found,—smoke, rather than light, will, upon the whole, be seen to be the result of it. At the very first step, the whole field, it will be seen, is involved in an all-obscuring cloud: a cloud too thick for any ulterior operation to be capable of dissipating.

Its principal merit and use will, it is believed, be seen to consist in the having formed, and presented to view, a general conception of a work of this sort,—and the having placed together, under one view, the whole stock of the materials, at that time known, to belong to it and to require to be employed in the composition of it.

Taking the work in the form in which it is exhibited by D'Alembert, the following are among the imperfections, which have presented themselves as chargeable upon it,—

1. The very *subject* of the work, inadequately designated.
2. The *primary source* of *division*, unhappily chosen.
3. The *scheme of division*, loose and irregular.
4. The *appellations*, in several leading instances, *inapposite*.
5. The *distinctions*, in several instances, *groundless*; distinctions, without any determinate and assignable difference.
6. *Repetitions abundant* —under different names, the same object repeated a multitude of times.
7. The *texture* of the discourse *incomplete*: no *verbs*; consequently no *propositions*; nothing but *substantives*, with here and there an *article* or an *adjective*.

I. *Subject of the work, inadequately designated.*

Of the relation between *Art and Science*,—as well as of the relation between Art and Science *taken together* on the one part, and the *remainder* of the whole field of *thought* and *action* on the other part,—the idea above given† will (it is hoped) be found a tolerably clear one. Of this relation, no attempt to give any idea is made in *D'Alembert's Map*, or in the *Explanation* given of it.

"*Système figuré*"—figured system: des *Connoissances* Humaines—of Human *Knowledge*, is the *title* under which the whole contents of the Table are arranged. At the conclusion, even *Poetry*, presented to view in the character of the principal product of the *imagination*, is, at the same time, exhibited in the character of a subject, or a branch, of the all-comprehending aggregate—human *knowledge*.‡ In the same paragraph, and but four lines after, he speaks of this Table, by the description of "*a Genealogical Distribution or Map of the Sciences and the Arts*," and, in this loose shape, and no other, is introduced the only mention made of *the Arts*, or the word *Art*. And, though

* The denomination *Encyclopedia* had established usage, and perhaps even necessity, to warrant it.

Considered, however, in its original import, viz. *instruction in a circle*, it is not in every respect a very happy one. Moving continually in a circle is not the way to get on. By labour, speed may indeed be increased; but by no degree of either can any advance be made. Thus, at the very outset, and by the very name, an irrelevant idea is obtruded, and in lieu of that encouragement which is so much needed, discouragement is presented.

The image of a *field* presented itself as being in every respect much better adapted to the purpose. By the image of a circle, is presented the idea of a limited extent, determined by the circumference. By the image of a field no limitation whatsoever is presented.

This image of a *field* will moreover be, with equal convenience, applicable to two expanses—two perfectly distinguishable, though intimately connected expanses, one within the other—the one of them boundless, and so therefore the other, viz. the field of *action* and *thought*, and the field of *art* and *science*.

In the pursuance of this *necessary* fiction (for all language which has *mind* for its subject, is unavoidably fictitious, speaking of *mind* as if it were *matter*,) on the occasion of the use made of this necessarily fictitious image, there will be found a convenience in speaking, sometimes of the ideal *receptacle*, the *field*, as if it were a real one, sometimes of the *objects* in question, viz. the several branches of art and science, in the character of its *contents*. By the word *field* this convenience will always be afforded.

† Table I. note (9.)

‡ Voilà toute la *Partie Poetique* de la Connoissance Humaine; ce qu'on en peut rapporter à l'imagination, et la fin de notre distribution généalogique (ou si l'on veut Mappemonde) des Sciences et des Arts.—*D'Alembert Melanges*, i. 239. *Amsterdam*. 1767. *Explication du Système figuré*.—N. B. The above, as far as it goes, is an exact copy of the original; but, as in the grammatical structure of the passage some deficiency in the articles of clearness and correctness presents itself, some slip of the press is suspected.

fiction is mentioned as an essential ingredient in the composition of the idea meant by him to be attached to the word, yet neither on this occasion, nor on any other, is it brought to view in the character of the name of an *Art*, nor in any other character than that of the name of a branch of *Science*.

From the difficulty here in question, the mind of D'Alembert, it therefore appears, withdrew its force. His precursor, *Chambers*, in the Preface to his Dictionary had, before him, grappled with it; but (as any one, who, in this view, may be disposed to turn to that elaborate work, will, it is believed, find reason to acknowledge) altogether without success.

Instead of *Knowledge*, in which (see Chrestomathia, Table I.) *Science* is included,—instead of knowledge alone, the subject of the work in question should then have been *Art and Science*: art and science all along *in conjunction*: for, in conjunction they must all along be taken and considered, or no tolerably adequate conception of either will be formed.

But the *subject* of *art and science together*, what is it?—Answer—*Being* in general: *being*, in all the *modifications*, of which, to our view, it is susceptible. *Being*, in some shape or shapes, the *subject*,—*well-being*, in some shape or shapes, the *object*,—of everything that, by man, is or can be *done* or *thought of*. Of these fundamental and eminently simple truths, the bare mention may suffice for the present. In the section, in which some of the *first lines*, of the sort of *map* in question, are attempted to be given, the consideration of them will come to be resumed. As the process of division and distribution, drawn as the principle of division is from different *sources*,—as this sort of anatomical process proceeds, the several modifications of *being* which are the result of it, display themselves to view.

II. *Primary Source of Division, ill chosen.*

The primary *source* of his divisions is,—what? Not the nature of the *subject*, and of its respective parts, but, as already noticed, the nature of the several human *faculties*, which, by a strange misconception, are respectively considered as applying themselves exclusively to different parts of it.

Strange indeed may this misconception be pronounced: at any rate, if it be true, that, when these faculties come to be mentioned, so it is that, of all the branches into which the body of the arts and sciences has ever been or ever can be divided, not a single one can be mentioned, upon which the whole list of the human faculties can not be shown to be, in some way or other, applied.

Memory, Reason, Imagination.—Of these, and these alone, is his list of the human faculties, as brought forward on this occasion, composed. If, for any other purpose, if, on any other occasion, asked for a list of those faculties, would D'Alembert have given this for a complete one? *Perception*, for example, not to look any further, would not *this* have been added? would it not have been placed before *Memory*? But the truth is, that in the subsequent ramifications, though not in this primary one, not only *perception*, but other faculties besides, are by D'Alembert himself brought to view.

But, for this purpose, what list of these faculties, other than a complete one, could, with propriety, have been proposed to serve? In addition to these three, each of which, according to this division, applies itself exclusively to a certain parcel of the branches of *art and science*, or at any rate of *science*, is it that there are any, of which no application is made to *any* branch of *art* or *science*? Of the faculty of *perception*, for example, is it that no application is made, in the study of *Natural History* for example? If, either in this or in any other instance, any such faculty be to be found, if this be indeed a truth, it surely is not of the number of those truths, which are so completely obvious, that no proof of them can, either for conviction or satisfaction, be justly regarded as necessary.

Quere: unless it be through the *perceptive faculty*, through what medium does the *retentive* receive any of the original, and exteriorly derived, part of its contents?

Of a set of fictitious entities to give in a list, neither the correctness nor the completeness of which shall be exempt from dispute or doubt, cannot be a very easy task. Of the articles inserted in the Note, neither the *perceptibility*, (meaning that sort of perceptibility of which these sorts of fictitious entities are susceptible) —neither the perceptibility, nor the mutual *distinctness*,—say rather *distinguibility*,—will, it is hoped, be found much exposed to dispute.*

The *inventor*, the *learner*, the *teacher*: the *inventor*, or in the place of, or in company with the *inventor*, the *discoverer*, and their assistant,

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*** Of those which are here distinguished by an * mention is made in D'Alembert's Table: those and no others.

*1. *Perception*, or say *perceptive faculty*, *alias simple apprehension*.

*2. *Judgment*, or say *judicial faculty*.

*3. *Memory*, or say *retentive faculty*.

*4. *Deduction*, or say *ratiocination* or *deductive faculty*—that by which a number of judgments, i. e. acts of the *judicial faculty* are deduced one from another.

5. *Abstraction* or say *abstractive faculty*.

6. *Synthesis*, i. e. *combination*.

*7. *Imagination*, or say *imaginative faculty*, whereby a number of *abstracted ideas*—*results*, or *products* of the exercise of the *abstractive faculty*—are combined, compounded, put together as it were, into one *image*. It is combination, preceded by, and operating upon, the products of abstraction.

8. *Invention*, or say *inventive faculty*, whereby, out of a number of the products of the *abstractive* faculty, such compounds are formed as are *new*: i. e. were never produced before. *Invention* is *imagi-*

TABLE III.

Being a Reprint of D'ALEMBERT's ENCYCLOPÆDICAL TABLE, as inserted in his *Melanges*, tom. i. p. 239 or 250. Amsterdam, 1767. For an examination of this Table, see *Chrestomathia*, Appendix, No. IV. from p. 73 to 82.

SYSTÊME FIGURE DES CONNOISSANCES HUMAINES.

ENTENDEMENT.

MEMOIRE.

HISTOIRE.

- SACRÉE.—HISTOIRE DES PROPHÉTIES.
- ECCLÉSIASTIQUE.
- CIVILE, ANC. ET MODERNE. — HIST. CIVILE, *proprement dite.* — MÉMOIRES. / ANTIQUITÉS. / HISTOIRE COMPLETE.
- HISTOIRE LITTÉRAIRE.
- NATURELLE.
  - UNIFORMITÉ DE LA NATURE. — HISTOIRE. — HISTOIRE CELESTE. / DES MÉTEORES. / DE LA TERRE ET DE LA MER. / DES MINERAUX. / DES VEGETAUX. / DES ANIMAUX. / DES ELEMENS.
  - ECARTS DE LA NATURE. — PRODIGES CELESTES. / MÉTEORES PRODIGIEUX. / PRODIGES SUR LA TERRE ET LA MER. / MINERAUX MONSTRUEUX. / VEGETAUX MONSTRUEUX. / ANIMAUX MONSTRUEUX. / PRODIGES DES ELEMENS.
  - USAGES DE LA NATURE. — ARTS. METIERS. MANUFACTURES.
    - TRAVAIL ET USAGES DE L'OR. ET DE L'ARGENT. — Monnoyeur. / Batteur d'or. / Fileur d'or. / Tireur d'or. / Orfevre. / Planeur. / Metteur en œuvre, *&c.*
    - TRAVAIL ET USAGES DES PIERRES FINES ET PRECIEUSES. — Lapidaire. / Diamantaire. / Joaillier, *&c.*
    - TRAVAIL ET USAGES DU FER. — Grosses Forges. / Serrurerie. / Taillanderie. / Armurerie. / Arquebuserie, *&c.*
    - TRAVAIL ET USAGES DU VERRE. — Verreries. / Glaces. / Miroitier. / Lunetier. / Vitrier.
    - TRAVAIL ET USAGES DES PEAUX. — Taneur. / Chamoiseur. / Peaussier. / Gantier, *&c.*
    - TRAVAIL ET USAGES DE LA PIERRE, DU PLATRE, DE L'ARDOISE, *&c.* — Architecture pratique. / Sculpture pratique. / Maçon. / Couvreur, *&c,*
    - TRAVAIL ET USAGES DE LA SOIE. — Tirage. / Moulinage. / Ouvrages, *comme* Velours / Droguets brochés, *&c.*
    - TRAVAIL ET USAGES DE LA LAINE. — Draperie. / Bonneterie, *&c.*
    - TRAVAIL ET USAGES, *&c.*

RAISON.

PHILOSOPHIE.

MÉTAPHYSIQUE GÉNÉRALE, *ou* ONTOLOGIE, *ou* SCIENCE DE L'ÊTRE EN GÉNÉRAL, DE LA POSSIBILITÉ, DE L'EXISTENCE, DE LA DURÉE, &C.

SCIENCE DE DIEU.

- THEOLOGIE NATURELLE. THEOLOGIE REVELÉE. — RELIGION, *D'où par abus,* SUPERSTITION.
- SCIENCE DES ESPRITS BIEN ET MAL-FAISANS. — DIVINATION. / MAGIE NOIRE.

SCIENCE DE L'HOMME.

- PNEUMATOLOGIE *ou* SCIENCE DE L'AME. — *Raisonnable.* / *Sensitive*
- LOGIQUE.
  - ART DE PENSER
    - APPREHENSION. — *Science des Idées*
    - JUGEMENT. — *Science des Propositions*
    - RAISONNEMENT. — *Induction.*
    - MÉTHODE. — *Démonstration.* — Analyse. / Synthese.
  - ART DE RETENIR
    - MEMOIRE. — *Naturelle* / *Artificielle.* — Prénotion. / Emblême.
    - SUPPLÉMENT DE LA MÉMOIRE. — *Ecriture.* / *Imprimerie* — Alphabeth. / Chiffres. — ARTS *D'Ecrire, D'Imprimer, De Lire, de Dechiffrer.* — Orthographe.
  - ART DE COMMUNIQUER.
    - *Geste* ..... — Pantomime. / Déclamation.
    - *Caracteres.* — Idéaux. / Hiéroglyphiques. / Héraldiques, *ou* Blason.
    - SCIENCE DE L'INSTRUMENT DU DISCOURS. — *Grammaire.* — *Signes* .. / *Prosodie.* / *Construction.* / *Syntaxe.* / *Philologie.* / *Critique.* / *Pedagogique.* — Choix des Etudes. / Maniere d'enseigner.
    - SCIENCE DES QUALITÉS DU DISCOURS. — *Rhetorique.* / *Méchanique de la Poésie,* ou *Versification.*
- MORALE.
  - GENERALE. — SCIENCE DU BIEN ET DU MAL EN GENERAL. DES DEVOIRS EN GENERAL. DE LA VERTU. DE LA NECESSITE D'ETRE VERTUEUX, &C.
  - PARTICULIERE — SCIENCE DES LOIS, *ou* JURISPRUDENCE. — *Naturelle.* / *Œconomique.* / *Politique.* — *Commerce intérieur, extérieur, de Terre & de Mer.*

SCIENCE DE LA NATURE.

METAPHYSIQUE DES CORPS, *ou* PHYSIQUE GENERALE. DE L'ETENDUE, DE L'IMPENETRABILITE, DU MOUVEMENT, DU VUIDE, &C.

MATHEMATIQUES.

- PURES ..
  - ARITHMETIQUE. — NUMÉRIQUE.
  - *Algebre* ..... — *Elementaire.* — *Infinitesimale* — Différentielle. / Intégrale.
  - GEOMETRIE. — ELÉMENTAIRE. (Architecture Militaire. Tactique. / TRANSCENDANTE. (Théorie des Courbes.
- MIXTES ..
  - MÉCHANIQUE.
    - *Statique*.... — *Statique,* proprement dite. / *Hydrostatique.*
    - *Dynamique.* — *Dynamique,* proprement dite. / *Balistique.* / *Hydrodynamique.* — Hydraulique. / Navigation. Archit. Navale.
  - ASTRONOMIE GÉOMÉTRIQUE.
    - *Cosmographie.* — *Uranographie.* / *Geographie.* / *Hydrographie.*
    - *Chronologie.*
    - *Gnomonique.*
  - OPTIQUE. — *Optique,* proprement dite. / *Dioptrique. Perspective.* / *Catoptrique.*
  - ACOUSTIQUE.
  - PNEUMATIQUE.
  - ART DE CONJECTURER. (*Analyse des hasards.*

PHYSICO-MATHEMATIQUES.

RAISON.

PHILOSOPHIE.

SCIENCE DE LA NATURE.

PHYSIQUE PARTICULIERE.

- ZOOLOGIE ..... — ANATOMIE. — *Simple.* / *Comparée.*
- PHYSIOLOGIE.
- MEDECINE. — *Hygiene..* — *Hygiene,* proprement dite. / *Cosmetique.* [Orthopédie. / *Athletique.* [Gymnastique. — *Pathologie.* — *Semeiotique* — *Therapeutique.* — *Diete.* / *Chirurgie.* / *Pharmacie.*
- VÉTÉRINAIRE.
- MANEGE.
- CHASSE
- PECHE.
- FAUCONNERIE.
- ASTRONOMIE PHYSIQUE. *Astrologie.* — *Astrologie Judiciaire.* / *Astrologie Physique.*
- METEOROLOGIE.
- COSMOLOGIE. — URANOLOGIE. / AEROLOGIE. / GEOLOGIE. / HYDROLOGIE.
- BOTANIQUE. — AGRICULTURE. / JARDINAGE.
- MINÉRALOGIE.
- CHYMIE.. .. ... — CHYMIE, *proprement dite.* [Pyrotechnie. Teinture, *&c.* / MÉTALLURGIE. / ALCHYMIE. / MAGIE NATURELLE.

IMAGINATION.

POESIE.

- SACREE. PROFANE.
  - NARRATIVE.
    - POËME EPIQUE.
    - MADRIGAL.
    - ÉPIGRAMME.
    - ROMAN, *&c.*
  - DRAMATIQUE.
    - TRAGEDIE.
    - COMEDIE.
    - OPERA.
    - PASTORALES, *&c.*
  - PARABOLIQUE. — ALLEGORIES.

MUSIQUE .. — Théorique. / Pratique. / Instrumentale. / Vocale.

PEINTURE.

SCULPTURE.

ARCHITECTURE CIVILE.

GRAVURE.

the *observer*, in regard to every branch of science, be it what it may,—by these different *nation*, directed in its exercise to the attainment of some particular *end*.

9. *Attention*, or the *attentive faculty*. The exercise of *this* faculty seems to be the result of an exercise of the *will*: of a special application made, of the power of *that* faculty to the purpose of attaching to their work, with different *degrees of force*, and for different *lengths of time*, any one or more of the several distinguishable faculties above-mentioned.

10. *Observation*.—In this are included, *perception*, *memory*, *judgment*, and commonly *ratiocination*, set and kept to work by *attention*, and directed commonly in their exercise to the accomplishment of some particular *end*.

11. *Comparison*. This is an application made of the faculties of attention and judgment. In this case the attention applies itself alternately to the objects which are the subjects of it—viz., for the purpose of descrying their mutual relations to each other.

12. *Generalization*. This is a mode of *imagination*. i. e. from the observation of one or more individuals, perceived or supposed to be endued with a certain property, *imagination* of an indefinite number of individuals, regarded as being possessed, each of them, of a property of that same sort. It is *combination*, performed by the *imagination*, and guided by *observation* of analogy, i. e. similitude.

13. *Induction*: i. e. *deduction*, or say *ratiocination*, applied as a result of the process of *generalization* as above, followed by a *judgment* accordingly passed, pronouncing that the sort of conformity so *imagined* has, in the instances in question, been *realized*.

14. *Analysis*—i. e. *division* (literally *resolution*) —viz. *logical*, or say *noological* analysis. This is the converse of *generalization*; and supposes that operation antecedently performed. By the combination made of the ideas of a multitude of individuals, or sorts of individuals, in virtue of some property, which is supposed to belong to them in common, and which is thus made to serve as a bond of ideal union, by which they are bound together into one *aggregate*, and that aggregate recorded and fixed by one common name,—*generalization* is performed. By the *division* and *sub-division* of an aggregate thus found, correspondent names, whether single-worded or many-worded, being either formed or made for the several parts, which are the results of the several acts of division and sub-division,—*analysis*, i. e. the *resolutive* division and decomposition of the antecedently formed artificial aggregate, is performed.

Thus, on the *Porphyrian tree*, as in the annexed Table, working in the direction of *generalization*, and setting out either from *Homo* or *Brutum*, or from a sub-species, or an individual of either species, you may arrive, immediately, or through *sensitivum*, *vivens* and *corpus*, all or any of them, at least at *substantia*. Working in the direction of *synthesis*, the course you take is exactly the reverse.

By *imagination*, the idea and practice of *logical*, *noological*, *metaphysical* analysis, was deduced from that of *physical*. Physical is either *mechanical* or *chemical*. *Physical* analysis is an instance of a *real* and *material* operation; *logical*, of an *immaterial*, and thus, in some sort, a fictitious one, of the same name.

A term, which will be apt to be considered as sets of persons, different faculties, or sets of faculties, are put into exercise.

not only the opposite, but exactly co-extensive, correlative of *analysis*, is the above-mentioned term *synthesis*:—*synthesis*, literally, *putting together; analysis*, literally, *resolution*, i. e. *putting asunder*. If the coincidence were thus complete, *synthesis* and *generalization* would be exactly synonymous, and ought to be interconvertibly employed. This, however, is not the case. Of any number of ideas, how heterogeneous soever, the putting together may be termed *synthesis*. But, in so far as the term *analysis* is applied, the ideas, comprehended in the subject in which the operation is to be performed, are by the supposition *homogeneous*. The subject analysed is an aggregate or *genus*, which is divided into *species*, those into *sub-species*, and so on. The only case in which *synthesis* is exactly opposite and correspondent to, and no more than co-extensive with analysis, is when between the ideas put together there is that sort of conformity from which the act of putting them together receives the name of *generalization*.

Analysis and *synthesis*—*analytic method* and *synthetic method*—are locutions which are but too frequently to be found employed, on occasions in which the import meant to be attached to them is far from being clear and determinate. The same operation which by one person is called by one of these names, shall by another person be called by the other. By giving to every supposed explanation the name of *an analysis*, *Condillac*, in his Logic, thinks he has explained everything: and thus it is that he explains nothing. *Analysis* (he says) *is nothing but a language well-made*. He sees not, that it is of an act of *synthesis* (the declared object of his antipathy) that every name, which is not, in the grammatical sense, a *proper* name, is the sign and the result. and that, were it not for that despised and much vituperated agent, his favourite and exclusively lauded instrument would not have a subject on which to operate.

15. *Methodization*, or say *arrangement*, or the exercise of what (if a *faculty* is to be imagined for the purpose) may be called the *tactic* faculty. It may be employed, with little or no exception, in the service of every one of the above-named faculties, in the exercise of which the *attention* is employed. By it, for giving facility to *comparison*, objects are *imagined* to lie in a certain order; for example, *above*, *below*, or *by the side of* one another.

16. *Distribution*. In effect this is, generally speaking, much the same sort of operation as *Division*: but, for presenting that effect to view, a somewhat different image is employed. In the case where the word employed is *division*, whatsoever may be the parts, or elementary articles contained in the subject, they are considered as antecedently aggregated into one *whole*: whereupon, in proportion as the operation proceeds, that whole is divided into *parts*. In the case where the word employed is *distribution*, whatsoever may be the subject on which the operation is to be performed, the parts or component articles, whatsoever they may be, which are considered as belonging to it, are considered as lying in a state of separation from each other.

When a multitude of articles being considered as co-existing, no *aggregation* of them is considered as having been made, no *division* can be considered as being capable of being made: consequently, in

What the *inventor* is in relation to *art*, the *discoverer is*, in relation to *science*. In art and science, not merely every existing branch, but every the minutest twig, must have given exercise to the *inventive* faculty, ere it could have come into existence. *Invention*, as above, is *imagination*, taken under command by *attention*, and directed to the accomplishment of some particular *object* or *end in view*. The products of the exercise of the *abstractive faculty* are the materials of which the work of the imagination is composed. Among the objects of invention or discovery, is *method*: and, when once invented or discovered, it becomes an instrument in the hands of *Invention*, of *Discovery*, and of *Observation*. It is by Natural History, in greater proportion, than by any other branch of art and science, that exercise is afforded for *observation* and for *method*: next to that by those branches which have *mind* for their subject.

Abstraction, *Imagination*, *Invention*, *Discovery*, *Methodization*, *Communication*, of none of these faculties does the *learner*, as such, find in himself any demand for the exercise: *attention* and *observation*, applied to the impressions and ideas, which are respectively the products of the exercise of the several faculties of *perception*, *judgment*, *memory*, and *ratiocination*,—for the exercise of all *these* faculties, but for that of no *others* than these, does the situation, occupied by the *learner*, as such, afford a demand.

To the faculties, for the exercise of which the situation of the *learner* affords a demand, that of *teacher* adds that of *communication*; of communication, and in so far as, in the *method* which he employs, there happens to be anything which was thought of by him, without its having, to his knowledge, been thought of by any other person, *invention*.

Without any the slightest notice taken of any of these distinctions—*Poetry*, with its nearest branches, in vast capitals, and those next to them still in great and upright ones; after Poetry, *Music*, *Painting*, *Sculpture*, *Civil Architecture*, and Engraving, these, and no others, are, by D'Alembert, huddled together in a corner, and—as if standing in awe of *Poetry*, and should they presume to place themselves on a line with her, fearing the lash of one of her daughters, viz., *Satire*—are dressed, in capitals, indeed, but those *leaning* ones, and, in comparison with those which are not refused to *Madrigal*, *Epigram*, or *Romance*, scarcely visible. These, too, are all together placed under the head of *imagination*; as if, in the first place, to the exercise of all *these* branches of art, the exercise of the imaginative faculty were necessary; and as if, in the next place, it were not so to any of the *others*.

Yet, when once pointed out, who is there that does not recognise, that neither to the *Musical* performer, nor to the *Painter* as such, nor to the *Sculptor* as such, nor to the *Architect*, or, in plain English, the *Builder*, as such, nor to the *Engraver* as such, is any exercise of the *imaginative* faculty necessary? Yes; in so far as, by any of them, anything *new* is to be hit upon; but in this there is nothing which they do not possess in common with the artist in every other line whatsoever.

Aristotle was an *observer* and *inventor*: for by him was invented, how far soever from perfected, the art and science of *Logic*, schoolmistress of all the *other* arts and sciences. *Bacon* was an *observer* and *inventor*: for by him was invented the art of *learning Natural History* and *Natural Philosophy*, more particularly the latter. *Newton* was an *observer*, a *discoverer*, and an *inventor*. *Locke* was an *observer* and a *discoverer*: his *field* of discovery the region of mind. *Linnæus* was, *Werner* is, an *observer* and *inventive*, and thereby *imaginative*, *methodizer*:—which of these men was ever a *Musician*, a *Painter*, a *Sculptor*, a *Builder*, or an *Engraver*?

Placed where it is, the word *Reason* is, of itself, sufficient to involve the whole subject in a cloud. To the production of confusion and dismay, had that been the purpose, it would have been but too effectually adapted; clear conceptions, placed where it is, it is not in the nature of it to bring to view. What is the object meant to be presented by it?—*Answer*. One of the faculties of the human mind. What,

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this case, *distribution* is the only one of the two instruments of method that the nature of the case can be considered as admitting of.

17. *Communication*, or the *communicative faculty*: a faculty which may have for its *subject*, the results or products of the exercise of any one or more of the several faculties above-mentioned — *Speaking*, *writing*,—and *pantomime*, i. e. discourse by *gestures*, or otherwise by *deportment*—are so many modes, in and by which it is exercised.

Communication, on the one part, supposes *receipt*, or say *reception*, on the other. In so far as, to the exercise of the act of *reception*, *attention*, on the part of the *receiver*, is considered as necessary —the *receiver* is styled a *learner*.

For *correctness*—viz. as a *test* of, and *security* for that quality—for correctness, as well as clearness, this test would require a correspondent list of examples. But, for any such additional quantity of matter, neither time nor place can here be afforded. In its present form it must, therefore, be left to stand: in its present form, and with all its imperfections.

An intricate subject of discussion would be—the order in which the several articles might be most advantageously disposed, and made to follow one another. What shall be the principle of arrangement? Shall it be priority? But from this source no decision can be deduced, as between a number of operations which are performed at the same time.—Shall it be *degree* of *simplicity*?—From this source some light seems to be reflected on the first steps: but, when multitudes flock together, with equal forwardness, this light is extinguished.

[The author's opinions on these subjects will be found more at length in the works on logic and its cognate branches of knowledge immediately following the Chrestomathia.—*Ed.*]

then, is this faculty?—*Answer.* The faculty called the *ratiocinative* or *inductive* faculty, including, of course, the *judgment* or *judicial faculty.* What, then, is *Reason?*—*Answer.* It is a name which, on *some* occasions, and *only* on some occasions, a man is wont to give to the ratiocinative faculty, or the exercise of it. What then are these occasions?—*Answer.* Those, and those alone, on which the exercise, which he considers as given to it, is such as he approves of. Here, then, instead of that *neutral* sort of appellation, which alone is suitable to the purpose, viz. that sort of appellation, of which the words *induction* and *inductive faculty, judgment* and *judicial* faculty, as well as the words *memory* and *imagination*, are exemplifications, the appellative, employed for the designation of the *ratiocinative*, including the *judicial* faculty, is an *eulogistic* one.

Of the act of misappellation thus committed, now then observe the consequence. Of every application made of this word, in the designation of the faculty in question, the effect being to attach to it a latent proposition, expressive of the *approbation* of the speaker, as annexed to the exercise given to the faculty, one consequence is, that, without a contradiction in terms, it cannot be employed, on any occasion, in which it is the intention to bring that exercise to view, in the character of an object of disapprobation; or even to avoid bringing it to view in the opposite character.

Thus it is, that of the *three* leading terms in question, while *two* are, as far as they go, proper and suitable to the purpose, between them is thrust in another, which mismatches them—and communicates to the whole group its own delusive colour.

Memory and *Imagination*—it is by the *Logicians*, that *these* two appellations, simple and suitable as they are, were taken in hand. *Reason*—it is of the *Rhetorician* that this appellative was the choice. In the word *Reason* may be seen one of that numerous set of names of *fictitious entities*, in the fabrication of which the labours of the *Rhetorician* and the *Poet* have been conjoined. In *Reason* they have joined in giving us a sort of *goddess:* a goddess, in whom another goddess, *Passion*, finds a constant antagonist—and a third goddess, *Religion*, *Reason's* elder sister—sometimes a troublesome rival, sometimes a useful subordinate. It is not by any such mythology, that any clear and correct instruction can be conveyed.

Under the head of *Memory*—under that one head—are arranged the contents of the whole field of *Natural History*, together with those of the field of *History*, simply and properly so called:—under the head of *Reason*, the contents of the field of *Natural Philosophy.*

In regard to the distribution thus made, thus much is indeed true, viz. that in the formation and retention, of ideas relative to the subject of *Natural Philosophy*, the quantity of exercise given to the ratiocinative faculty,—more particularly in so far as the art and *science* takes for its subject the relation between *cause* and *effect*,—is commonly greater than the quantity of exercise given to *another* faculty? But, this *other* faculty, what is it? Not the *Memory*, to which the two philosophers refer so much; but the *Perception* or *Apprehension*, to which they refer nothing.

Scarcely has even *History—History*, in its narrowed and most usual sense, viz. an account of *states* of *things* and *events*, as they are supposed to have had existence in times past—scarcely in this limited sense can *History*, with more propriety than *Natural History* or *Natural Philosophy*, be said to belong to the province of *the Memory.* To the *Memory*, it is true, almost exclusively, before the invention of the art of *writing*, must all successive generations have been indebted for whatsoever notions they could have obtained and retained, concerning the states of things and events, that had had place in the respectively preceding generations. But,—of a state of things, or an event, that had had place at an antecedent point of time, when the description had once been expressed and fixed, in and by the permanent sort of signs, which are the product of that mind-exalting art,—a man's faculty of bearing it in mind was no more dependent upon *memory*, than his faculty of bearing in mind the matter of any other branch of art and science:—the correspondency, for example, between the acquisition of mechanical *power* and the sacrifice of *despatch;* the composition of *water* and respirable *air;* or the equivalency of the sum of *all the angles* that can be constructed round any given point, to that of *four right ones.*

A circumstance which, at the times respectively in question, these philosophers seem not, either of them, to have been aware of, but which, when once brought to view, will not be found the less undeniable, is, that not only the practice and knowledge that has had place, in relation to *international intercourse* and *internal government*, but every other branch of Art and Science—every one as well as every other—has its *History. Natural History, Natural Philosophy, Poetry, Music, Logic*, everything. In relation to *War* and *Government*, has the state of this part of the universe, presented itself at different times, in different shapes? so has it in relation to *Mechanics*, to *Chemistry*, to *Poetry*, to *Music*, and so on. Not to speak of the *future*, which, to our limited view, is, all of it, in a state of *contingency*, the distinction between the *past* and the *present*, to what portion of the whole field of thought and action, to what portion of the known field of existence, does it not apply itself.

Placed under the head of *Memory*, the title *Irregularities of Nature (Ecarts de la Nature)* presents itself in the character of a blotch, to which a sponge might apply a not incongruous cure. Natural, and but too excusable, in *Bacon's* time, it was not equally so in *D'Alem-*

bert's. In the time of the English Philosopher, the mind was annoyed and oppressed by terrors, which, in the time of his French disciple, had lost, though not the whole, the greater part of their force. In *Bacon's* time—in the early part of the 17th century—everything in nature that was, or was supposed to be, *extraordinary*, was *alarming*; alarming, and in some shape or other, if not *productive*, *predictive* at least of human misery. In this place, as in other places—at this time, as at other times—*Ghosts* and *Witches* composed a constant part of the population, *Devils* an occasional one. Patronised by *Queen Elizabeth*, Dee had not long ceased to hold converse with his disembodied intimates: *Lilly* was preparing for the connexion he succeeded in forming with *his*. To burn heretics, to hang witches, and to combat devils, were operations, for all which Bacon's Royal Patron held himself in equal and constant readiness.

Celestial Prodigies, *Prodigious Meteors*, *Prodigies* on *Land* and *Sea*, *Monstrous Minerals*, *Monstrous Vegetables*, *Monstrous Animals*, *Prodigies* of *the Elements*, by D'Alembert, all these (alas!) are exhibited in the character of so many distinct classes of the subjects of human knowledge, distinct classes of things, subordinate, and standing next in subordination, to the including class denominated as above, *Irregularities of Nature*. This too under title *Memory*: for most of them at least, the *Imagination* might have been a more apposite one.

In the days of *Bacon* battles on dry ground were scarcely more common than *battles in the air*; in the thin element, peace had assuredly been already pretty well established in D'Alembert's time.

Placed under the head of *Reason*, *Divination* and *Black Magic* were perhaps two whiffs of necessary incense offered up to the *Archbishop of Paris*: subjects, if not branches, of that science which had for its already declared subjects "*spirits beneficent* and *malificent*," for the expulsion of the latter of whom the Ritual of that Most Reverend person furnished him with weapons, to which they had never been known to oppose any effectual resistance—those gems in the panoply of theological warfare could not then be spared;—but, by that oblation his appetite for the supernatural might, one should have thought, have been satisfied, without the addition of so many swarms of monsters.

At present, at any rate, much, it is believed, will hardly be found to be said, in favour of a principle of Classification, by which a *middle-sized* man is placed in one niche, a *tall* man and a *short* man *together* in another.

In the ancient order of things, commencement precedes accomplishment, trial precedes success; *experiment* upon a *small* scale precedes *establishment* upon a *large* scale. In each and every part of the field, *experimental researches* must necessarily have preceded those *established practices*, of which the products of *handicraft arts*, *manufactures*, and the arts called *fine arts*, are the results. Accordingly, in the sketch attempted in the next section, exhibited under the new name, proposed as a substitute to this its present trivial one, *Experimental Philosophy* precedes *Technology*, the branch of *science* which belongs to the necessary and more useful part of the *arts*.

Not so in D'Alembert's. In *that*, it is under the general head of *Natural History*, that we see ranked what concerns all *finished* products of the *Arts*, with their *et ceteras*, as above; while, by the still more general head *Memory*, intimation is given, if not that it is by the exertion of that single faculty that they are *produced*, at any rate, that it is by that one alone of all the human faculties, that anything *else*, in relation to them, is either *known* or *done*.

A dislocation so strange, by what train of thought can it have been produced? From the terms of the Table, a sort of conjectural answer may be collected. By every exercise given to *Art*, some production of *Nature* is put to *use*. Accordingly, *Arts*, (handicraft) *Trades* and *Manufactures*, are there exhibited, in the character of exemplifications, of the "*Uses* made of *Nature*." But, by the same title, might not *Poetry* be ranked under the head of *Natural History*? and its fruits—an *Epic* or *Dramatic* poem, for example—represented as being the work of *Memory*, or, at any rate, as belonging, in some way or other, to the *province* or *faculty* of *Memory*? For, the *brain*, by which it was dictated, as well as the *pen* by which it was written, not to speak of the *gall nuts*, the *sulphate* of *iron*, and the *water*, by which the pen was enabled to give permanence to the marks traced by it, what are they, any of them, but so many works of *Nature*?

III. *Scheme of Division, loose and irregular.*

In a former section (VI.) the *dichotomous* or *bifurcate* mode of division, performed upon the *exhaustive* principle, has been already brought to view, in the character of the only one perfectly suited to what ought to be the design of the *first lines* of an *Encyclopedical Map or Table*. Of the *considerations* or *reasons*, by which its claim to that character was suggested, a view will be given in an ensuing section.

At the same time the observation was made, that, with the regularity and comprehensiveness which characterize that mode, the mode pursued in this Map of *D'Alembert's* forms a striking contrast.

Of the existence of this character in it—of this *imperfection*, if such it should be deemed—it would be useless to present to view, in this place, and in this manner, any protracted chain of proofs. By a single glance at the Table, they will be seen all together:—for the assistance of the first steps of such a survey, a few words will be sufficient at least, if not superfluous.

Common Trunk, the *understanding*. Ramification of this trunk into *three* branches: viz. *Memory*, *Reason*, and *Imagination*:—division, trifurcate. Under *Memory* placed *History*: no division. Under History, *Sacred*, *Ecclesiastical*, *Civil*, *Ancient* and *Modern*, and *Natural History*:—division, *quadrifurcate* or *quinquefurcate*. Under Natural History, *Uniformity of Nature*, *Irregularities of Nature*, and *uses* made of Nature:—division, *trifurcate*.—Of title *Uniformity*, seven *branches*: of title *Irregularities*, seven. By the side of title *Uses made of Nature*—terms put in apposition, *Arts*, (handicraft) *Trades*, and *Manufactures*—division, *novemfurcate*—the list of *nine* branches, concluding with an *&c.*; each of them having its own branches, each concluding in like manner with an *&c.*

Thus much under *Memory*: and, without proceeding onwards either with *Reason* or with *Imagination*, this sample will assuredly be found sufficient.

IV. *Appellations inapposite.*

Of this species of imperfection no exemplifications worth noticing have been observed, other than those, with which the language he found in general use, stood chargeable,—and of which the principal samples have, in this Essay, been already brought to view. (§ 4.)—These are, 1. *Natural History*—2. *Philosophy*:—(not, as with us, *Natural Philosophy*, but simply *Philosophy*.) *under* which comes *Physics*. *Physics* is divided into *general* and *particular*: but under neither of them is *Natural History* (that being ranked under *History*) included.—3. *Mathematics*.

The promise, which it fell to his lot to give, being the promise of a body of information, relative to all the branches of *art* and *science*, which were, or were at that time considered as being, in existence,—that which it was necessary his Map should contain, was a collection of those *names* by which they were respectively in use to be designated, and by which and which alone they were generally known. Under these circumstances, whatsoever might be the imperfections which any of these denominations might be found labouring under, with none of them could this intelligent philosopher be justly chargeable: and it appears not that to this established stock of imperfections any of his own making have been added.

V. *Distinctions groundless*:—unwarranted by any determinate, and assignable, correspondent differences.

Of this species of imperfection several exemplifications may be seen under the ensuing head of *Repetitions*.

VI. *Repetitions abundant*:—under different names, the same objects presented to view a number of different times.

Four times over, in the character of subjects of *Memory*, are the several classes of known bodies, of which the earth's surface is composed, brought to view in this Table: viz. 1st, under the name of *Meteors*; 2dly, under the name of *Earth* and *Sea*; 3dly, under their own distinctive names; viz. *Minerals*, *Vegetables*, and *Animals*; 4thly, under the name of *Elements*.

Four times? Yes: and also *four* times *more*: viz. all such of them to which it should at any time happen to present to the eye of the reader, whoever he may be, anything, which, to that same eye, shall appear to have in it anything that is *extraordinary*, as if *ordinary* and *extraordinary* were anything more than *relative* terms: relative, not to the nature of the objects themselves, but to the position, occupied at the moment, by the mind, by which they are respectively viewed: as if the same object, which to a preceding generation had been *extraordinary*, had not become *ordinary* to a succeeding one. Such as they are, here they follow.—1. *Prodigious Meteors*, or Meteoric Prodigies. 2. *Prodigies* on *Earth* and *Sea*. 3. *Monstrous Minerals*. 4. *Monstrous Vegetables*. 5. *Monstrous Animals*. 6. *Prodigies of the Elements*.

Not content with thus presenting them, *eight* times over, in the character of *objects* or *subjects* of *memory*, once more are we made to see these same beings, and *now* in the character of *objects* or *subjects* of *Reason*: for, still they are the same existences, and even viewed under the same aspects, notwithstanding the termination *logy* (in the French, *logie*,) which now forms a termination to the Greek word, by which they are respectively brought to view. Meteors are now represented, in the first place by *Meteorology*, then presently once more by *Aerology*: *Minerals*, first by *Geology*, then presently once more by *Mineralogy*: *Water*, by *Hydrology* *Vegetables*, by *Botany*—divided, and not improperly, into *Agriculture* and *Gardening*.

Meteors (as already observed) *Meteors*—i. e. *meteoric* (meaning neither more nor less than *elevated*) bodies or particles, are,—what are they, what can they be but, bodies or particles, of the number of those of which the earth's surface is composed?—only mixed up with that part of it, which is mostly in a *gaseous* state, and then detached, to a distance more or less considerable, *above*, i. e. *beyond* that principal mass, which is partly in a *solid*, partly in a *liquid* state?—masses, consequently composed, in different and ever-varying proportions, of matters belonging respectively to the three great *kingdoms*, as they are called—the *mineral*, the *vegetable*, and the *animal*.

Yet, in the character of a sort of subject—and that a distinct one—of *Natural History*, *D'Alembert*, as we have seen already, places *Meteors*, and *that* in a situation anterior to the situations respectively allotted to *Minerals*, *Vegetables*, and *Animals*: and to them he *subjoins*, as if they were constitutive of a dis-

tinct class of objects, *Elements*:—a word which in trivial language is indeed employed even now: but which had had its rise, in modes of thought and action, which, even in *D'Alembert's* time, were already antiquated and exploded. *Four* in number, as every body knows, used to be these elements: viz. Earth, Water, Air, and Fire. *Earth*, a term employed to designate any mass of matter whatsoever, in so far as it is considered as being in a *solid* state: *Water*, a term employed to designate a mass of the same matter, when in the liquid state; —a mass of matter, which is itself the same, though, by its being thus designated by a different appellative, represented and spoken of as if it were different. *Air*, a term by which the self-same mass is once more designated, when considered as being in the *gaseous* state. *Fire*, a word, to which no determinate idea was ever annexed, but which is wont to be employed, whenever, in conjunction with an extraordinary mass of *light*, an extraordinary mass of *caloric*, i. e. *heat*, is perceived to issue from the same spot.

In a manner not unsuitable to our situation, and thence to our mode of contemplating objects of all sorts, the world, i. e. all that part of it, in relation to which it has been within our power to obtain any the smallest and faintest spark of knowledge, has by some been divided into *Earth* and *Heaven*: *Earth*, the globe which we inhabit: *Heaven*, comprehending all other globes, all other bodies, whatsoever. Accordingly, such is the conception, by which the Philosopher seems to have been guided, while *Memory* was the presiding deity. First comes *Celestial* History, and without any division: then comes *History by itself*, followed by its several adjuncts: viz. *Meteors*, *Earth*, and *Sea*, and so forth, as above.

In conformity to this part of the plan, when, furnished with Greek-sprung names, with the termination *logy* tacked to each name, the same objects or subjects came to be put under the presidence of *Reason*, *Science de la Nature* —(*Natural History* not having, it should seem, been recognised in the character of a *science*, but only as a sort of *knowledge*, different from, and employed to prepare the way for, *science*)—*Science de la Nature*, followed by its synonym *Physique particulière*, should have been branched out, in the first place into *Cosmologie* and *Géologie*, and after that *Géologie* into *Météorologie*, *Mineralogie*, and the other *logies*, according to the method which, as above, had already been observed. Instead of *that*, follow the particulars, in an order which, besides being, with relation to that in which the same objects had already been arranged, so completely incongruous, is, in itself, so completely perturbate, that to delineate, in the form of a continuous discourse, those intrinsic incongruities, which, after *this* intimation,—at any rate, with the help of the ensuing sketch—may be discovered by the examination of about forty words, (such being the number contained in this part of D'Alembert's sketch) might afford full work for as many pages.

Branches of the *Science of Nature*, alias *Particular Physics*, seven; viz. 1. Zoology. 2. *Physical Astronomy* (as if there were an *Astronomy* that was not *Physical*.) 3. *Meteorology*. 4. *Cosmology*. 5. *Botany*, 6. *Mineralogy*. 7. *Chemistry*. Thus, in the first place, *Animals* of all sorts, then the *Stars*, and then (whatever they are) the *Meteors*, are brought to view, and that by *Reason*, before any such receptacle as *a world* has been found for them to exist in; and, between *animals* and the *plants* on which they have to depend for their existence, this same whole *world*, as soon as it is found, is placed, besides all the *stars* and all the *meteors*.

In company with this *Figured System* (*Système Figuré*,) and antecedently to it, is presented by the Author, as above noticed, an "*Explanation*" of it. For an explanation, and therein for a justification, of the sort of order, a sample of which has just been exhibited, reference to the above *Explanation* was, of course, made. Of this reference, what was the result?—that the order pursued in the Explanation was, on this part of the ground, altogether different from the order, given to the articles which it professed to explain. This too after his having observed, in so many words, that, (p. 233,) "*Particular Physics ought to follow the* SAME *distribution as Natural History.*"*

In this same *Explanation* another strange intimation is given; and such is the store set upon it, it is repeated through the whole course of several pages. This is, that so long as under the presidence of *Memory* you are studying *Natural History*, (in which he includes the history of all the *arts* except the *fine* ones,) you are to make use of your *senses* and nothing more; on the other hand, when you come to the study of the same objects under the presidence of *Reason*, then it is, that for the first time you are to apply to them the faculty of *reflection*, and so long as *that* is at work, you have no occasion for your *senses*.† What perhaps might be found to be true is, that in the study of *Natural History*, rather more use is made of the senses than in that of *Natural Philosophy*; in the study of Natural Philosophy, rather more use made of the faculty of *reflection* than in the study of Natural History. But he who should attempt to do anything in *Natural History*, without being at any expense

* La physique particulière doit suivre la meme distribution que l'histoire naturelle, p. 233.

† De l'histoire, prise par les sens, des *Astres*, de *leurs mouvemens*, *apparences sensibles*, &c., la réflexion a passé à la recherche de leur origine, des causes de leurs phénomènes, &c., et a produit la science qu'on appelle *Astronomie physique* . . . . . De l'histoire, prise par les sens, des *vents*, des *pluies*, &c., ... la réflexion a passé à la recherche de leurs origines, ... &c.—*Ib.*

in the article of *reflection*, or in *Natural Philosophy*, without making any use of his *senses*, would assuredly find it very up-hill work.

VII. The nature of the discourse *incomplete*; no *verbs* in it; consequently no *propositions*; nothing but *substantives*, with here and there an *adjective*.

By this sort of discourse, if discourse it can be called, for want of the necessary and indispensable tie, or *copula*, as the logicians and grammarians call it, which is afforded by the part of speech called a *verb*, no complete assertion being contained in it, no determinate information is conveyed.

By nothing short of an entire proposition can any such conveyance be made. True it is, that *nouns*, and in particular noun *substantives*, are the principal materials out of which the sign of an assertion is composed; but still, without the *copula* no determinate assertion is formed. Set down any two, or any greater number of substantives, out of these same materials, one man will make one sort of proposition, another man another, and a third man will not know what to make of them. Of the readers—that is, of the persons for whose instruction the work is intended—some, it is possible there may be, whose conception of the work, when executed, may be adequate to that which the workman, the instructor, had in his mind, at the time he executed it. But that such will be the case with the generality of readers,* is surely not the sort of supposition on which a work of this sort ought to be grounded. Destitute of this principle of fixation and bond of union, objects may, in innumerable multitude, and endless succession, be presented to the mind; and, after all, leave in it an impression, not more durable than that which is left in the waters by a vessel by which they have been traversed.

To the sort of sketch, a sample of which is attempted in the ensuing section, a Tabular Sketch, jotted down in this unconnected mode, will be found to bear much the same sort of relation, as a stock of bricks, mortar, and timber, deposited by the side of each other, bears to a house. Thus, instead of a structure ready put together for use, the reader, out of the materials thus shot down before him, is left to make one for himself as well as he is able. The learner is left, and called upon, to do for himself, what the teacher, perhaps because he knew not how to do it, has left undone.

Several causes concur, in recommending to the hand of the *workman* this mode of executing the work. In comparison of the opposite mode, the value given to the work in this mode is indeed small, and the interest of the *customer*, the *learner*, proportionably ill-served. Not so the interest of the workman, the *instructor*, over all errors and all ignorances a very convenient veil is everywhere spread by it. 1. No assertion at all being contained in it, no false assertion, no erroneous judgment, can be imputed to it. Scarcely in any way can a man thoroughly commit himself, by anything which he has inserted, still less by anything which he has omitted to insert, in it. 2. Yet, by a too natural misconception, the less the instructor has in this case done for his pupil, the more he is thought to have had it in his power to do, or even to have done. By this form of discourse, if discourse it can be called, an air of mysticism and oracularity is cast over it. This was among the characteristics of the *Egyptian hieroglyphics*. Ideas, such as they are, suggested in abundance; but, among them no such thing as an *assertion* to be found. Only in proportion as it is understood, is language of any use. Whatsoever is obscure is, in proportion to the obscurity, unintelligible. Speaking thus obscurely and unintelligibly, is it that you are *unable* to speak plain, or is it that you are *unwilling*? If unwilling, what but *deception* can be your object? Such are the questions to which every discourse stands exposed, in proportion as it is obscure.

Yet to those materials for thinking—loose as they were—profound, in former ages, was the depth of wisdom that was ascribed: to those loose materials for thinking, out of which the best thoughts that could have been made would, probably, have been, most, if not all of them, foolish ones. At the same time, while the understanding of the reader is thus left in this comparatively unsupplied state, his vanity is gratified: to do what the philosophers have left undone, affords to those who have a taste for it, a pastime; a pastime, in the course of which, as many little triumphs may be reaped, as there are propositions that can be put together out of such materials as it supplies.

Sketches of this sort, on a variety of subjects, are assuredly not wanting, in which D'Alembert may have found so many precedents, and thereby so many warrants, for this unconnected, and, to the reader, so little instructive,—but, at the same time, to the author, so much the most convenient,—mode. If, unconscious of any such warrant, he had regarded it as matter of obligation, to employ that mode which was best suited to the end in view, none but the *connected* mode would have presented itself to his view: the conception he would thus have been forced to frame to himself, would have been correspondently clear, and the work would have appeared, in a form very different from that in which it meets the eye at present.

All this while, to the French philosopher,

* By the writers on Rhetoric, a certain degree of unconnectedness being, in certain cases, capable of rendering the discourse more impressive, and, in its operation upon the passions, more efficient, is, under the name of *asyndeton*, i. e. that which is without *connectives*, brought to view in the character of a *rhetorical figure*. But the connectives, which on that occasion are in view, are—not *verbs*, but conjunctions—conjunctions *copulative*.

circumstanced as he was, the choice of this inadequate form was matter, not so much of *policy* alone, as of *necessity*. But of this perhaps in another place.

Whether, *in any place*, it is in the nature of any such speculations, as the above, to be of any real use, to render to mankind any perceptible service,—whether for speculations of this sort, and to this effect, *the place* in which they are thus brought to view is a *fit* place,—these are, among the points in which, in his own way, every reader will pronounce his own judgment. By any one, whose patience may have carried him thus far, thus much at any rate will, it is believed, be admitted, viz. that if, at the time when that Table was made public, there existed, on the ground of utility, any real demand for a Table of that sort, that demand has not, by any of the information therein given, been superseded.

Section VIII.

*Specimen of a New Encyclopedical Sketch, with a correspondent Synoptic Table, or Diagram.**

Directly or indirectly, *well-being*, in some shape or other, or in several shapes, or all shapes taken together, is the subject of every thought, and object of every action, on the part of every known *Being*, who is, at the same time a sensitive and thinking Being. Constantly and unpreventably it actually is so; nor can any intelligible reason be given for desiring that it should be otherwise.

This being admitted, *Eudæmonics*, in some one or other of the divisions of which it is susceptible, or in all of them taken together, may be said to be the *object* of every branch of *art*, and the *subject* of every branch of *science*. *Eudæmonics*,† the *art*, which has for the object of its endeavours, to contribute in some way or other to the attainment of *well-being*, and the *science* in virtue of which, in so far as it is possessed by him, a man knows in what manner he is to conduct himself in order to exercise that art with effect.

Considered in the character of an *edifice* or *receptacle*, *Eudæmonics* may, therefore, be termed the *Common Hall* or *central place of meeting*, of all the *arts* and *sciences*: change the metaphor, every *art*, with its correspondent *science*, is a branch of *Eudæmonics*.

If the above observation be correct, it is only in one or other of two shapes or characters—viz. that of a *source of happiness*, or that of a security against *unhappiness* that *being* can in

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* In the original edition of the Table there is the following note:—"The completion of this Table, as it now stands, having been posterior by about a twelvemonth to the printing of the letterpress of Chrestomathia, Appendix, (No. IV.,) to which it belongs, in the interval some few changes having presented themselves in the character of amendments, they are here inserted. But, of these alterations one consequence has of course been, a correspondent diversity, between the nomenclature employed in the body of the work and the nomenclature employed in this Table." In further explanation, it is said, "a convenience had, in the interval, been found in giving to the termination *scopic (regarding)* a more extensive application than in the first instance had been given to it." To have, in this edition, substituted the nomenclature of the Table for that which it supersedes, in the body of the Essay, would have occasioned the sacrifice of much valuable matter, attached in the way of commentary and incidental remark, to the superseded words. It has, however, been thought advisable, for the purpose of facilitating reference from the Essay to the Table, to insert in brackets the word made use of in the latter, whenever it differs from that employed in the former, and to append in notes, the explanation given to each word in the note to the table here quoted.—*Ed.*

† [*Eudæmonics.*] From a Greek word, which signifies happiness, originally, *attended by a good genius*.

For reasons already given (see § 6.,) and according to the usage, which, with great advantage, has place as above-mentioned, in regard to newly devised scientific names, the following ones are mostly taken from the Greek: explanations of them, in English, are subjoined; and that for two reasons; one is, that, among the persons to whom speculations of this kind may be not unacceptable, there may be many, to whom the Greek language is not sufficiently familiar, to render the denominations in question, in every instance, readily intelligible to them, even supposing those denominations constructed with perfect propriety; the other is, that the words will, probably, not be in every instance so well adapted to the giving expression to the intended meaning, as, with the help of a less imperfect acquaintance with the language, they might have been made.

The quantity or degree of *well-being*, experienced during any given length of time, is directly as the *magnitude* (i. e. the *intensity* multiplied by the *duration*) of the sum of the pleasures, and inversely as the *magnitude* of the sum of the *pains*, experienced during that same length of time.

In so far as the sum of the *pleasures* of all kinds, experienced by the person in question, during the length of time in question, is regarded, as *considerable*,—the sum of the *pains* of all kinds, experienced by him during that same length of time, being, moreover, laid out of the account,—the state which in that respect he is regarded as being in, is termed a state of *happiness*.

In so far as the sum of the pain of all kinds experienced by the person in question, during the length of time in question, is regarded as considerable, the sum of the *pleasures* of all kinds, experienced by him during that same length of time, being, moreover, laid out of the account, the state which, in this respect, he is regarded as being in, is termed a state of *unhappiness*.[a]

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[a] Any person, to whom this account of *happiness* fails of being satisfactory, may find a very different one given by *James Harris*, in that one of his "*Three Treatises*," published together in one octavo volume, which takes *Happiness* for its subject and its title; but from no part of which would any person suppose, that any such dark spot as that of *unhappiness* is anywhere to be found.

PAUPER POPULATION TABLE.

I. Out-Door or Out-Allowance List; showing the Number of Paupers of the several Classes undermentioned, and of all Ages, not lodging *in* the Poor-House, but receiving Weekly or other *regular* Allowances.

II. In-Door or House List; showing in Red Ink (for which the same Columns may serve) the Numbers of the several Classes and Ages, lodging *in* the Poor-House, where there is one.

INSTRUCTIONS *respecting the filling up of the Blanks in this* TABLE, *in such Manner as to convey the Information desired; the Object of which is—not the scrutinizing into the Management of any particular Parish, &c.—but the forming a Sample of the State of the Pauper Population throughout* England, *collected from as many Parishes, and those as differently circumstanced, as possible.*——☞ For the Uses of such a Sample, see Vol. VIII. p. 362 *et seq.*

☞ 1. At the Top of the Table insert the Name of the Parish or Hamlet, &c. or, in the Case of an Industry-House, the District of Parishes, as the Case may be, with the Town (if any) and County; as also the Year, Month, and Day, on which the filling up of the Table happens to have been completed.

2. Give the several Ages, and the Numbers of each Age, as well in the Instance of the several particular Classes (viz. those *with the Mother,*) &c. [Columns 6, 7, 8, 9, 10, 11,] *Orphans,* &c. [Columns 12, 13, 14, 15, 16, 17,] and so on throughout—as in regard to *all Sorts put together*; meaning of the *living*; for, in regard to the *dead*, these Distinctions are not material: and accordingly no Columns are here provided for them.

3. The including of a Person in the Number contained under one of these Heads should not prevent the reckoning him under as many other Heads as his Condition in other respects requires. Thus a Child's being *with the Mother* should not hinder its being numbered also with *fatherless* Orphans, if it happens to be fatherless; nor with Children *deserted by the Father*, if deserted by the Father; nor with *Idiots*, if an Idiot; and so on.

4. Amount of the Poor Rates for the three last Years; the said Years ending respectively on the [ ] Day of the Month of [ ].

Year.	£.	s.	d.
179			
179			
179			

Please to fill up the above Blanks, if there be no Objection; taking for the Sums the *gross* Sums *imposed* within the Period, whether *collected* or not; and without deducting what Sums may have been applied to Purposes other than the Relief of the Poor. The *Day* is left in blank, under the Uncertainty with respect to the Day on which the Account of the Poor Rates happens to be usually made up in the Parish or other District in question; viz. the last Day of each Year, or any other Day, such as Easter, &c. But observe that the *Years* set down be entire Years, on what Days soever they begin and end; otherwise the Comparison between the Expense of one Year and the Expense of another will lead to wrong Conclusions.

5. For each Entry observe to take that Compartment which has for its Bounds the *perpendicular* Lines that bound the Columns expressive of the Class or Condition, (as *Orphans, Blind*, and so forth,) and the *horizontal* Lines that include the Figures expressive of the *Age*. Thus among the *female* Children that are *Bastards*, should there happen to be 3, and no more than 3, that are between the Ages of 4 and 5, to express this, insert a Figure of 3 in Column 27, between the two horizontal Lines, between which, at that End of them which runs through the Column of *Years of Age* [Col. 1] the Figures 4 *to* 5 are included.

6. *If the information hereby requested cannot, in regard to every point, be communicated; please to return the Table, the sooner the better, with such Part of the Information inserted, as can be communicated.—Direct to* Jeremy Bentham, Esq., *Queen's Square Place, Westminster.*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
YEARS OF AGE.	DIED within the Year, ending the [ ] of 179 of the several Ages underneath.		LIVING, all Sorts together, of the several Ages underneath.		And among them Children: With the Mother.		With a Wet Nurse.		With a Dry Nurse.		ORPHANS. Fatherless only.		Motherless only.		Fatherless and Motherless.		DESERTED. By the Father only.		By both Parents.		By the Mother only.		FOUNDLINGS.		BASTARDS.		INSANE. Lunatics.		Idiots.		Foolish or Weak in Mind.		DEAF AND DUMB.		BLIND.		CRIPPLED in the Hand or Hands.		CRIPPLED in the Foot or Feet.		MARRIED.		WIDOWED.		BEDRIDDEN.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
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☞ *Underneath are the Spaces referred to in Note 7, under the Name of* blank Spaces: *in these any miscellaneous remarks, that occur, may also be entered: as likewise upon the back of the Paper: reserving on the Back a Place for the Direction, in case of the Papers being returned by the Post—that the weight may not be increased, or the Postage doubled, by a Cover.*

7. [Columns 2 and 3—*Died within the Year ending the* [ ] *of* [179]. In the Blanks insert the Month and Day of the Month on which the filling up of the Table happens to be completed:—if this Part of the Account cannot conveniently be brought down to so late a Day, then take any prior Day, for example, 31 Dec. 1796; observing, however, that the *Period* taken for this Purpose be neither greater nor less than a whole Year; or if less than a Year, then mark the Length of it, by adding the first Day of the Period, with the Word [*beginning*] before it.

N. B. The Account of the Deaths is more particularly material in the instance of Persons dying at Ages short of 21.

If, in the Deaths under 1 Year old, the number of *Days* old can be given (as by giving the Birth-day) with the Initials of the Child's or the Mother's, or Mother's and Father's Names, just for the Purpose of identifying it, so much the better; but this Head of information is not so indispensable as the rest. This and any other miscellaneous Information, not reducible under the above Heads, may be entered in the blank Space.

If in any Instance the exact Year of Age cannot be given (which in this Rank of Life is not unfrequently the Case, especially among old People,) give it according to the nearest Guess.

8. [Columns 18, 19, 20, 21, 22, 23—*Deserted*]. *Foundlings*, having a distinct Pair of Columns provided for them, need not be inserted here.

9. [Columns 32, 33—*Foolish or Weak in Mind*]. Here insert any such as, though mature enough in point of Age, are, by reason of Weakness of Understanding, looked upon as not fit to be trusted with the Management of their own Affairs.

10. [Columns 38, 39, 40, 41—*Crippled.*] Here include as well those who have lost the Limb itself, as those who have lost the Use of it: mentioning, in the blank Spaces, Cases relative to two, three, or four limbs.

11. [Columns 40, 41.] Should the last happen to contain any Persons, rendered incapable of all Exertion in the Way of Industry, by any other lasting bodily Affliction, other than old Age, Mention may be made of the Number of Persons so circumstanced, specifying in each Case the Species of Infirmity, together with the Sex, and the Age. Cancerous Cases may serve as an Example. But if this Head of Information should be attended with any difficulty; no Notice need be taken of it.

12. [Columns 46, 47—*Bedridden.*] By this are meant those who are unable to stand or walk without Help, whether confined to their Beds or not.

any of its modifications, possess any claim to man's regard.*

Eudæmonics being the name for the universally practised *art*, the *pursuit of happiness*, *being* in some of its various shapes, will be allowed to be an indispensable *means*, without which the object of that art cannot in any instance be pursued and attained. *Sensitive being* is the only *seat* of happiness: *being*, in that and other shapes, is the universal *instrument* of happiness. To the attainment of happiness in any shape or degree, an acquaintance, more or less considerable, with the *seat* of happiness, and with such *beings* as, in each instance, afford a promise of serving in the character of *instruments* of happiness, is more or less conducive, or even necessary. For the designation, of whatsoever portion of science may be regarded as capable of being attained, concerning *being* taken in its utmost conceivable extent, the word *Ontology* has, for ages, been employed.

Eudæmonics is the art of *well-being*. Necessary to *well-being* is *being*. In every part, therefore, of the common field, concomitant and correspondent to *Eudæmonics* considered as an *art*, runs *Ontology*,† considered as a *science*.

For the expressly declared *subject of division*, let us take the *science*: art and science running along everywhere together, every division performed on the one, may, on any occasion, be considered as applying to the other.

By means of this joint consideration, as often as, on looking at the name of a branch of art and science as it stands in the Table, we come to consider its *nature*, our attention will be pointed to the only source and measure of its *value*.

Familiar as is the name Ontology, the idea commonly attached to that appellation has hitherto been subjected, by usage, to a restriction, which is not exactly conformable, either to the present purpose, or even to the etymology and original signification of the word, as above. The case is, that, by all those philosophers, by whom, under this name, any instruction has been undertaken to be given, those properties alone have been either considered, or professed to be considered, which have been regarded by them as incident to *all* beings without distinction: such as *actuality*, *possibility*, *necessity*, *impossibility*, *probability*, *improbability*, *certainty*, *simplicity*, *compositeness*, power of *causation*, *derivation* from a cause, and so forth.

Cœnoscopic‡ and *Idioscopic*,§ by succes-

* The *summum bonum* is a fruit of the tree of *pure good*, upon the taking of which into his mouth, a man experiences at one and the same time every pleasure of which in the nature of a sensitive being he is susceptible, each in the highest degree; pains of all sorts at the same time keeping aloof, so long as this precious fruit remains in any part of the *primæ viæ*.

It is the kernel of that fruit, of which the *philosopher's stone* is the shell. It was lately found by Baron *Munchausen*, in the Island of *Medemusia*, after a careful search made, in pursuance of the directions given by *Aristotle*, *Plato*, and *Cicero*, in whose philosophical repasts,—as in the codes of those universally admired masters of ethical science, anybody may see,—it formed a constant article.

By *Cicero*, in his Tusculan Questions, it has been made plain, to the perfect satisfaction of his *Auditor*, (a most perfectly well-bred young gentleman, whom he introduces to us by that name,) that *pain is no evil*. But the truth is, as the *philosopher* confessed to the *Baron*, that, during the whole of this dialogue, they were both of them chewing the *summum bonum nut*, to which the *areca*, even when wrapped up in the *betel* leaf, forms a very inadequate substitute. The consequence was—that, all that time, to the philosopher and his agreeable young friend, pain was no evil, whatsoever it may have been, and be about to be, to the vulgar of that and other ages.

† [*Ontology.*] From two Greek words:—one of which signifies *being* in general; the other, *an account*:—an account of *being* in general.

‡ [*Coenoscopic*] From two Greek words, one of which signifies *common*—things belonging to others in common; the other *looking* to. By *Coenoscopic ontology*, then, is designated that part of the science, which takes for its subject those properties, which are considered as possessed in common by all the individuals, belonging to the class which the name *ontology* is employed to designate: i. e. by *all beings*.

In the word *Cœnobite*—less properly spelt *Cenobite*—the first of these words has already a footing in the language. In the words *microscope*, *microscopic*,—*telescope*, *telescopic*,—and several others designative of philosophical instruments,—the termination—*scopic* is become perfectly familiar.

The termination *-scopic*, in what cases shall it be employed in the formation of the appellative? —On the one hand, in many instances it is either indispensably necessary, or at least highly conducive, to the intelligibility of the word; on the other hand, in every instance it adds to its length, and in some instances would probably be found to render it too unwieldy for use.

Cases, in which it will (it is supposed) be found indispensably necessary to complete the intended signification, are as follows, viz. 1. *Mesoscopic*, as applied to *Eudæmonics* 2 *Morphoscopic*, as applied to *Posology*: 3. *Aboscopic*, as applied to *Physiurgic Somatics* 4. *Embioscopic*, as applied to ditto. 5. *Pathematoscopic*, as applied to *Pneumatology* or *Pneumatics* 6. *Thelematoscopic*, as applied to ditto: 7. *Esoscopic*, and 8. *Exoscopic*, as applied to *Ethics* —for the etymology and explanation of all which, see the ensuing pages.

Cases, in which it may be dispensed with, whether as being altogether unnecessary, or as being less indispensably necessary, are those, in which the import, intended to be conveyed by it, may, without difficulty, or with little difficulty, be understood to be expressed by the more customary terminations—*logy* and *logical*, or the still shorter, though less expressive, termination, *ics*.

Instances of terminations already in use are 1. *Physics*, 2. *Mechanics* 3. *Pneumatics*, 4. *Mathematics*, 5. *Statistics*, 6. *Ethics* 7. *Politics*—and various others. In *Logic*, the final *s* has, for this long time, been omitted.

§ [*Idioscopic*] From two Greek words, the first

sively attaching to the subject *Ontology* these two adjuncts, the field of art and science may thus be divided, the whole of it, into two portions; in one of which, viz. the *coenoscopic*, shall be contained the appalling and repulsive branch of science, to which the no less formidable, and to many a man intensely odious, appellation of *metaphysics*, is sometimes also applied; while to the other, viz. the *idioscopic*, all the other branches of art and science, may, without distinction, be consigned.

Division the 1st. Division of Ontology into 1. *Coenoscopic*, and 2. *Idioscopic*.

Matter and *mind*—into these two portions, *being* in general, considered as an aggregate, is wont to be considered as divided. Hence arises,

2. Division the 2d. Division of Idioscopic Ontology into *Somatology*,* or *Somatics*, and *Pneumatology*,† or‡ *Pneumatics*, synonyms *Psychology* and *Psychics*.§

In the consideration bestowed upon *body*, the mind may confine itself, or not confine itself,

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of which signifies *peculiar*. In *Idioscopic Ontology*, then, we have that branch of art and science, which takes for its subject such properties, as are considered as peculiar to different classes of beings: some appertaining to one such class, others to another.

In the words *idiom*, *idiomatical*, *idiosyncrasy*, and a few others, though none of them in any very common use—this word has already a footing in the language; a footing, better known in some instances than in others.

Coenosyncratocoscopic and *idiosyncratocoscopic* might be somewhat more expressive, but would be too long-winded. *Coenosyncratic* and *idiosyncratic* would scarcely be equally expressive:—*syncratic*, from *syncrasis* i. e. *commixture*, *composition*, *constitution*.

* [*Somatology*.] From two Greek words, the first of which signifies *body*, *matter*, or *corporeal substance*.

† [*Pneumatology*.] From two Greek words: the first of which (πνευμα) signifies *spirit*, i. e. *incorporeal substance*, in the sense in which it is used as synonymous to *mind*: in their original sense, the Latin as well as the Greek word corresponding to the English word *breath*. In the New Testament, αγιον πνευμα is the name, employed in the original, in designating the object, for the designation of which, in the English version, the compound appellative *Holy Spirit* is employed: more frequently (according to a phrase, which, when, on other occasions, applied to other objects, is either obsolete, or expressive of a different class of beings or supposed beings) *Holy Ghost*. In this sense, *pneumatology* and *pneumatics*, as well as *psychology*, are already in use: though more upon the continent than in Britain.

If, on this occasion, and in this sense, the word *pneumatics* were employed, it would need to cease being employed in the sense in which it is at present wont to be employed: viz. that in which it designates the branch of art and science, which has for its subject *bodies in general*, considered as being in the state, which, since *Chemistry* has become a science, has been termed the *gaseous* state. [In the Table the alternative word Pneumatics is not employed. In the original edition the following explanation of the omission is given, accompanied by a statement that the Table was completed subsequently to these notes. "To *Pneumatology*, *Pneumatics* could not here be added, as *Somatics* is to *Somatology*—Why?—Because *Pneumatics* is at present much more commonly used in an acceptation comparatively limited: an acceptation, appertaining partly to *Mechanics*, partly to *Chemistry*, both of them branches appertaining to *Somatology*, or say *Somatics*—the condividend branch correspondent and opposite to that, for the designation of which the word *Pneumatology* is here employed." —See p. 82. Note *.]

By the name of *materialists*, stand distinguished a set of philosophers, of whom *Priestley* was one, according to whom there exists not any such created being as a *mind* distinct from matter: for that *that* which is called *mind* is but an assemblage or collection, of the sort of fictitious entities called *properties*, with which certain species of *matter* are endowed. One of the grossest imperfections, that could be chargeable upon any Encyclopedical system, would be found to attach upon it, if, by the unnecessary assumption of any proposition, which by any class of men were regarded as false, the effect of it were to render itself so far: *i. e.* with reference to that class of men, unfit for use.

To the use of this class of philosophers, this division may be sufficiently accommodated by a very slight change of phrase, as thus:—To *pneumatology* belongs the consideration of such bodies or portions of matter, as are endowed with the aggregate mass of properties collectively styled *mind*, considered in relation to those same peculiar properties.

‡ [*or*] On this occasion,—as on every other on which *certainty* is an object,—an imperfection, attached to the English language, presents a very distressing impediment. It consists in the ambiguity inherent in the import of the conjunction *or*. Inserted between two words,—noun-substantives suppose,—it is employed with equal frequency, and without any the least discrimination, for two purposes altogether different: and is thus continually liable to give rise, either to interminable uncertainty, or to any the most delusive and most mischievous misconceptions. The one is—that of giving to understand that what is meant to be said of the thing signified by the one, is not meant to be said of the thing signified by the other: the other, that they are but two words for one and the same thing: not to speak of a third case, in which the option is meant to be given between two things, for the designation of which the two words are employed. In other words, it is employed in either of the two so widely different senses, distinguished by the grammarians of classical antiquity, and, after them, by *Harris*, in his *Hermes*, by the two *adjuncts*, *disjunctive* and *sub-disjunctive*: *disjunctive*, when the two words are meant to be exhibited in the character of names of two different things; *sub-disjunctive*, when they are meant to be represented as different names of one and the same thing.

A more frequently occurring, or a more frequently pernicious, imperfection will not easily be found in any language.

From this great blemish, the Greek language, as

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§ From a Greek word which signifies a butterfly, and (probably from thence) the soul of man.

to that property which belongs alike to all *body*, and even to every determinate portion of *space* unoccupied by body, viz. *quantity*. Hence arises

Division 3d. Division of *Somatics* into *Posological** [Pososcopic] Somatics, and *Poiological*† [Poioscopic] Somatics. To avoid an inconvenience above brought to view, for an equivalent to *Posological Somatics*, may be employed the single-worded appellative *Posology*.

In the consideration of *quantity*, that of *figure* may be either taken into account or neglected. Hence arises

Division 4th. Division of Posology into *Morphoscopic* ‡ Posology, and *Alegomorphic* or Alegomorphous § Posology. By *Morphoscopic* Posology is denoted the same branch of art and science, for the designation of which the not altogether *unexpressive*, yet but *inadequately expressive*, term *Geometry* is the word in use.

In so far as it is without relation to *figure* that quantity is considered, the only diversification of which it is susceptible, is of that sort, for the expression of which the several modifications of which *number* is susceptible are employed. By *Alegomorphic* or *Alegomorphous Posology*, is here designated the same branch of art and science, for the designation of which the single-worded and adequately expressive appellation *Arithmetic* is the word in universal use.

Of a quantity, for the designation of which no more than one numerical figure,—or one line of such figures, no matter how long, so it be an uninterrupted one,—is employed, the amount is considered *as known*: i. e. by itself; the conception of it being, in so far as it is capable of being conveyed, conveyed in a *direct* way, and without need of the intervention of any other set of signs, to the mind of every person, by whom the import of those same figures, placed in that position with relation to one another, is understood.

Of a quantity, for the designation of which any two or more such lines of *numerical* figures, or one or more single figures, together with one or more such lines of figures, are employed, the amount is not, in a *direct* way, as yet known: for practical purposes it is not sufficiently known, until the *composite* expression, composed as above, has been transformed, or *translated* as it were, into a *simple* expression, consisting, as above, of some one single numerical figure, or some one single line of numerical figures, the elements of which are free from all such interruption as is produced by the interposition of any other sort of sign. To substitute to any other more complicated mode the simple mode of notation thus described, is what every operation of simple arithmetic has for its object.

In and for the designation of *numbers*, a convenience has, comparatively speaking, of late years, been found in the employing, in addition to numerical figures, and even on some occasions, or during some part of the operation, in lieu of numerical figures, signs of another kind, not varying in their signification, according to the order in which they succeed one another, in the same way as do the component elements of a line of numerical figures: of these newly devised signs, such as are capable of being ultimately translated into those which are composed of numerical figures, have, for a

observed by *Harris*, is altogether free: it has one word for the *disjunctive* sense, and another for the *sub-disjunctive*.

Even the French language either is already exempt from this imperfection, or at any rate, with comparatively little difficulty, might be rendered free from it. *Ou*, or *ou bien*, it is believed, is *the* diction, or at any rate *a* diction employed, where the purpose is to present to view the *disjunctive* sense: employed it assuredly is in this sense, and, it is believed, seldom if ever employed in the other: while, when put between two substantives, *soit* is indubitably employed in the sub-disjunctive sense, and seldom if ever, it is believed, in the disjunctive.

In English, if *or*, being confined to the disjunctive, *or say* were the diction employed, and that exclusively, where the sense meant to be presented is the *sub-disjunctive*,—a blemish, so incompatible with certainty and clearness of conception, might thus be removed. But supposing the improvement were ever so desirable, how the introduction of it could be effected seems not very easy to conceive. The inconvenience of departure from habit is an inconvenience, which, in such a case, would be felt by every body: by every body, as well in the capacity of *speaker* or *writer*, as in that of *hearer* or *reader*.

The uneasiness produced by a violation of the law of custom, in matters of discourse, is an inconvenience to which everybody, without exception, is more or less sensible. want of precision—want of certainty—is an inconvenience to which, though in many cases so much more serious than the other is in any case, few indeed are sensible.

For this same purpose—viz. designation of the sub-disjunctive sense, the Latin word *alias*—a word already applied to this same purpose—would serve full as well, were it not for the displeasing idea attached to it by the use made of it on the occasions on which it is employed, in speaking of this or that man of bad character, who, to elude justice, has, at different times, assumed different names. For conveying to the eye the import in question, the well-known letters, *i. e.* might in some measure be made to serve: but *id est*, of which they exhibit the abbreviation, is crude Latin: and the correspondent English phrase would be felt to be insufferably long.

* [*Posology.*] From two Greek words, the first of which signifies *quantity*.

† [*Poiology.*] From two Greek words, the first of which signifies *quality*.

‡ [*Morphoscopic.*] From two Greek words: the first of which signifies *shape*, *form*, or *figure*; the other *regarding*: from the first comes the English word *metamorphosed—changed* in respect of *figure*.

§ [*Alegomorphic.*] From two Greek words: the first of which signifies *disregarding* or *not regarding*, from the other comes the English verb *to metamorphose*.

long time past, universally and exclusively been composed of the letters of the alphabet. But by none of these recently employed signs can any quantity ever be expressed in a *direct* manner: in any other manner than by reference to some single numerical figure, or line of numerical figures, ranged in arithmetical order, as above. Hence arises

Division 5th. Division of *Alegomorphous* posology, into *Gnosto-symbolic*,* or say *Delo-symbolic*,† and *Agnosto-symbolic*, or say *Adelo-symbolic*:‡ *Gnosto-symbolic* or *Delo-symbolic* being the term employed for the designation of the branch, for the designation of which the term *common Arithmetic* is in use to be employed, *Agnosto-symbolic*, or *Adelo-symbolic*, is the term, employed for the designation of that, for the designation of which the inadequately expressive composite appellation *Algebraical Arithmetic*,—or, much more frequently, the single-worded and completely unexpressive appellative *Algebra*,—is employed.

II. To return to *Poiological Somatology* [Poioscopic Somatics,] or *Somatology* at large. —Where bodies are considered, it may be either *with*, or *without*, reference to any operation, performed upon or in relation to them, by human *art*, by the help of human *science*. Hence arises

Division 6th. Division of *Somatology*, or *Somatics* at large, into *Physiurgic*§ [Physiurgoscopic] and *Anthropurgic*‖ [Anthropurgoscopic.] This division has for its source the consideration of the absence or presence of human art and science, applied to the purpose either of discovering *latent* properties already belonging to the subject, or of investing it with new ones. *Physiurgic Somatology* has for its synonym the above-mentioned *misexpressive* appellation—*Natural History*.

Anthropurgic Somatology has for its synonym the still more flagrantly and perplexingly *misexpressive* appellation *Natural Philosophy*, taken in one of the two or more different degrees of extension, which, as above, have been given to it.

Applied to *bodies*, alias *portions of matter*, in their *natural*, or say *physiurgic*, state, *human art*—or say *elaboration by human art*—has two distinguishable objects: sometimes it is to the one, sometimes to the other, sometimes to both, that it is directed. These are, 1. The discovery of such properties, as—already, and before it has, by the application of human genius and industry, been endued with any new properties—it is in possession of, having been put in possession of them, as it were, by the hand of *Nature*. 2. The giving to it, in addition to, or instead of, any such properties as it is found endued with by the hands of Nature, some *new* property or set of properties.

Intimately connected, and, in many instances, inextricably blended and intermingled, are, it is evident, these two functions: the detection of an *already existing* property or set of properties, being very often a *condition precedent*,—and always, in so far as it affords suitable indications, an encouragement,—to the engaging in any such operations as are found conducive to the faculty of investing the subject with *new* ones.

Of *Physiurgy*, alias *Natural History*, the object and business is—to discover and observe the properties possessed by objects, in the state into which they have been brought by the powers of unassisted *Nature*. But, to the bringing them for that purpose to view, and presenting them in a state as little changed as may be, *new* properties are, in many instances, requisite to be given to them: nor, in general, would the labour necessary to the accomplishment of this purpose be bestowed upon them, but in the view of investing them with *new* properties:—properties, by which they will be brought into some state or other, better adapted to human use, than any, into which they had been brought by the hand of *Nature*.

Division 7. Division of *Physiurgic Somatology*, or say *Physiurgics* into *Uranoscopic*¶ and *Epigeoscopic*** *Physiurgics*.

Uranoscopic Physiurgics has for its single-worded synonym the adequately expressive appellative *Astronomy*.

Division 8. Division of *Epigeoscopic Physiurgics* into *Abioscopic*†† and *Embioscopic*‡‡

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* [*Gnosto-symbolic.*] From two Greek words: the first of which signifies *known*; the other, *a sign*, or *belonging to a sign*.

† [*Delo-symbolic.*] From two Greek words, the first of which signifies *manifest*, or manifestly known.

‡ [*Agnosto-symbolic.*] [*Adelo-symbolic.*] Prefixed to a word, the Greek particle *a* frequently, as in these cases, is significative of *negation*:—of the *negation*, for example, or *absence* of any quality, to the denomination of which it is prefixed.

§ [*Physiurgic.*] From two Greek words; the first of which signifies *nature*; the other, *work*, or *belonging to work*: the art and science which has for its subject those properties, the *production* and *display* of which are the work of nature alone, unmodified by the intervention of human genius and industry. In several instances, the termination formed by the latter word is, in this same sense, already in the language: viz. in *chirurgy* (from whence *surgery*,) *energy*, *liturgy*, *metallurgy*, *theurgy*.

‖ [*Anthropurgic.*] From two Greek words; the first of which signifies *Man*.—the art and science, which has for its subject those properties, either the *production* or the *discovery* and *display* of which, are the work of human genius and industry.

¶ [*Uranoscopic.*] From two Greek words, the first of which signifies *heaven*, or say *the heavens*.

** [*Epigeoscopic.*] From three Greek words: the first of which signifies *upon*; the second, *the earth*.

†† [*Abioscopic.*] From two Greek words: the first of which signifies *that which has not life*.

‡‡ [*Embioscopic.*] From two Greek words: the first of which signifies *that which has life*.

Physiurgics: say *Abioscopic* and *Embioscopic Epigeoscopics.*

Abioscopic Physiurgics has for its synonym the adequately expressive and single-worded appellative *Mineralogy.*

Division 9. Division of *Embioscopic Physiurgics* into *Azooscopic*,* *Azoologic*, or *Azoic*, and *Zooscopic* or *Zoologic* Physiurgics.

Azooscopic Embioscopics has for its synonyms the adequately expressive and single-worded appellations already in use—*Botany* and *Phytology.*

Zooscopic Embioscopics has for its synonym the adequately expressive and single-worded appellative already in use—*Zoology.*

Beyond this point, no adequate advantage seems to be promised, at least on the present occasion, by the task of carrying on, in this direction, that track of *dichotomous* or *bifurcate* division, which, at the expense of much labour to the workman,—and not less perhaps to the small number of *amateurs* that can reasonably be looked for,—has thus far been persevered in. By the words *Zoophytology*, *Entomology*, *Erpetology*, *Ichthyology*, *Ornithology*, *Tetrapodology*, and *Amphibiology*, having for their respective subjects, *Plant-Animals*, *Insects*, *Reptiles*, *Fishes*, *Birds*, *Beasts*, alias *Quadrupeds*, and *Amphibious*, alias *Land-and-Water Animals*,—so many divisions of *Zoology* have for this long time actually been, or, in virtue of powers granted by *Analogy*, may, at any time, be in use to be designated.

Division 10. (1.) Division of *Anthropurgics*, or say *Anthropurgoscopic Somatology* or *Somatics*, into *Coenoscopic*† or *Phanerodynamic*‡ *Anthropurgics*, and *Idioscopic* § or *Cryptodynamic* ‖ *Anthropurgics.*

Coenoscopic or *Phanerodynamic Anthropurgics* has for its single-worded synonym the inadequately expressive appellative *Mechanics:* viz. when taken in the most extensive sense of the word, i. e. that in which it is employed to include whatsoever portions of *Anthropurgic Somatics* are not comprehended within the domain of *Chemistry.*

Idioscopic, or *Cryptodynamic Anthropurgics.* has for its single-worded synonym the unexpressive appellation *Chemistry.*

The properties, of which *Mechanics*—or, as the phrase is, *Mechanical Philosophy*—takes cognizance, are for the most part such as belong to *all* matter, taken in all its *forms* and *species;* by this circumstance it is that this branch of Art and Science is entitled to the appellation of *Coenoscopic Anthropurgics*, or *Somatics.*

These properties are, moreover, in comparison with those which belong to the subjects of the other just-mentioned branch, *manifest*, or say *conspicuous*, of themselves; not requiring the aid of human art to bring them out to view: in this circumstance it is that this same branch founds its title to the appellation of *Phanerodynamic.*

These properties being mostly, if not altogether, such as, in the common course of scientific language, come under the denomination of *powers;* hence, in speaking of this division of art and science, it has been thought that, on this occasion, a word corresponding to *powers* might, by contributing to clearness of apprehension, be not altogether without its use.

The properties, of which *Chemistry* takes cognizance, are for the most part, such as belong, not to all matter, nor to matter in *general*, but to this or that *particular* species of matter, as distinguished, each of them from the rest, by such a collection of these properties as, taken in the aggregate, belongs peculiarly to itself. By this circumstance it is that this branch of art and science entitles itself to the appellation of *Idioscopic Anthropurgics.*

These properties are, moreover, in comparison with those which belong to the branch just mentioned, recondite and unconspicuous; requiring—to the *production*, and, in some instances, as it were, to the *creation* of them—more or less of human art and elaboration, consisting chiefly in *mixture*, and in the application of different degrees of *temperature:* changes, which, in so far as the phenomena of *heat* and *cold* are considered as being the result of the absence or presence, the influx or efflux, of a particular species of matter, termed *caloric*, or the matter of *heat*, may also be considered as referable to the head of *mixture.*

Accordingly, in the adequately expressive appellative, *Mixiology*, or *Symmictology*, should any clear advantage be ever found derivable from the use of it, the originally unexpressive term *Chemistry* might at any time find an equally single-worded, and by no means unexpressive synonym. ¶

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* [*Azooscopic.*] From two Greek words: the first of which signifies that which has not *animal*, i. e. *sensitive* life.

To *azooscopic* might be added, for a synonym, *anæsthesioscopic;* and to *zooscopic*, the correspondent synonym, *æsthesioscopic. Anæsthesioscopic*, from two Greek words: the first of which signifies that which is not endowed with *sensation*, i. e. *feeling.* The word *æsthetics* has already a footing in modern language, and even in the English: though as yet not so much employed in the English as in some of the *continental* languages, particularly the *German.* It is used to signify the doctrine concerning what belongs to *taste:* viz. as applied to literary composition, and the arts called *Fine Arts:—feeling*, principally of the *mind*, considered as applied to the productions of those arts.

† [*Coenoscopic.*] See above, note †, p. 83.

‡ [*Phanerodynamic.*] From two Greek words: one of which signifies *conspicuous*, the other, *power.* The word *Dynamics*, as applied to designate a branch of Mechanics, is already in use in modern languages; ex. gr. in the *English*, but not so much so as in the *French.*

§ [*Idioscopic.*] See above, note §, p. 83.

‖ [*Cryptodynamic.*] From two Greek words: the first of which signifies *latent* or *unconspicuous.*

¶ By the word *Crasiodæresics*, a more ade-

Division 10 (2.) Division of *Anthropurgics* into *Anapirical*, or *Anapiric*,* and *Catastatical*, or *Catastatic*,† [Catastatico-chrestic.‡]

This division has for its source the application or non-application of those newly discovered or created properties, which *Art*, in conjunction with *Science*, has had for its fruits, to the purposes of *common life*, through the medium of *commercially established Art* and *Manufacture*: *Art* and *Manufacture*, established upon such a footing that their produce is become an object of commerce.

Anapirical Anthropurgics has for its synonym the familiar compound appellative *Experimental Philosophy*.

Catastatical, or *Catastatic* Anthropurgics, has for its synonym the expressive, already established, and not altogether unfamiliar, appellative *Technology*.§

This tenth division, it is manifest, is not with reference to the last preceding one, *subordinate*, but *co-ordinate*: the aggregate being in both cases the same; only the *source*, from which the principle of division is derived, different.

It comprehends accordingly, and with equal propriety applies itself to, the *mechanical* branch and the *chemical*.

The demand, which in practice, there seemed to be for this division, viz. Experimental Philosophy and Technology being considered, the appellatives, which constitute the two branches of it being already in use, a place in this sketch could not be refused to it. True it is that, from the first of these ideal receptacles, as the newly produced fruits of art and science are converted into articles of commerce, individual objects are continually passing into the second; but of the appellations respectively given to the receptacles themselves, the propriety remains unchanged.

Beyond this point in the line of *bifurcate* division, there seems not, at present at least, any adequate use, in carrying on the investigation in this direction. Of the genus *Mechanics*, the species, according to a list more or less approaching to completeness, will be found ranged in a vertical line in a column of Table I., and so of the genus *Chemistry*.

III. To return to *Pneumatology* or *Pneumatics*.

Division 11. Division of *Pneumatology* into *Alegopathematic*‖ [Nooscopic¶] and *Pathematoscopic*** [Pathoscopic.††]

Alegopathematic, or say *Alego-œsthetic* Pneumatology has, for its single-worded synonym, the not unexpressive appellation *Noology*.‡‡

It has for its subject *spirit* or *mind*, considered apart from all *feeling*, whether of the pleasurable or painful kind: considered that is to say with reference to the purely intellectual part of the animal frame; including *simple perception*, *memory*, *judgment*, *reasoning*, *abstraction*, *imagination*, &c.

Pathematoscopic Pneumatology may have for its synonym *Pneumatic*, or *Psychological*‖‖ *Pathology*.

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quately expressive—and, though a compound, yet still a single-worded appellative—might be afforded. By it, in addition to *mixture*, *decomposition* would be designated: and, of a chemical operation, even without mixture, decomposition is sometimes the result.

* [*Anapiric.*] From a Greek word, which signifies *experimental*. *Empiric*,—a word, the signification of which was originally the same,—has, in modern languages, and in particular in the English, been long in use. By having been confined in its application to the designation of medical practitioners,—and, among medical practitioners, to those who are considered as making experiments on the bodies of patients, without taking for the ground of such their practice, any sufficient stock of scientific information,—thus it has happened, that the word *Empiric*, how proper soever in its original acceptation, is in any other than that dyslogistic, i. e. condemnatory one,—and in particular in the one here in question,—become unfit for use. Hence came the necessity of having recourse, as here, to the word *anapiric*:—a word which, no less than *empiric* has place already in the Greek language.

† [Catastatical or *Catastatic.*] From a Greek word, which signifies *established*.

[‡ Viz.—Established use affording.]

§ [*Technology.*] From two Greek words, the first of which signifies *art*. The word *technical*—*belonging to art*—has long been in the language. The word *Technology* has for many years had place in modern languages, and is come into use even in the *English*, though not so much so as in some of the *continental* languages.

‖ [*Alegopathematic.*] Sensitive-faculty—not-regarding; from two Greek words: the first of which, as above, signifies *to pass by unnoticed*; the other, *sensation*, *feeling*, or *affection*.

[¶ Synonyms, *Alegopathematic*, as above; and *Alego-œsthetic*, taste or feeling not regarding.]

** [*Pathematoscopic.*] From two Greek words: the first of which signifies *sensation* or *feeling*, as above.

[†† Synonyms, *Pneumatic Pathology*, *Psychological Pathology*.]

‡‡ [*Noology.*] From two Greek words: the first of which signifies *mind*, and in particular the *intellectual* part. Though the word thus compounded has not yet found its way into the body of the language, yet among literary men, and in particular in the universities, the first of its elements *nous* has for many years been in use, though rather in a jocular and purely colloquial, than a serious and regularly established sense. A man is said to have some *nous*—or to be not altogether devoid of *nous*—i. e. *understanding*—*intelligence*.

‖‖ [*Psychological.*] From two Greek words: the first of which signifies *the soul of man*; though, probably enough, it began to do so, not till after it had for some time signified a *butterfly*. The word *psychology*, though more in use on the continent than in England, is already in the English dictionaries. *Animula*, *vagula*, *blandula*, &c.—"Little foolish, fluttering thing"—was the celebrated address, made, on his death-bed, to his own soul, by the Emperor Adrian, to whose mind the original signification of the word *psyche* seems, on that occasion, to have presented itself.

Division 12. Division of *Pathematoscopic*, [Pathoscopic] *Pneumatology*, or say *Pneumatic* or *Psychological Pathology*,* into *Aplopathematic*,† [Aplopathoscopic,‡] and *Thelematoscopic*.§

Aplopathematic Pneumatology or *Pathology* has for its subject the aggregate of *Pleasures* and *Pains* of all kinds, considered apart from whatsoever influence, in the character of motives, the prospects of them may have upon the *will* or *volitional* faculty, and the *acts*, as well purely *mental* and *internal*, as *corporeal* and *external*, of which those prospects may become the *causes*.‖

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* [*Pathology.*] From two Greek words: the first of which signifies *feeling* or *sensation*. It has long been in the English language, though not often employed in any other than a *medical* sense: in which case the import of it is seldom extended beyond that of *bodily sensation* or *feeling*, considered with a view to some *disorder* with which it may be supposed to be connected.

† [*Aplo-pathematic.*] From two Greek words: the first of which means *simple*,—relating to the thing in question and nothing else;—the other, *sensation* or *feeling*, as above.

[‡ Mere-sensation-regarding, in which is included *Æsthetics*, the science of what regards taste. *Vide supra*, note *, p. 87.]

§ [*Thelematoscopic.*] From two Greek words, the first of which denotes the faculty of the *will*—the *volitional* faculty—as contradistinguished from the *intellectual*. It seems wonderful, that, neither from the Greek, nor from the Latin, a word so continually in demand as the substantive *will* should have any *conjugate* in the shape of an *adjective* belonging to it. The adjective *volitional*, derived by analogy from the substantive *volition*, is not in *Sheridan's* English Dictionary, nor, probably, in any other; instead of it may be found the word *volitive*, a word which is not at all in use, nor is, by a good deal, so nearly allied in sound.

‖ [*Aplopathematic Pathology.*] Either from the genus *Technology*, or from the genus *Aplopathematic Pathology*, the process of ramification might have been carried on further to an indefinite length. But, on the present occasion, in consideration partly of the quantity of labour, which, in case of any such formal continuation, would, on the part of the author, have been necessary, partly of the largeness of the draughts which it would have been necessary to make on the patience of the reader—at this point it has been deemed most advisable to stop.

Beyond this point it seems as yet matter of uncertainty, whether it would be worth while to persevere in proceeding on the *exhaustive* principle.

Of these two branches, *Aplopathematic Pathology*, as being in the Systematic Sketch, with its accompanying Table, *that* to which the precedence was found necessary to be allotted, is that which, in respect of its nearer vicinity, and more obvious relation to the common end, a convenience may be seen in bringing to view, on the present occasion, in the first instance.

Under *Aplopathematic Pathology*, the *source* of ramification will be the nature of the *end*, to which the several branches of art and science issuing from it, will respectively and successively be directed: under *Technology*, it will be the nature of the *means* employed for the attainment of that end.

Thelematoscopic Pneumatology or *Pathology*,

Proceeding from the consideration of the nature of the *end*, the first division might be into *Odynothetic* and *Hedonosceuastic*, or say *Hedonistic—pain-repelling* and *pleasure-producing*.

Widely distant as pain and pleasure are from one another in their extreme degrees, not only in their nearest degrees do they run one into another undistinguishably, but, in some instances, to an indefinite extent, by one and the same individual operation, by which the one is excluded, the other is produced. But this is a difficulty which, throughout the whole field, the labours of the logical tactician have to encounter at every step; nor does the nature of things admit of its being either avoided or removed.

Under *Odynothetics*, one obvious source of division is the nature of the *source*, from which, immediately or more or less remote the pain may be found to flow; and here the distinction between the work of unassisted *Nature* and the work of *Man* would again find place.

Considered as being purely the work of *Nature*, Pain will have its immediate source, either *within* the precincts of the body afflicted with it, or *without* those precincts. Considered as having its source *within* the body, it may be referred to *disease*; and under the name of *Hygiantics*, the branch of art and science, which employs itself in combating that affliction, may, together with those branches which presented themselves as subservient to this principal one, be seen already held up to view, though without any attempt at systematic order, in Table I.

Considered as having its source *without* the body, pain will be found referable either to the head of *calamity*, purely *physical calamity*, or to that of *delinquency*.

As to the *means immediately* employable for combating pain, considered as having calamity for its source, these will, of course, be different, according to the nature of the particular calamity, and will accordingly be referable to different branches of art and science. But, in so far as *power—political power*—is, in a less immediate way, employed in causing application to be made of those means, the subject belongs to the ensuing head of *Politics* or *Government*, and there-under to one of the sub-branches of the branch termed *Police*.

In so far as the affliction is considered as having its source in *delinquency*, the art and science to which it belongs is also *Government*, of which in the text.

For the subject of *Hedonistics*, two obvious sources of division present themselves: one is the *seat* of the pleasure in question; the other, the *channel* or *inlet*, through which it is *let in* to the mind.

The *seat* will either be, in virtue of the whole of the nervous system taken together, the whole of the bodily frame, or, in a more particular manner, this or that particular organ, or other part. To the first of these heads belong the means employed to the opposite purposes of *calefaction* and *refrigeration*: both concurring in confining the quantity of *caloric* diffused through the body within those bounds, within which bodily comfort is among the fruits of it.

To this same head belongs, in the next place, the consideration of the various *instruments*, by the application of which that state of the nervous system which, in its several modifications may be com-

has for a syonym the single-worded appellative *Ethics*,* taken in its largest sense.

In the character of synonyms to Ethics are also used, in some circumstances, the words *Morals* and *Morality*.

Division 13. Division of *Nooscopics* or *Noology*

prised under the generic term of *intoxication*, is capable of being produced.

To the other of the above two heads may be seen to belong the subjects of *Cookery* and *Confectionary*, *Liquor-making* and *Perfumery*: the term *Liquor-making* being here considered as confined to the designation of potable liquors, other than those applied to the just-mentioned purpose of intoxication.

From the nature of the *inlet*, considered as distinct from the *seat*, may be deduced any such ramifications as may be employed in presenting to view, in the first place, *gymnastic exercises* in general, exercises productive of a pleasure of which *the whole body* is the *inlet*, as well as the *instrument*: in the next place, such *games of skill*, and even of *chance*, which, no part of the pleasure afforded by them being considered as having its seat in the body, may be considered as exercises productive of a pleasure administered by, and let in through the body, to the mind.

To the branches of Art and Science, which have for their subject the above exercises, *none* of which have any special inlet, may here be added,—under the description of branches, having, for their subject, pleasures admitted respectively through their several *special inlets*,—those which are commonly designated by the collective name of the *Fine Arts*: —viz. *Music*, having for its sole inlet the *ear*; *Painting* and *Sculpture*, the *eye*; *Poetry*, affording a pleasure which finds its entrance at both those inlets.

In the case of the *Fine Arts*, two perfectly different *species*, affording commonly as decidedly distinct *degrees* of pleasure, may be distinguished: viz. that which is experienced by those, by whom nothing but the product of the operation is enjoyed, and that which is experienced by him, by whom—singly, or in conjunction with others,—the operation is performed: the first-mentioned set unlimited in multitude; the other, limited to the fortunately endowed few: the former, mere passive recipients; the other, adding in their persons to the character of passive recipients, that of active and productive instruments.

Under the name of *Somatico-Hedonistics* might be collected and comprehended, those branches of art and science which, as above, have for their objects those modifications of pleasure, which have the *body* for their seat; under the name of *Pneumatico-Hedonistics*, such as have for their objects those more refined classes of pleasures which, passing through one or more of the inlets afforded by the body, find their ultimate seat in the mind.

For *Technology*, the first division might be that which has for its source, the distinction between such instruments as are applied *immediately* to one or other, or both together, of the two all-comprehensive objects above-mentioned,—viz. exemption from pain, and perception of pleasure,—and such as are conducive to the production of those same desirable effects, no otherwise than in a manner more or less *remote*, viz. by being, in some way or other, conducive to the production of the just-mentioned immediate instruments. Of the branches thus elicited, the field upon the face of this account of it, appears to be nearly, if not altogether co-extensive and coincident, with that of *Aplopathematic Pathology*,—considered in its two branches, viz. the *Odynothetic* and the *Hedonistic*, as above-mentioned.

Materials and *instruments*—materials on which the art is exercised, and instruments with the help of which it is exercised—in the distinction between the extensive and multifarious classes of objects, thus respectively denominated, another source of division may be observed.

In respect of *vicinity to use*, the station of the *materials*, serving as subjects to the art, is susceptible of indefinitely numerous degrees. The *extreme* stations are those respectively expressed by the appellatives *raw materials* and *finished work*. Between these two extremes may be seen interposed, according to the nature of the finished work, different numbers of distinguishable *intermediate* states. As the number of these intermediate states *increases*, the *finished work* being the same, the total mass of labour, employed in the production of the finished work, has been observed to be *diminished*: diminished by the influence of causes, which, under the head of *division of labour*, have been so clearly held up to view by *Adam Smith*.

When, considered under all the modifications of which it is susceptible, the *work* has been brought into that state in which the appellation of *finished work* may with propriety be applied to it,—on taking any article of it for an example, it will be found to be either of such nature as enables it, without the intervention of any other object, to be applied in an immediate way to *immediate use*,—viz. in the way either of excluding pain or of administering pleasure, as above,—or else not to be susceptible of being applied to use in any other shape than that of *preparatory*, *subservient*, or say *instrumental* use,—viz. by being subservient to the production, or right and effective application, of some subject or subjects, applicable, as above, in an *immediate* way to use.

As there are instruments, the use of which consists in their being respectively applied in an *immediate* way; that is, each according to its nature and destination, applied without the intervention of any other, to the repulsion of pain, or production of pleasure, or to both at once, so there are others which, howsoever truly conducive to these ends, are not so in any other than an *unimmediate* way, *i. e.* by being subservient either to the production, or to the application of some instrument or instruments, coming, as above, under the denomination of immediate instruments. *Immediate* utility admits not of *degrees*; but of *unimmediate* utility, as above, degrees may have place in any number. The *scale*, to which these degrees, belong, may be termed the scale of *vicinity to use*. Instruments the station of which is on the highest degree of the scale—say the *first* degree—the degree nearest to immediate use, may be termed instruments of the *1st order*; those, next to them, *i. e.* next below them, instruments of the *2d order*; and so on, through any number of degrees, which, in any system of connected instruments, may, at any time, be found exemplified.

* [*Ethics.*] From a Greek word, which signifies *manner* or *manners*: manner of *conducting* one's self in the course of life.

into *Plasioscopic** and *Coenonesioscopic* :†—*Plasioscopic*, i. e. *Formation—regarding; Coenonesioscopic*, i. e. *Communication—regarding.*

To the head of *Plasioscopic* Noology may be referred the *art of thinking*, with the correspondent science of what belongs to the formation of the matter of thought, in so far as the work of *formation* can be kept in view, and carried on in a state of separation from the work of *communication*, as applied to the same individual portion of that ideal species of matter.

To the word *Logic*, considered as the name of a branch of art and science, the conception that has been attached, seems never to have been altogether so determinate and definite as could be wished. But in *one* at least of the senses, in which it has been employed, it may be considered as the single-worded synonym of *Plasioscopic Noology*, as above characterized.

Division 14. Division of *Coenonesioscopic Noology*, or say *Coenonesiology*, into *Aplo-didactic*, or say *Didactic*, and *Pathemategeretic*, [Pathocinetic‡] or say *Egeretic. Aplo-didactic*, i. e. *simply information affording;* having, for the end or object of the communication in question, *that* and nothing more : *Pathemategeretic or Egeretic*, i. e. *Affection-exciting*, or in one word *excitative.*

Of the word *Grammar*, if not exactly coextensive with, the import will (it is believed) be recognised as comprehended under, the import of the word *Aplo-didactic*, as above explained.

To the head of *Grammar* seem commonly to be referred those rules, and no others, which have for their subject, among the words employed for the communication of thought, such relations between word and word as are still the same, whatsoever may be the particular *purpose* and *occasion* of the communication, and the *nature* and *subject* of the thoughts communicated. §

To the head of *Rhetoric* seem commonly to have been referred those rules, which have for their subject the choice capable of being made of words and combinations of words, on occasions on which the communication made, has for its purpose, or in the number of its purposes, the exercising an influence on the *Affections*, on the Affections, whether considered as having place in a *calm* state, or as in that state of *intensity* and *perturbation*, in which they receive the name of *Passions.* ‖

Of materials, and instruments of all kinds, whether applied immediately or unimmediately to use, some are applicable, and accordingly applied to their respective uses, each of them by itself ; others, not but in conjunction, each of them with one or more other instruments.

Agriculture is conspicuous for the number of instances it affords of instruments which are capable of being, and are wont to be employed *single*, as above : Manufactures, taken in the aggregate, for the multitude of the instances they afford, of instruments which cannot be employed but conjunctly.

The principal characteristics, by which the systems of productive operations, commonly comprehended under the appellation of *manufactures*, are distinguished from those called *trades*, or *handicraft trades*, seem to be, the greater length to which they carry the division of labour, the multitude of the instances they afford of instruments of *subservient use*, employed *conjunctly* with each other, and the number of the different *orders* into which, as above, those instruments would be found ranged below one another in the scale of *vicinity to use.*

Raw material, or *finished work*—instrument of *immediate* use, or instrument of *unimmediate* and *subservient* use—no portion of matter can ever, or in any way be of use, until it is arrived at the *place*, which it is requisite it should occupy, in order to its being applied in that same way to use. Hence two universally concomitant modes of subserviency to use, of which, in so far as they are moveable, all useful instruments are susceptible : viz. subserviency in the way of *formation* or *application*, and subserviency in the way of *conveyance.*

To this place belongs a system of division, which, with a view to clear, correct, and all-comprehensive conception, might not altogether without advantage, in the way of instruction, be applied to the aggregate mass of the several different *instruments of conveyance;* these are (say) *stationary*, i. e. Roads ; *moveable*, i. e. *Carriages;* and so on.

In the above may be seen, though nothing like a complete list, a specimen of the various *sources of division*, by means of which, taken altogether, roads might, with no small instruction and convenience at any rate to the as yet unpractised traveller, be cut in so many various directions, through the wilderness of *Technology.*

A view of what was done in this way, by an ingenious philosopher of the 17th century, viz. *Bishop Wilkins*, though in prosecution of a design different from the present one, *his* being no less than that of substituting, throughout the whole field of language, an entire new language to all those at present in use, is intended for a separate article in this Appendix ; it contains so much of that great work as seemed to bear relation to Technology.

* [*Plasioscopic.*] From two Greek words, the first of which signifies *formation.*

† [*Coenonesioscopic.*] From two Greek words, the first of which signifies *communication.*

[‡ Passion-exciting.]

§ See the work on Grammar in this volume.

‖ Words, and assemblages of words, considered as applied or applicable to this purpose, are, in the institutional books, styled books of Rhetoric, designated by the collective name of *Figures of Speech;* but, on the list of these Figures of Speech, as designated by their respective names, several may be seen, that apply more decidedly to the *imagination* than to the *affections* ; as well as others, which, without addressing themselves to either of these two classes of psychological fictitious entities, are considered as capable of being subservient to the communication of thought, by means of *collateral associations;* i. e. by means of *accessory* ideas, which stand associated with the principal idea, with the idea, of which the word in question is directly and professedly significative, and which it was in the first instance employed to bring to view.

Works of this description—the study of which is commonly, in schools, an immediate sequel to that of the rules of *grammar*—are what the author of

Division 15. First Division of *Ethics* (taken in the largest sense of the word) viz. into *Di-*

Hudibras appears to have had in view, where he says—

> "For all a rhetorician's rules
> Teach but the naming of his tools."

This portion of stock, marshalled as have been the contents of it by the didactic verse-maker rather than by the Logician, remains as yet, it is believed, in that original chaotic state in which, without particular examination, it seems scarcely practicable to bestow upon it any denomination, more characteristic than that of *Figures of speech*, by which it has hitherto been designated.

Between the imports, which, by even the most ancient Greek writers extant, was annexed, and from them continues to be annexed, to the words *Grammar* and *Rhetoric* respectively, the relation, which may be seen to have place, is very different from that which can not but have originally had place, if not between the words themselves, between those from which they were respectively derived. By the word *Rhetoric*, derived from the verb ῥεω to flow in a stream, which in some of its *conjugates*, though not in all, (for in this secondary sense the assemblage is far from complete,) was employed to designate the particular kind of *efflux*, distinguished by the name of *speech*, the *audible* signs of language, and none but the audible signs, were denoted: by the word *Grammar*, derived from γραφω to make *visible* or *tangible* marks, none but the visible or tangible ones.

Thus far, to judge from the undubitable etymologies of the two words, *Rhetoric* should have been the name, which, in the earliest stage of society—viz. antecedently to the invention of the visible and tangible class of signs—was employed to designate the thought-communicating art, viz. taken in the whole of its then extent, and to what purpose soever it was considered as applied or applicable. So, in like manner, from and after the introduction of those visible and tangible signs, *Grammar* should have been applied to the same field, taken in the same unlimited extent, so as in its import to differ from *Rhetoric* on no other point than that of the different species of *signs* respectively employed by the two arts.

Of the change which, upon the face of this statement, appears to have taken place between those original, and the subsequently established and still existing imports, absolute and relative, of the two words, the cause seems to be this:—Antecedent to the time at which the use of *letters* was invented in, or imported into, the cluster of nations, whose language was the Greek language, the operation of speaking to a numerous audience, on subjects of a complicated nature, and thence in discourses which continued *flowing on* as it were, to a considerable length, had in consequence of the form taken by the political constitution of some of these nations, grown into use. Ρητωρ (*Rhetor*) the man of *fluency*, was accordingly the appellation by which a man, considered as engaged in operations of this description, came to be designated.

But, on the occasion of an address, delivered on such subjects, and to such audiences, motives for exercising on the *affections*, and even on the *passions*, whether directly, or through the medium and with the assistance of the *imagination*, whatsoever influence a man was able to exercise, could never be wanting. And thus it was, that *Rhetoric*—the language of the *Rhetor*—i. e. the *Public Speaker*, came to signify, not so much speech at large, as speech considered as addressing itself, either directly or through the medium of the *imagination*, to the *affections* and the *passions*.

When, the art exercised by the public speaker having, for a length of time more or less considerable, been already in use, the signs, invented for the purpose of giving permanence to the import expressed by those audible and evanescent signs, had also, for a length of time more or less considerable, been in use, then, and not till then, it was, that those relations, for the designation of which the collective appellation *parts of speech* came to be employed, could for the first time have presented themselves to view.

To obtain over the vast aggregate, composed of the whole assemblage of the words, of which the language used by the nation in question was composed, such a command, as enabled a man to marshal them all in his mind, and lodge them, every one of them in one or other of the eight or ten classes, having for their collective denomination the many-worded appellative *parts of speech*, was an enterprise, such as could scarcely have been projected, much less executed, without the benefit of that assemblage of permanent and everlasting signs, which, in every combination they are susceptible of, are capable of being kept in a steady position during any required length of time, under the corporeal, and thence under the mental eye.

And, in the progress of the art of *Education*, thus it was, that to instruction in the art of perceiving the import, and tracing the forms, of these visible and tangible *characters*, came by degrees to be added instruction in the nature of those *relations*, between their respective imports, in contemplation of which the whole body of the words, of which a language is composed, is divided and distributed among the parts of speech.

In the institutional works on this subject, derived by us, whether immediately, or through the medium of the Latins, from the Greeks, a division made of Grammar is into *Orthoëpy* and *Orthography*:—*Orthoëpy*, the art of performing the operation of speaking, in the *right*, i. e. in the *customary* mode; *Orthography*, the art of performing the operation of *writing* in the correspondently right mode.

Considered merely as *operations*, first of the two, as above, came *speech*, then, and not till after an interval of indefinite and unmeasurable length, *writing*. But considered as *arts*, to the exercise of which *aberration* from a standard, and thence *rectitude* (the absence of aberration) were incident, first must have come (if the above observations be well grounded) *Orthography*, the art of *writing*, and not till after *that*, the art of *speaking* correctly, viz. according to the *usages* to which expression had been given, in and by the rules of *Grammar*.

The word *Rhetoric* having thus two considerably different significations, the one, original and unbounded; the other, derivative, comparatively modern, and comparatively narrow: the one designating the operation of speech, taken in its whole extent; the other, the art of speech considered no otherwise than as applied to the particular purpose of exercising, *occasionally*, through the medium of the *imagination*, influence over the *affections* and the *passions*, no wonder if, in works having for

castic,* i. e. *Censorial*, and simply *Exegetic*,† i. e. *Expository*, or *Enunciative*. *Dicastic*, or *Censorial*, i. e. expressive of a judgment or sentiment of approbation or disapprobation, as intended by the author of the discourse, to be attached to the ideas of the several *voluntary actions*, (or say *modifications of human conduct*,) which, in the course of it, are brought to view: in other words, his opinion, in relation to each such act, on the question, whether it *ought* to be done, ought to be left undone, or may, without impropriety, be done or left undone.

Simply *Exegetic*, i. e. *Expository* or *Enunciative*, viz. in so far as, without bestowing any such mark of approbation, disapprobation, or indifference, the discourse has for its object the stating what, in the opinion of the author, has, on each such occasion, actually come to pass, or is likely to have come to pass, or to have place at present, or to be about to come to pass in future,—i. e. what act is, on the occasion in question, most likely to have been done, to be doing, or to be about to be done.

This division has for its source the nature of the *mental faculty*, to which the discourse is immediately addressed. In so far as the discourse is of the *Censorial* cast, the faculty to which it addresses itself, and which, in so doing, it seeks to influence, is the *volitional*—the *will*, or at any rate the *pathematic*. In so far as it is of the simply *Expository*, or *Enunciative*, cast, the only faculty to which it immediately applies itself, viz. by seeking to afford *information* to it, is the *intellectual* faculty, the *understanding*.

For a synonym, *Dicastic Ethics* may have the single-worded appellative *Deontology*.‡

The principle of division, deduced from this

their subject the import of this word, the line drawn between these two connected significations should be found not altogether clear and uniform; in this or that work taken singly, not clear; in such or such two works compared together, not the same.

How narrow the conception is, which, by the word *rhetoric* has been presented to the authors of the small institutional books above alluded to, may be seen, by means of a glance bestowed on the string of definitions and examples, of which the books so intituled are composed, and scarcely by any other means. In any one of *these* books may be seen the import of this appellation taken at its *minimum*. The *maximum* may be seen in the definition given of it, in one of the most instructive as well as most recent books on the subject—viz. The Philosophy of Rhetoric, by the late Dr Campbell, of Aberdeen. In the first page of the body of the work, after having, without notice given of the change, or of the relation between the import of the two words, substituted *eloquence* to *rhetoric*—"The word *eloquence*, taken in its greatest latitude, denotes" (he says) "that art or talent by which the discourse is adapted to its end. All the ends of speaking" (continues he) "are reducible to four; every speech being intended to enlighten the understanding, to please the imagination, to move the passions, or to influence the will." Thereupon, not adverting to the practice of *writing*, whether for the writer's own use, or for the use of others—whether particular individuals or the public at large, he immediately uses not only the word *speech*, but the word *speaking*, as co-extensive with and synonymous to the word *discourse*. In a Note, "the word *eloquence*" (says he) "in common conversation is seldom used in such a comprehensive sense." For "the choice" made "of this definition," he thereupon gives two reasons, the second too long to be noticed here; the first is, that "it exactly corresponds with Tully's idea of a perfect orator," which he thereupon quotes. But in this the Christian Divine does the Heathen Philosopher much more, and himself much less than justice: for of his last mentioned *end*, viz. influencing *the will*, in comparison of which those mentioned by Tully are, all of them, but as *means*, the passage from Tully says nothing.

In regard to Grammar, the case is, that, of the field of language,—considered without reference to the particular nature, of the subject, purpose, or occasion on which it is employed, and in *that* sense, in a purely *grammatical* point of view,—the consideration of what belongs to the mutual relations correspondent to the different parts of speech, does not cover the whole expanse. In this part of the field, what is wanted for use, for general use, is a work, the object of which shall be to show the course best adapted to the purpose of rendering language,—i. e. the particular language employed, whatsoever it be,—in the highest practical degree, well adapted to the *general* end or purpose of language, viz. *communication of thought*, abstraction made of the *particular* nature of the particular *purpose*, to which, on the particular *occasion* in question, it may happen to it to be employed. By the observation of the rules, called *rules of grammar*, belonging to the particular language in question, true it is, *that* general purpose will in some measure be accomplished. But to afford a complete direction for the complete accomplishment of it, will, it is believed, be found to require, in addition to those at present designated by the appellation of *grammatical rules*, others, in considerable numbers, extent and variety, which have not as yet been brought to view. To attempt something in this way has been among the designs comprehended in the present work.

* [*Dicastic.*] From a Greek word, which signifies *to determine, in the character of a judge.*

† [*Exegetic.*] From a Greek word which signifies *to set forth in the way of discourse.*

‡ [*Deontology.*] From two Greek words, the first of which signifies *fit, fitting, right, becoming, proper.* Deontology—an account or indication of that which, on the occasion in question, whatsoever it be, is (i. e. by him who speaks or writes, is regarded as being) *fit, fitting, becoming, proper.* It is in *sound* only, and not in *signification*, that it has any connexion with the word *ontology*, employed above.

Applied to every branch of Ethics, taken in the largest sense of the word *Ethics*, the use of such a word as *Deontology* affords a promise of being attended with considerable convenience. It will accord equally well with every system which ever has been, or ever can be, devised, in relation to the foundation of moral obligation: in the use of it, no such incongruity and presumption is involved, as that which is called *petitio principii*—i. e. a begging of the question, an assumption of the matter in dispute.

source, will be seen to be applicable, and accordingly applying itself, severally to all the following ones.

Division 16.* Division of *Ethics* (whether *Expository* or *Dicastic*) into *Genicoscopic*,† i. e. *general matters-regarding*, and Idioscopic,‡ i. e. particular-matters-regarding.

Synonyms to *Genicoscopic*, as applied to Ethics, are, 1. *Theoretical*; 2. *Speculative*. Synonyms to Idioscopic, as applied to Ethics, is the word *practical*.

In this, as commonly in other cases, the limits between *general* and *particular* not being determinate, so neither are those between what, on the one hand, is *theoretical* or *speculative*, on the other, *practical*. Of the observations expressed, such part as is allotted to the explanation and fixation of the import of *general words*—words of extensive import, the use of each of which is spread over the whole field, or a large portion of the whole field, of the art and science—will belong mostly to the *genicoscopic, theoretical*, or *speculative* branch; and, under the name of *principles*, to the above observations will naturally be added any such *rules*, whether of the expository or the censorial cast, as in this respect are most extensive.

The deeper it descends into particulars, the more plainly it will be seen to belong to the *idioscopic*. In so far as, with the incidents exhibited in the fictitious narrative, any rules of a *deontological* nature (as in modern productions is frequently the case) happen to be intermixed, the matter of *novels* and *romances* comes to be included in, and the immense mass of it forms but a part of, the matter of PRACTICAL ETHICS.

Division 17. Division of Ethics—whether Exegetic or Dicastic, and whether Genicoscopic or Idioscopic, into *Apolioscopic*,§ i. e. *political-state-not-regarding*, viz. PRIVATE ETHICS, *Ethics* in the more usual sense of the word,—and *Polioscopic*, i. e. *political-state-regarding*,‖ viz. GOVERNMENT,¶ alias POLITICS.**

Division 18. Division of *Politics* and *Government* into *Esoscopic*,†† i. e. *internal* or *interior-concerns*-regarding, viz. INTERNAL GOVERNMENT,—and *Exoscopic*,‡‡ i. e. *external-concerns-regarding*,—viz. INTER-NATIONAL GOVERNMENT and POLITICS.

By *internal* Politics, may be understood that branch of *Ethics* which has for its subject the conduct of *Government*, i. e. of the *ruling* members of the *political community* or state in question, as towards the *whole* number of the members of that *same* community; by *International Politics*, that branch of *Ethics*, which has for its subject the conduct of Government, as above, as towards the members, whether rulers or subjects, of *other* such communities.

Division 19. Division of *Internal Government* and *Politics*, into *Nomothetic*, [Nomothetioscopic, §§] i. e. *legislative*, viz., LEGISLATION, —and *Aneunomothetic*, [Aneunomothetioscopic, ‖‖] i. e. *without legislation*,—viz. ADMINISTRATION.

In so far as it is by the establishing of laws that the business of government is carried on, it is carried on in the way of *legislation*; ¶¶ in so far as it is carried on otherwise than by the establishing of laws, it is carried on in the way of *Administration*.

Division 20. Division of *Administration*

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* This division will not be found in the Table.—*Ed.*

† [*Genicoscopic.*] From two Greek words, the first signifying *general*.

‡ [*Idioscopic*] From two Greek words, the first signifying *particular*.

§ [*Apolioscopic.*] From three Greek words: the first of which is the sign of negation; the second signifies a political state, and the third *regarding*.

‖ [*Polioscopic.*] From two Greek words, as above.

¶ [*Government.*] ** [*Politics.*] By the word *Government*, the *practice*, and thence the *art*, seems to be more especially signified: by the word *Politics*, the corresponding branch of *science*.

A commodious division of Private Ethics might be into *esoscopic* and *exoscopic*, i. e. *within-regarding*, (or say *self-regarding*,) and *extra-regarding*, what it is right for a man to do, in so far as his own is the sole interest in question, and what it becomes right for him to do, when the interests of other sensitive beings are taken into the account.

†† [*Esoscopic.*] From two Greek words, the first of which signifies *within* or *inwards*: looking inwards, viz. to the welfare of that individual alone, by whom, on the occasion in question, the subject in question—viz. his own conduct—is looked into.

‡‡ [*Exoscopic.*] From two Greek words: the first of which signifies *outwards*: looking outwards, i. e. to the welfare of some person or persons, other than the one whose conduct is in question, as above.

Two words from the same roots, viz. *esoteric* and *exoteric*, are already in the language; they are, however, but little in use, being terms of technical divinity, applied to the case where the same discourse is supposed to have had, in the intention of him whose discourse it was, two different meanings; one, in which it was designed that it should be understood by one person or set of persons; another, in which it was designed it should be understood by another.

[§§ Government-by-legislation-regarding.]

[‖‖ Government-otherwise-than-by-legislation regarding]

¶¶ A law is a discourse—conceived mostly in *general*, and always in *determinate*, words—expressive of the *will* of some person or persons, to whom, on the occasion, and in relation to the subject in question, whether by habit or express engagement, the members of the community to which it is addressed are disposed to pay obedience.

This is the only plain and proper sense of the word: in this sense the object of which it is designative is a *real entity*. In every other sense, it is figurative and improper; the object of which it is designative is a mere *fictitious entity*; and every discourse, in which the reality of it is assumed delusory.

Mostly in general words—loose is the expression; but the looseness was unavoidable. Of the mode and degree of *generality*, necessary to distinguish *a law* from *an order of administration*, no

into *Aneristic*,* [Aneristicoscopic,†] i. e. *Uncontentious*, viz. ADMINISTRATION in the more common import of the term,—and *Eristic*, [Eristicoscopic, ‡] i. e. *Contentious*—viz. JUDICATURE.

Division 21. Division of Judicature into *Autothetic*,§ [Autothetoscopic,‖] i. e. *self-established*, viz. Judicature, according to COMMON *alias* UNWRITTEN LAW,—and *Catanomothetic*, ¶ [Catanomothetoscopic,**] i. e. according to Legislation, viz. Judicature according to STATUTE *alias* WRITTEN LAW.

description is to be found anywhere ; and any description on the subject would here be out of place.

Scarcely, perhaps, will the few lines that follow find excuse.

Of the hands, by which political *power*—whether of the *administrative* or the *legislative* cast—is exercised, the situation may be either *supreme* or *subordinate*. In common speech, however,—so indistinct are the conceptions commonly entertained, and the language commonly held, in this part of the field of thought and action,—the terms *legislation* and *legislators* are wont to be regarded and employed, as if applicable in no other case than that in which the situation of the hands, by which the power is exercised, is *supreme* Accordingly, and in consequence, in the case where it is regarded as being subordinate, the discourses, in and by which their will stands expressed, are, by a confusion of terms, wont to be spoken of, as being the result of the exercise, not of *legislative* but of *administrative* power : as *acts*, not of *legislation* but *administration*.

Between such discourses, as are regarded as being the results or products of the exercise of *legislative* power, and such as are not regarded in that light (the *will* expressed being, in both instances, regarded as the will of a person or persons, possessing in that behalf competent authority) the line of separation remains, even to this day, altogether unsettled and indeterminate. Among the terms, employed in the designation of the various objects, whether *persons or things*, to which the discourse makes reference, the greater the proportion of those, which, in contradistinction to the *individual*, are of the *generic* cast,—being names of *sorts* of persons or things, and not merely of *individual* persons or things, the more likely,—the less that proportion, the less likely,—the discourse is, to be regarded as a result of the exercise of *legislative* power.

* [*Aneristic.*] From two Greek words · one of which is a sign of *negation*; the other signifies *contention* or *of contention*.

The *science* corresponding to the *art* of judicature is termed JURISPRUDENCE. But this is not the only sense in which the word Jurisprudence is employed. In France and in French it has been used to designate what, in English, is called *Common*, or *Unwritten*, *Law*, in contradistinction to *Statute*, or *Written*, Law. Witness *Jurisprudence des Arrêts*.

[† Uncontentious-administration-regarding.]

[‡ Contentious-administration-regarding.]

§ [*Autothetic.*] From two Greek words: the first of which signifies *self*; the second, *established*.

[‖ Self-grounded-judicature-regarding : from *autothetic* and *scopic*. Many are even the already made compounds, which the common Lexicon (Hederic's) presents as capable of being, with more or less propriety and felicity, capable of being, in the character of synonyms to this word *autothetic*, employed to designate the differential character, by which Law in *this* form is distinguished from Law in the *Statute* form: *autothemethlic*, (self-grounded); *autogenethlic*, (self-sprung); *autogonous*, (self-begotten); *autognomonic*, (self-opinioned); *autobulic*, (self-counselled), &c. &c.]

¶ [*Catanomothetic.*] From three Greek words: the first of which signifies *according to*; the second, *law*, or *by law*, the third, *established*.

[** Law-grounded-judicature-regarding.]

SECTION IX.

Explanations, relative to the above Sketch and Table.

In the sketch thus attempted, the following particulars present themselves as having, in a greater or less degree, a claim to notice. Subjoined to them, respectively, are a few *questions*, in relation to which some satisfaction may not improbably, it is supposed, be looked for, and will accordingly be here endeavoured to be afforded :—

1. In the Tabular Diagram, and accordingly in the Explanation given of it, the *division* or *ramification* professes all along to be *exhaustive*.—*Question* 1. What are the uses or advantages derivable from a *tabular* sketch, exhibiting in one view a number, more or less considerable, of the branches of art and science? *Answer.* See § 10.—*Question* 2. Why *branches of Art and Science*, and not *Arts and Sciences*? *Answer.* Because, in every part of the field, *Art* and *Science* are found together : no branch of art without a correspondent branch of science—no branch of science without a correspondent branch of art. It is not that in one part of the field you have an art, in another a science, in a third both ; but that in whatever part you have either, you have both. See Chrestomathia, Table I. Note (32.) supra, p. 24.—*Question* 3. Why *exhaustive*? What are the uses and advantages resulting from its being so? *Answer.* See § 11.—*Question* 4. Can it, by any and what means, be proved to be so? *Answer.* See § 12.—*Question* 5. The idea of the *utility* of exhaustiveness, as applied to logical division—is it new to the *scientific*, and in particular to the *logical* world? *Answer.* Far from new ; but at the same time not as yet quite so clear as it might be, and it is hoped will here be rendered. See § 13.—*Question* 6. Can any directions be given, by the pursuance of which, the exhaustiveness of a systematic sketch, of the subdivisions and contents, of any branch of art and science may be secured? *Answer.* See § 12.

2. The ramification is all along *dichotomous*, alias *bifurcate*, i. e. two-pronged.—*Question* 1. Why *bifurcate* rather than *multifurcate*? *Answer.* To secure its being exhaustive ; concerning which, see § 12.—*Question* 2. Is the idea of the necessity of bifurcation to exhaus-

tiveness new, as above? *Answer.* So it is supposed to be. See § 13.

3. Of the first partition of this kind that occurs, the result is composed of *two*, and no more than two, branches of art and science, which are thereby represented as included in that *one*, the division of which has thus been made; and as containing between them the whole contents of it. And so in the case of any other.

4. Of those two condividend branches, the names are respectively formed by, and composed of, the name of the *immediate* trunk,—which, grammatically speaking, is a *noun-substantive*,—followed, in each of the two instances, by a *noun-adjective*. *Question* 1. Of this two-worded name what is the use? *Answer.* To afford a *definition*, and, by means of the definition, an *explanation*, of the name constituting the immediate trunk.

5. Being thus composed of two words put together, each such name may, in *Greek-sprung* language, be termed a *poly-epic*, and in particular a *biepic*, name; in *English-sprung language*, a *many-worded*, and in particular a *two-worded* name.

6. In every instance, for reasons that have already been brought to view, (§ 6.) this two-worded name is, in the first instance, a *Greek-sprung*, and in most instances a newly-framed denomination. *Question.* Why *Greek-sprung*? *Answer.* See above, § 6.

7. In several instances, in the character of *synonyms*, subjoined to this principal biepic and Greek-sprung name, are other such names, one or more in each division; for which see the *Notes*. *Question.* Why these synonyms? *Answer.* 1. That, in each such group of names, the identity of import between the several names may be established; and in so far *that* error prevented, which would have place, if, from diversity in the sign, diversity in the object meant to be brought to view were inferred. 2. That by each of these names the object may in future be made known—not by that name only, but by any one or more of the others:—so that, on each occasion, *that* one of them may be employed, which, with reference to that same occasion, appears most convenient.

8. In most instances, to those *Greek-sprung* two-worded names, are added one or more two-worded, or many-worded, *English-sprung* names. *Question.* Why these names? *Answer.* To make known the import to such readers of English, to whom the import of the Greek-sprung names, new as they mostly are, —especially to English readers,—would not explain itself. By the unavoidable awkwardness of these compound English names, will be afforded the only justification that could be afforded for the practice of employing any such names, as, being borrowed from a foreign language,—and *that* a dead one,—are, until explanations of them have respectively been given and received, not intelligible to any but the comparatively small number, of those by whom the import of the corresponding foreign words happens to be understood.

9. Also, in several instances, new-coined, *mono-epic*, or *single-worded Greek-sprung*, names. *Question* 1. To what purpose are they thus added? *Answer.* To show by what means, in these several instances, the facility, afforded by the use of single-worded appellatives, may be substituted to the entanglement and embarrassment produced by the use of many-worded ones.

10. Also, in several instances, appellatives already in familiar use. *Question* 1. For what purpose are these added? *Answer.* For the purpose of contributing to the fixation of the import of these most familiar terms, viz. by presenting the clearest and most correct conception that can be afforded, of the mutual *relations* of the objects respectively designated by them,—and thus giving the greatest extent that can be given, to whatsoever benefits may be derivable, from the use of a Table constructed in this mode.

11. The first single-worded names that occur, viz. *Eudæmonics* and its associate *Ontology* (both of them Greek-sprung,) are so many names of that trunk which, with reference to the several pairs of branches,—products of successive acts of partition or ramification,—may be styled the *universal* trunk:—*Eudæmonics*, the universal trunk of *Arts*; *Ontology*, of *Sciences*.

12. With reference to the two branches into which it is divided, the name of every branch of art and science, which here presents itself, may, as above, be termed the name of the *immediate* trunk. Every such *immediate* trunk may, with reference to the *universal* trunk, be styled a *particular* or *partial* trunk.*

13. Any number of trunks, intervening between the universal trunk and the partial trunk in question, may, with reference to these two trunks, be styled *intermediate trunks*.

14. The trunk, which stands next to the universal trunk, may be styled the partial trunk of the *first rank* or *order:* that which stands next to it, the partial trunk of the *second* rank or order: and so on.

15. In some instances, several partial trunks are of *the same* rank or order. This is the case, as often as, from different *sources*, the same trunk is successively subjected to so many different divisive operations. In this case, whatsoever be the number of these operations, the divisions performed by them may, in every instance, be equally exhaustive. Be the numbers of *sets* of branches (viz. in so far as the bifurcate mode is conformed to, *pairs* of branches) ever so numerous, the operations themselves, and the pairs of branches, which

* Thus, in Botany, within an *universal* umbel, are, in the instance of many plants, included a number of umbels, termed on that account *partial* umbels.

are respectively their results, are all, with reference to each other, *co-ordinate:* with reference to the results of a division, performed on any trunk of a higher rank, (the highest rank being expressed by the smallest number) *subordinate:* with reference to the results, of a division performed on a trunk of a lower rank, *superordinate.*

16. The relation which, by the *lesser* aggregate designated by the name attached to any such subordinate trunk, is borne to the *greater* aggregate designated by the name attached to its immediate superordinate, is the same as that which, in the language of the current logic, a *species* bears to its next immediate *genus*—the genus of which it is the immediate species. The trunk, here styled *the universal trunk*, corresponds to the *genus generalissimum* of logicians.

17. Contrarily to the usage, which seems chiefly, if not exclusively, prevalent,—for giving intimation of the relation which, in each instance, is represented as having place between the *trunk* and its two *immediate* branches, the word *is*—instead of being omitted, and left to be supplied by the reader, is inserted.*

Question 1. Why thus depart from the most usual, it being also the most simple, mode?

Answer 1. To exclude *obscurity* unless the sign of this instrument of connexion is brought to view, no meaning is fully and adequately expressed:—unless the import of it is present to the mind, no meaning is comprehended. True it is, that, to the mind of one, to whom Tables of this kind are to a certain degree familiar, the import of this necessary bond of connexion *may*, at the first glance, and at the same instant, have been presented by those words of the proposition, which are inserted: and thus far no obscurity has place. But, other minds there may be, by which, though through the above-mentioned means, this same conception, will, sooner or later, have been obtained by them, yet for some time it will *not* have been obtained: and, till it is obtained, the undesirable quality of *obscurity* remains in the *object*, and the unpleasant sense of *fruitless labour* in the *mind* to which the object is presented.

Answer 2. To exclude *ambiguity.*—By the sort of omission here in question, it may be, that, in the individual sketch in question, framed as it is here framed, the imperfection thus denominated would not have been found produced. But, in a Table, framed in the manner, in which, to say the least, most Tables constructed for the sort of purpose here in question have been framed, the imperfection would, it is believed, be apt to have place. Two cases may be mentioned, in either of which it has place: 1. In so far as, between any two nouns that have place in the Table, a doubt arises, what is the *copula* intended, viz. whether the *simple* copula—the verb *substantive*—or this or that *complex* copula, that is, any verb, other than the verb substantive.† 2. In so far as, this simple copula being the one fixed upon, so it is that of the nouns, for the connexion of which it is capable of serving, the number is greater than *two*, a doubt arises for the connexion of what two or more it was intended to serve.

In the Table of *D'Alembert*, these doubts—one of them at least, if not both—will frequently, it is believed, be found presenting themselves.

Answer 3. To exclude *misconception.*—As often as of two conceptions, by the simultaneous existence of which ambiguity is presented, one alone is that which was intended by him whose discourse the discourse is, here the ambiguity has two *issues* or modes of termination, either of them capable of taking place. In so far as that which happens to be embraced by the reader, is different from that which was intended by the writer, misconception is the result.

17. For presenting to view so many different classes of the words of which the Table in question is composed, so many different *types* are, it may be observed, employed:—viz. 1. for the designation of the *Greek-sprung* words, which, in conjunction with the name of the *immediate trunk*, constitute respectively the two-worded names of its immediate branches, *Italics*, and these in a comparatively large type, are employed.

18.—2. For the familiar English words, which, when strung together in the form of one composite word, form those appellatives which, to the English reader, are designed to afford an explanation of the, in most instances, new, and, in every instance, *Greek-sprung* epithet,—the common Roman types, and in a comparatively small size, are employed.

19.—3. For the words, which form respectively those single-worded appellatives, which,

* The word *is*—parcel of the aggregate of intimately related words, framing, altogether, what, by grammarians, is called *a verb*, viz. the verb *substantive*—the verb by which *existence* and nothing else is indicated—(*a* verb—as if the different sorts of words of which it is composed, were, all of them put together, no more than one) is by *logicians* styled the *copula*. i. e. the instrument of connexion, of which, in the operation, styled by logicians *predication*, the import is always either expressed or understood. By it, unless where the sign of negation is added to it, existence is, in every instance, attributed to some one object, and, in most instances, *identity*, coincidence, or connexion, to two objects with which it is associated.

† In addition to the import of the *copula*, i. e. of the mere sign of *existence*, by every verb other than the verb substantive, the import of the name of some quality or other, either in the character of a permanent, or in that of a momentary one, may, it is believed, be found presented to the mind:—and this, over and above any of those *accessory* imports, which are denoted by the grammatical terms, *mood*, *tense*, *person*, and *number*.

being of Greek origin, and for the most part new, have on the present occasion been framed for the present purpose,—the sort of type called *black-letter* is employed.

20.—4. For those words, which, being respectively names of so many branches of art and science, are already in the English language, and in familiar use,—for these appellatives, whether single-worded or two-worded, —capital letters are employed.

21. As the trunks, which they respectively designate, recede further and further from the universal trunk, the types employed for these capitals are smaller and smaller.*

Questions respecting Articles 17 *to* 21.

Question 1. Why, for the different classes of words, employ types of different *species*?—*Answer*. That, at short glances, the differences may be the more rapidly and clearly apprehended.

Question 2. Why, for trunks, at different distances from the universal trunk, employ types of different *sizes*?—*Answer*. That the relations, which have place, in respect of extent of import, between these several terms, may be the more rapidly and clearly apprehended.

Question 3. For the English many-worded appellatives (viz. epithets) inserted for the explanation of the corresponding *Greek-sprung*, and mostly new-coined, appellatives, why employ so small a type?—*Answer*. In order that, forming as it were so many botches, they may, while offering themselves to the eye, rather recede from it than meet it, so as not to be looked at, but in proportion as the demand for the use of them presents itself.

Uncouth as this portion of the language here employed cannot be denied to be, it is not more so than that in which, for the accommodation of English readers, entire works, viz. on the subject of *Botany*, may be seen composed.

Question 4. For those names of arts and sciences which are already in familiar use, why employ large and conspicuous capitals? *Answer*. That with a particular degree of force they may attract the eye: two main uses of the Table being the helping to fix the imports respectively attached to these most frequently employed appellatives, and to exhibit to view, in the clearest manner, the mutual relations between the objects which they are respectively employed to designate.

22. By the familiar sign, composed of the letters *i. e.*—initials of the Latin words, *id est*, —the eye is throughout conducted to the above-mentioned explanatory words, explanatory of the Greek-sprung adjectives; by the kindred sign, *viz.* for *videlicet*, to those appellatives in common use, to which, for the reason above-mentioned, the types called *capitals* have been allotted.

23. Though, by means of some of the above-mentioned appellatives,—viz. *trunk, universal trunk, partial trunks*, and *intermediate branches*, the matter of the Table is spoken of as if it were arranged in the form of *a tree*, yet the position of the object styled the *universal trunk*, is at the top of the Table; and that of the *branches*, instead of being higher and higher, is lower and lower, as they recede from it. *Question*. Why this apparent contradiction and incongruity? *Answer*. That, here in the tabular diagram, as in the continued explanatory discourse, those parts, which, for the understanding of it, require to be first read, may be the first to meet the eye. Nor, at bottom, is there any absolute contradiction in the case. *Roots*, as well as *trunks*, have their *branches*: and in the instance of a numerous tribe of plants; in a word, in that of *trees* in general, by so simple a cause as a change in the surrounding medium, branches being buried in the earth, while roots are exposed to the air, not only under the hand of the artist, but even under the hand of Nature, roots are found convertible into branches, as well as branches into roots.

Section X.

Uses of a Synoptic Encyclopedical Table or Diagram.

By the name of an *Encyclopedical Sketch*, two perfectly different, however nearly related, objects may, with equal propriety, be designated, and under that common appellative thereby comprehended. The one is, a *continued discourse*, expressed in the forms of ordinary language: the other is a *Systematic Table* or *Diagram*, so constructed as to be in some degree *emblematic*. In the continued discourse, the relations in question are expressed at length in words and words alone: in the emblematic diagram some *image* is employed, by reason of which, while by their respective names, the objects in question are presented to the eye, all of them in the same place, and at the same time, certain *relations**

* It will be found that the author has, in his table, diverged slightly from this description.—*Ed.*

* Pleading for his quondam instructor, the poet *Archias*, "Between art and art," (says *Cicero*,) there exists throughout the whole assemblage of them, *commune vinculum*, a common tie—True; and that tie is the one already above indicated: viz. their common *object—well-being*—by which they are constituted so many branches of the universal art, *Eudæmonics*. Between art and art?—Yes; and moreover between *science* and *science:* and of these the common tie is their common *subject*, viz. *substance* [a] and by this common tie it is that they are constituted so many branches of the universal *science*, *ontology—particular* as well as *general* ontology included, as above, (§ 8.) But, between *art*, taken in its whole extent, and *science*,

[a] In the import of this word,—in the sense in which, by the *Aristotelians*—at any rate by the *Christian* followers of that philosophy—it has always been employed,—is included (it should be remembered) not *matter* only (i. e. all *bodies*) but *mind*.

which they bear to one another, are at the same time held up to view. As to the image, that of a *tree*, with its *trunk* and *branches*, is that which, in the earliest example known,* was thus employed ; nor does it appear that the nature of the case affords any object better adapted to this purpose.

To the form of *a continued discourse* the advantage attached is, that the quantity of explanation given by it is not restricted : but with this advantage is connected a disadvantage, viz. that, if it be of a certain length, it is only in succession that the several parts of it are presented to, and can be taken cognizance of by, the eye ; so that, unless it be under the constantly repeated trouble and embarrassment, of turning backwards and forwards, leaf after leaf, or that of a constant strain upon the memory, or both, no comparison of part to part can be made.

In *the systematic diagram*, the advantage is, that, for the purpose of uninterrupted and universal comparison, continued to any length, after the objects with their several relations have been respectively explained, each of them, at whatever length may have been deemed requisite, in and by the continued discourse, the whole assemblage of them is, or at least, as above-mentioned, may be so brought together, as to be kept under the eye at once, forming as it were so many parts of one and the same picture.

Thus it is, that to this form two perfectly distinguishable, howsoever closely connected, advantages, both of them of a practical nature, are attached : in the first place, of the whole matter taken together, *conception* is facilitated and expedited ; in the next place, *comparison* —reciprocal comparison—the articles being capable of being run over for all purposes, in all directions, and in all imaginable orders of succession, without interruption, and with that *rapidity* which is proverbial as being among the characters of *thought*.

To set against these advantages, no disadvantage has place, except that to the quantity of matter, to which *this* form is capable of being given, there are limits which apply not to the other. But, within these limits, here, as in a *map* or an assortment of maps, it is seldom that, be the purpose what it may, within the quantity of space capable of being thus employed, a quantity of matter sufficient for the purpose will not be capable of being displayed.

Anterior to the time of Bacon, were the profit worth the trouble, Encyclopedical Sketches might, even in the *tabular* form, it is believed, be found, and in both forms in no inconsiderable abundance. But, by the true lights, shed upon the field of *thought and action*, and thence upon the field of *art and science*, by that resplendent genius, all those false lights have been extinguished.

Of the two above-distinguished forms, of which an Encyclopedical Sketch is susceptible, the only one, however, of which the works of Bacon afford an exemplification, is that of a continued discourse, the *purely verbal* form.

In like manner, in no other than the purely verbal form, and that, too, wrought in a looser texture, may be seen the Encyclopedical Sketch prefixed by *Ephraim Chambers* to his Dictionary of Arts and Sciences.

With the two Encyclopedical Sketches of *Bacon* and *Chambers* before him, *D'Alembert* prefixed to the French *Encyclopedia* his Encyclopedical Sketch, in the *purely verbal* form, taken, as he says, chiefly from Bacon : and, moreover—and for the first time reckoning from the days of Bacon—that correspondent sketch, in the form of a *systematic diagram*, which is here copied,† and which has been the subject of the remarks given above.

This diagram is exhibited by him in the character of the principal object ; and it is in the character of an *Explanation* of that principal object, that the continued and purely verbal discourse attached to it, is delivered by him.

Notwithstanding the imperfections above held up to view, to which others might have been added, signal was the service which, in the estimation of the author's collaborators, among whom were numbered almost all the men of any literary eminence whom France at that time afforded, was rendered by the instrument

taken in its whole extent, there runs throughout that all-pervading and most intimate connexion, which has above been brought to view : (See Tab. I. Note 32.) For the arts he was speaking of, the Orator might thus, in virtue of this connexion, supposing him aware of it, and supposing it to have been suitable to his purpose and to the occasion, have found two, viz. the two above-mentioned, common ties.

Not that, in any part of the field, any such conception, as it is in the power of any of the words in question to convey, of those *general* ideas, of which they are respectively the names, can serve in the place of ideas derived from the perception of individuals, of the correspondent individual objects respectively contained in them. No ; it is only through *individual* objects, that any clear and adequate ideas are presented and lodged in the mind : and it is the opposite notion, that constituted the all-pervading error of the class of philosophers called the *Schoolmen* or *School-Logicians*, and gave, to little less than the whole mass of knowledge or supposed knowledge of those times, the character of a nut-shell without a kernel, or a skull without brains.

But what it *is* in the power of these words to do is—to afford so many ready *receptacles*, as it were, or *boxes*, in which the *individual ideas*,—in proportion as they are drawn forth from the *individual objects* which are their *sources*,—may be lodged and deposited, in such manner as to take hold of the memory, and there to remain, in readiness to be, at any time, called up for use.

* The *Tree* of *Porphyrius*, as exhibited in the Table hereto annexed. For explanation, see the next Section.

† See the Table.

so constructed as hath been seen. In it they beheld, nor with other eyes has it been beholden (it is believed) in that or other countries, by their contemporaries or their successors, a sort of *novum organum* in miniature: a sort of instrument, which every man, to whose lot it has fallen, to labour, upon a scale of any considerable extent, in any part of the field of art and science, ought to have constantly in his hands and before his eyes.

To what instruction soever may have been extractible from that diagram, whether any and what addition has been afforded, by the remarks herein above made on it, together with the subjoined sample of another, executed upon a plan considerably different, the reader will judge.

A Table of this sort may be considered as an instrument in the hand of *Analogy*.

Scarce will the *art* be found, from which, through the medium of *Analogy*, assistance may not, in some shape or other, be borrowed by *some* other art, not to say by *every* other.

By *Analogy*, scarce will the article of *knowledge* be found, by which, in some shape or other, *light* may not be received from some other, not to say every other.*

Conception, retention, combination, generalization, analysis, distribution, comparison, methodization, invention—for all or any of these purposes, with an Encyclopedical tree in his hand, suited to the particular object which he has in view, skipping backwards and forwards, with the rapidity of thought, from twig to twig, hunting out and pursuing whatsoever analogies it appears to afford, the eye of the artist or of the man of science may, at pleasure, make its profit, of the labour expended on this field.

Yes, true it is that, no otherwise than through individual objects, can any clear ideas be imbibed, from the names of those ideal aggregates or bundles, of different sorts and sizes, into which, by the associating and dividing power of those appellations, they are collected and distributed. But, from a comparatively small number of individual objects, may be obtained very instructive and practically serviceable ideas, of very extensive aggregates. Many years ago, forty thousand, or thereabouts, was supposed to be the number of *species* of plants at that time more or less known: forty thousand, the number of those ideal aggregates, designated by the name of *species:* millions of millions the number of the individuals at each moment designated by those same specific names. Yet from any one of those individuals may be abstracted a tolerably adequate idea of the species in which it is considered as contained; and how small is the number of species necessary to plant in the mind the prodigiously extensive idea designated by the word *plant!*

By attention, applying itself all along with still closer and closer grasp, by this faculty it is that advances, fresh and fresh advances, all of them so many conquests, are continually made in the field of art and science. Each laborious and inventive adventurer proceeds on in the wilderness, as far as his inclination and the force of his mind will carry him. Sooner or later, the same man or another, more frequently another, makes a road, whereby, to succeeding travellers, the quantity of labour necessary to the reaching of that farthest point is more or less reduced. By successive labourers of this pioneering class, the road is made gradually smoother and smoother. Where one ends, another begins; and hence it is that the veriest pigmy is at present able to look down, from a point, which, by his utmost exertions, the giant of anterior times could never reach.

That, of the branches of Art and Science, which, by the denominations here employed are thus endeavoured to be brought to view, the distinctness is, in a multitude of instances, far from corresponding to the distinctness of the denominations themselves, is but too true, and presents to view an imperfection no less undeniable than it is believed to be irremediable. In this tract, approximation is, throughout, the utmost that can be hoped for. But, unless and until some other scheme of distribution shall have been found, such as shall be exempt from, or at least in a less degree exposed to, this imputation of indistinctness, than that which is here submitted, the imperfection, so long as the work has any use, will not afford any sufficient reason for leaving it unattempted. That no scheme will be found altogether exempt from the imperfection, may be asserted with full assurance; and, if any scheme less tinctured with it than the present one is, could on this occasion, and by these eyes have been found, *that* and not *this* would have been the scheme in *this* place brought to view.

Let it not at any rate be said, that, by reason of this indistinctness, it is no more than upon a par with those other Encyclopedical Sketches, in the hope of superseding which it has been framed. Between the degree, and even the species of indistinctness, which has place in the two cases, wide indeed (it is believed) will be seen to be the difference. In *this* sketch (to borrow a phrase from Scottish history) in this sketch, may here and there be found (it is true) a small proportion of *debateable land*, concerning which it may be dubious to which of two contiguous districts it may with most propriety be said to belong: but in *those* cases, many are the instances, in which the whole of the territory, which is represented as belonging exclusively to one of two districts, may, with equal propriety, be said to belong to either or to both.

* See Note *, page 98

Section XI.

The Mode of Division should, as far as may be, be exhaustive—why?

If, of a sketch of the kind in question, the utility is by any person recognised, to satisfy him of the utility of its being rendered *exhaustive*, not many words can, it is supposed, be necessary. To be *exhaustive*, the parts which, at each partition or division so made, are the results of the operation, must, if put together again, be equal to the whole; and thus, and in this sense, *exhaust* (to use the word employed by logicians) the contents of the whole. It is only in so far as the divisions which it contains are, in this sense, respectively *exhaustive*, that the information, contained in a work which is composed of them, can be *complete*—can be what it appears to *undertake* for being, can be what it *might* be, and what, if it might, it *ought* to be. This being the case, if it be *not* exhaustive, every proposition, in which the exhaustiveness and completeness of the division is assumed, will, in so far as the assumption is proceeded upon, be, *pro tanto*, erroneous and incorrect; and, if received and acted upon, delusive: and, in whatsoever stage of the division the incompleteness has place, the consequence is, that, in every sub-division, the original imperfection is repeated, and the correspondent part of the work tainted with it.

But it is only by means of a system of division, carried on in the thus *declaredly* exhaustive mode, that any assurance can be afforded or obtained, that the survey taken of the field of *thought and action*, and therein of the field of *science and art*, or of whatsoever portion of that field is proposed to be comprehended, in the survey, is complete; any assurance, that, in the course of the progress made through it, a number of parts, in unlimited abundance each to an unlimited extent, may not have been omitted.

It is only in this way, that, even supposing the whole to have been actually embraced and comprehended in the survey, it can, in the mind that has embraced it, wear the aspect and character of *a whole*: instead of that of a regular *tree*, the form in which it presents itself will be no other than that of a confused heap of unconnected fragments,—each of them, in respect of *form* and *quantity*, boundless and indeterminate.

In the body of this work, intimation was given of what presented itself as the chief use, derivable from an insight, more or less extensive into those foreign languages, ancient and modern, in which the vernacular language has its roots. It consists (it was said) in *this*, viz. that, to an eye thus instructed, in the whole field of the language, there being no *hard words*, there shall be no absolutely *dark spots*; nothing that shall have the effect of casting a damp upon the mind, by presenting to it the idea of its ignorance, and thence of its weakness.

Correspondent to the sort of consciousness of power so obtainable in the field of language, is that which, by means of a set of *systematic sketches*,—and, in particular, by means of a set of *systematic* and *tabular diagrams*,—always supposing the mode pursued to be exhaustive, may be obtained and exercised over the field of *art and science*. No parts in it, from which through the medium of these appropriate denominations (the relations of which, as well those to one another, as to the matter of the body or branch of art and science, are determined and brought to view) ideas, more or less clear, *correct*, and *complete*, are not radiated to the surveying eye: in a word, no absolutely *dark spots*: no words that do not contribute their share towards the production of so desirable an effect, as that of substituting the exhilarating perception of mental strength, to the humiliating consciousness of ignorance and weakness.*

Desirable as this property will, it is hoped, be acknowledged to be, with reference to the purpose at present in question,—a purpose will now be mentioned, to which it must be acknowledged not to be applicable. Relations of *logical identity and diversity*, and relations of *practical dependence*, as between branch and branch, both these sets of *relations* have already been mentioned, as capable of being, with good effect, brought to view in the form of a *synoptic Table*. But, for the exhibition of relations thus different, neither can any one Table, nor any number of Tables, upon this same plan, be made to serve. In the plan, of division and correspondent distribution, pursued in the view given of the *logical* relations as above explained, *exhaustiveness* will indeed always be an essential feature. But where the relations to be exhibited are the *practical* sort of relations just spoken of, viz. those of *dependence*, or say, of *subservience*, (whether the subservience be mutual or but unilateral,) the nature of the subject admits not of any such regularity and all-comprehensiveness. From branches of art and science, the most remote from one another in the logical tree, one and the same *art* may be seen looking for

* Words which, whether derived or not from foreign languages, appertain exclusively to particular trades and occupations, will of course continue to operate as so many incidental sources of the sensation of *ignorance* to a person not correspondently conversant with the language of those particular trades and occupations respectively, there must, in those several divisions of the language, be of course as many *dark spots* as there are of these peculiar words. But, in these instances, it will, by the context of the discourse, be sufficiently shown, that, by a want of acquaintance with the import of these particular words, nothing worse is indicated, than a correspondent want of acquaintance with the field of that *particular* trade or occupation; not any want of acquaintance with any part of the general body of the language. The language of *seamanship* will afford an example.

assistance. *Natural History*, *Anatomy*, *Chemistry*, *Architecture*, *Political History*, *Ethics*—all these, not to mention any more, the *Painter*, not to speak of the *Poet*, may have occasion to summon to his aid.*

Exercising dominion over almost every branch of art and science, sometimes in furtherance of the interests of the professors of that particular branch, more frequently and more necessarily in furtherance of the interests of the whole community, the legislator, on pain of acting blindfold, has need of an insight,—the more clear, correct, and extensive the better,—into the matter of every such branch of art and science. For his use, therefore, to the Table of *logical relations*, exhibited upon an exhaustive plan, a Table of relations of *dependence* or *subservience*, as above explained, constructed upon a plan in which *particularity* and *copiousness* should be the ruling objects, would be an essential accompaniment.

Section XII.

Test of All-comprehensiveness in a Division how constructed—Additional Advantages, Distinctness and Instructiveness. Bifurcation why necessary.

A problem is here proposed, and undertaken to be solved. A logical aggregate of any kind, as designated by any appropriate name, being given, required to divide it into a number of parts, each in like manner designated by a distinctive name, in such sort, that, in the sum of these parts, shall be contained the same individuals, and all the individuals which, and no other individuals than those which are contained in the whole.

Such is the problem, the solution of which is requisite for the present purpose. In other words, the solution of it consists in securing to the *parts*, into which the sort of *whole* in question is to be divided, the *property* of *all-comprehensiveness*.

For the accomplishing of this solution, what has been found necessary, is, the construction of an *instrument*, such as, being employed in the divisional operation in question, and thereby in the conformation of the parts, which are the results of it, shall serve as a *test*, in such sort, as to demonstrate, if such be really the case, that the division thus effected is in fact an all-comprehensive one: call it accordingly, *the test of all-comprehensiveness*.

An instrument of this sort has accordingly been constructed;† and, on turning to the Encyclopædical Table, will be seen to have, in every part of it, been explicitly or implicitly employed. It consists in what may be called the *contradictory formula*: the essence of which consists in the sign of *negation*, employed or employable in the designation of some one in each pair of branches, and *not* in that of the other. But of this presently.

In and by the word *pair*, as applied to the branches thus produced, what is already implied is, that, by the instrument in question, it is only in the way of *bisection* that the problem can be solved. But in this mode, it will be seen, that every desirable purpose may be accomplished: that it cannot by any other mode; and that on any occasion at pleasure, by division into two parts, division into any other number of parts may, if there be any use in it, be accomplished.

Of the desirable property, which, on this occasion, stands as the principal object, and occupies the fore-ground,—*all-comprehensiveness*, having for its synonym, as already explained, the word *exhaustiveness*,—is the name. But, by the same means by which to the scheme of division in question this property is secured, two other desirable properties, as it will be seen, are, at this same time, secured, viz. *distinctness* and *instructiveness*.

Intimately as they are connected with the principal property, and, by the same docimastic instrument, secured to the scheme of division executed by means of it, what will at the same time be seen is, that these two subsidiary properties are not, either of them, inseparable from it. Instances require to be shown, and will accordingly be shown, in which a scheme of division is or may be *all-comprehensive* without being *distinct*, and all-comprehensive and *distinct* without being *instructive*.‡

For securing *clearness* to the ideas attached

* In the French Encyclopædical Table, so often mentioned, between the art and science of the *Painter* and that of the *Chemist*, according to the view there given of the two objects, there could not be any relation at all, except in so far as *painting* is a branch of *Connoissances Humaines—human knowledges* or *knowledge*. According to that Table, in *painting* (and not only in *painting* but in *engraving*) the only one of the human faculties employed, is the *imagination*: and as, according to the same Table, the *art* of making colours, fit to be used in painting, belongs to *memory*,—and, if it be included in *Chemistry*, the knowledge how to make them, belongs to *Reason*,—the *Painter* might be at some difficulty about his colours, if, for finding out the way to have good ones, he had no other means than what are afforded him by that French Table.

† By the mathematical reader, with reference to the solution of the principal problem, the construction of this test may, if he pleases, be considered in the character of a *lemma*.

‡ On the occasion of every such division, what, to prevent confusion, is altogether necessary, is—that, of the names, given to the parts which are the results of the division by no one shall any individuals be designated, *other* than those which are comprehended in the aggregate so undertaken to be divided. By the word *preciseness* or *precision* may be designated the ulterior property thus represented as desirable. But, to its presenting this signification, it will be necessary, that the original and material import of the word (*precision* from *præcido, to cut off*, viz. everything that out-stretches the proper line) be at the same time present to the mind.

Of this property, however, to avoid embarrassing the present inquiry with matter which, on the pre-

to the names of those three properties, a few words of explanation may have their use.

1. Of *all-comprehensiveness*, with its synonym *exhaustiveness*, enough has in this view been said already.

2. By *distinctness*, as applied to the division in question, (whether by the word *division* what is here meant be the *operation* or the *result*,) by distinctness what is meant is, that, of all the individuals contained in the subject of the division, viz., the *trunk* or say, the *major aggregate*, it shall, when the division has been performed, be, in the instance of every such individual, clear and manifest to which of the several branches it belongs.

3. By *instructiveness* is meant a property which bears relation, and applies to both the others. It consists in this; viz. that the words, employed for giving denomination to the branches, shall be such, as to declare and announce, that the division is *all-comprehensive*, as also that it is *distinct*.

Of this property, it will be seen, that neither is it *useless*, nor is the warning, thus given to secure to the scheme of division the benefit of it, *superfluous*. 1. The property is not *useless*. For from the property of *all-comprehensiveness* no use can be derived, but in so far as the scheme of division is understood to be possessed of it: and so in the case of *distinctness*. 2. Neither is the warning superfluous. For, various, it will be seen, are the instances, in which these properties, though really possessed by the branches, into which, by the current names employed in the designation of them, the trunk has been divided, yet (such is the structure of those names) are not held up by them to view, and are therefore of little or no use.

Thus much as to the desirable properties, which, by the test above alluded to, viz. the *contradictory formula* have been secured, it is supposed, to the scheme of division here employed:—now as to the *contradictory formula* itself. Examples of it have been in existence as long as the logical tree of *Ramus*, improperly (as will be seen) attributed to *Porphyrius*, has been in existence.* Examples of it are, as above, the matter of which the Encyclopædical tree here attempted is composed. What remains to be done here is, to point out the precise part to which the appellation is meant to be applied, and the ground on which it has been thus applied.

In the instance of each trunk, observation has been made, of a particular *property*, as being possessed by every individual, to which the name of the *generic* (say the *major* or *comprehending* aggregate, employed to represent the *trunk*) is applied: possessed, moreover, in like manner, by every individual, is a property to which the name of the *minor* or *comprehended* aggregate (the relatively specific appellative, employed to designate one of the two *branches*) is applied,—but as to the other of the two branches, *not* possessed by any one of the individuals, to which the appellative employed to designate that branch is applied.

Having thus the effect of giving, as it were, *birth* to, and, at any rate, *indication* of, the *distinctness* supposed to be possessed by the two branches, this property may be termed the *distinctive property*.

This subject (be it what it may) is *possessed of this quality* (be it what it may;) *this subject* (meaning the same subject)† *is* NOT *possessed of the quality* (meaning the same quality) —these two are—as the logicians call them, and as any body may see they are,—a pair of *contradictory* (viz. *mutually* contradictory) *propositions*: the former of these may be termed the *positive* contradictory, the other the *negative*.

In regard to *contradictories* (such for shortness is the term employed, instead of saying *a pair of mutually contradictory propositions*) two observations have been made by logicians, and delivered in the character of axioms. One is, that, to whatsoever *property*, and with reference to whatsoever *subject*, these opposite assertions are applied, in no instance will they, both of them, be found true. The other is, that, to whatsoever quality, and with reference to whatsoever subject, they are applied, one or other of them will be found true.‡

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sent occasion, has not presented itself as essential to it, no further mention, except what follows in this note, will be made.

In the scheme of division, pursued in the example here given of an encyclopædical tree, this property will, it is believed, be found actually possessed, and that by every branch without exception. But among the *trivial* or *current* names, which, in the character of synonyms to the names of the branches of the tree in its encyclopædical form, have for illustration been introduced, some may perhaps be found, whose claim to the possession of this property may not present itself as exempt from dispute. This deficiency, in respect of *preciseness*, is among the unavoidable results, of the indeterminateness, which will, in so many instances, be seen to be attached to the names in common use.

Properties may receive explanation from their opposites. *All-comprehensiveness* may be said to have for its opposite, *scantiness*; *preciseness*, *extravasation*.

* For this diagram see Table IV.

† Viz. if it be an individual, the same individual—the same in all its parts; if an aggregate, an aggregate composed of exactly the same individuals, neither more nor less.

The portion of *time* in question must also be, in both instances, exactly the same; for it may be that, at one time, the individual is possessed of the property in question; at another time *not* possessed of it.

‡ If, so far as it goes, the account *here* given of *contradictories* is correct and clear, that which may be seen given by the Aristotelian logicians will hardly be found in complete possession of either of these desirable qualities. Only between *assertions*, surely, can *contradictoriness* have place: yet, by Saunderson, it is spoken of as having place be-

An example may here perhaps be required. Turning to the Encyclopædical tree (letter-press or diagram) take then for the *dividendum*, viz. the *trunk* or *major aggregate*, the branch of art and science therein denominated *Posology*, but commonly called *Mathematics*. It having been proposed, in an *all-comprehensive* and distinct manner to divide this *major aggregate* into two *minor aggregates*, exhibited in the character of *branches*, a *property* was looked out for, which, being possessed by every individual object comprehended in the *major* aggregate, as also by every individual in one of the two aggregates into which the major aggregate was to be divided,—and at the same time *not* possessed by any individual *not* comprehended in that same minor aggregate,—might, for the purpose of distinguishing each of the two minor aggregates from the other, serve in the character of a *distinctive property*. In the property of bearing relation to *form*, or say *figure*—i. e. in the property of taking for its subject *form* or *figure*—a property which seemed capable of being employed in the character of a *distinctive property* was found. Of the two *minor* aggregates, into which, by this means, the *major* aggregate, *Posology* or *Mathematics*, was divided; *form-regarding*, or *figure-regarding* Posology or Mathematics, in *Greek-sprung* language, *Morphoscopic Posology*, was the name given to the *positive* minor aggregate: this done, the name of the *negative* minor aggregate was thereby determined and given, viz. *form-not-regarding*, in *Greek-sprung* language, *Amorphoscopic* Posology, or, to exclude ambiguity *Alegomorphoscopic*.

But, in that portion of the matter of discourse, which in the Table, is employed for giving expression to these two *minor* aggregates, in the character of branches of the *major* aggregate, of the division of which they are the *immediate* results, is contained the import of the above-mentioned *formula*, brought to view under the name of the *contradictory formula*. The division, of which they are the results, is therefore, at the same time *all-comprehensive* (or say, *exhaustive*) and *distinct*. It is moreover *instructive*: for, in and by the terms of it, the *all-comprehensiveness* and *distinctness*, which really belong to it, are declared. Speaking of propositions, delivered on the subject of *Mathematics*.—*This proposition does regard figure.*—*This proposition does not regard figure*; of no one *proposition*,* delivered on the subject of Mathematics, will these two contradictories be found, both of them, to hold good: and if, of all the *propositions*, which *do* thus regard *figure*, one branch of Mathematics be (and there is nothing to hinder it from being) composed, and if of all those which do not thus regard figure, another, and the whole of that other branch, be composed; here we have two branches, in one or other of which every conceivable proposition belonging to mathematics will be found to be contained.

For each one of these *minor* aggregates or branches, when in the character of a *major* aggregate, in pursuance of the divisional process, it came itself to be divided, in lieu of, or at least in addition to, the *many-worded* appellative, which, in its character of a *branch*, is, in the first instance, employed to designate it, there should be a *single-worded* appellative. In the words *Geometry* and *Arithmetic*, two words in current use presented themselves as being,—and that without any violence done to their established imports,—capable of being employed in this character; i. e., as comprehending between them the whole of the import, which either *is*, or with propriety *can be*,

tween two *terms*. Of the two above-mentioned *axioms*, which have *contradictories* for their subject, it has been seen how well they correspond.—Yet, by Saunderson, one of them, viz. the one last mentioned, is represented as applying to *terms* alone,[a] nothing being therein said of *propositions*: the other, as applying to entire propositions alone,[b] nothing being there said of *terms* and of these axioms, that which is applied to terms alone, instead of constituting a rule of itself, is, in the form of a *parenthesis*, sunk as it were under the head of another rule, which seems far from equalling it in clearness.—Though really derived from the Aristotelian logic, the account here given of *contradictories* not being exactly conformable to the account given in that system,—what difference there is between the two accounts might, but for this warning, be liable to be, without further scrutiny, supposed to be the result of misconception.

To obviate any such supposition, it seemed necessary thus to give a brief intimation, of the considerations, by which the departure here made from the authoritative standard seemed necessitated. Could room have been spared, other supposed imperfections in the Aristotelian account of the matter might here have been pointed out.

[a] Logicæ Artis Compendium, p. 40. [b] Ib. p. 72.

* [*Proposition.*] Note, that the sense in which the word *proposition* is here employed, is not that in which it is commonly employed by *Mathematicians*, but that in which it is employed by *Logicians*. If the former were the sense put upon it, the *distinctness*, here ascribed to the two branches, might not be very readily recognised, if, indeed, it would really be to be found. So apt are mathematical men to go backwards and forwards, between the *geometrical* and the *algebraical* mode of expression, according to the supposed convenience of the occasion and the moment, in a manner as it were mechanical, and almost without notice taken of the difference,—what may very well happen is, that of what may, in the mathematical sense, be one and the same *proposition*, in one part *figure* may *be*, and in another part *not* be, an object of regard. But, because two things are capable of being mixed together, it follows not that in their own natures they are not distinct: and, taking the word *proposition*, in the *logical* sense, scarcely will it be said, that, in one and the same *proposition*, the matter is spoken of at the same time in a Geometrical and in an Arithmetical point of view,—spoken of *with* reference to figure, and *not* with reference to figure at the same time.

comprehended in the import of the word *mathematics:* with propriety, *i.e.* without outstretching* the most extensive import, for the designation of which that appellative has ever been employed.

On this occasion, the pair of names, which, for these two branches of mathematics, have, on this occasion, been, in the *first* place, *brought to view*, are the two newly-devised *many-worded* ones. But the pair of names, by which *those* names, and the relation of which they are expressive, were, in the first instance, *suggested*, are the two old-established *single-worded* ones. *Geometry* and *Arithmetic*, considered as branches of art and science, in what particular, it was asked, do they *agree?* The answer was obvious enough:—as being, both of them, branches of *Mathematics*. So far so good. But, forasmuch as they are not the same branch, in what is it that they differ? Of a survey taken of the contents of each, with a view to this question, the result was *that*, to which, as above, the pair of *many-worded appellatives* have given expression. In one of them *figure* is regarded; in the other, *not*.

Now then, thanks to the Encyclopædical names,—of the two trivial names, viz. *Geometry* and *Arithmetic*, which are in use to be employed in the designation of these two branches of mathematical art and science, the *all-comprehensiveness*† will, it is believed, be readily enough, and generally enough recognised: nor will the *distinctness*,‡ it is believed, be found to be in any greater degree exposed to dispute.

At the same time, in regard to *instructiveness*, as above explained, the utter absence of this quality will, in the instance of both these trivial names, be found, it is believed, equally manifest: and thence it was, that, as soon as it did present itself, it was in the character of a sort of *discovery*, that the coincidence of these two imports, with the imports of the two many-worded appellatives to which they are here stated as being respectively synonymous, presented itself:—and, in this same character, howsoever it may be in the case of *an adept*, in the case of many a learner, there seems little doubt of its presenting itself.

Of the nature of the *contradictory formula*, the explanation above given will, it is hoped, be found tolerably intelligible. Its capacity of serving, in the character of a *test* of *all-comprehensiveness* and *distinctness*, in a logical division, will also, it is hoped, be recognised. In the formation of the Encyclopædical appellatives employed in the Table, this test will, in several instances, be seen actually and explicitly employed, included as it is in the composition of the words themselves. Other instances, however, there are, in which it is not thus employed. In the production of this omission, two considerations, whether sufficient or not, concurred: one was—that, by the employment of the two epithets, *both* in the positive form and independent of each other, instead of no more than one positive one,

* [*Out-stretching*] See above, Note ‡ to p 102.

† [*All-comprehensiveness.*] True it is, that, to the purpose of its being regarded as *all-comprehensive* (this division of *Mathematics* into *Geometry* and *Arithmetic*) it is necessary that, under *Arithmetic*, *Algebra* should be considered as comprehended. but about this there cannot be any difficulty, since, by Newton (as appears by his work, entituled *Arithmetica Universalis*,)—by Newton and so many others—it is spoken of as thus included.

True also it is—that, to this same purpose, it is equally necessary that, under *Algebra*, *Fluxions*, which, on this supposition, might, in the many-worded form, be denominated *Fluxional Algebra*, should be considered as included. But upon consideration, neither in this case, it is believed, will there be found any serious difficulty. Applicable, with equal propriety, to *Fluxions*, as well as to whatever part of Algebra cannot be brought under the denomination of *Fluxions*, will be found the appellative *Agnosto-symbolic* Agnosto-symbolic, i. e. *expressed by signs unknown*, by *signs*, of which, in the first instance, antecedently to the solution of the problem the value and import is not known—known in the same degree of clearness as those of which the written language, peculiar to *common Arithmetic*, is composed.

This division of *Algebra*, into *common* and *fluxional*, would any one wish to see it expressed in the language of the *Encyclopædical tree?* In the solution of this logical problem there would not, it is believed, be found much difficulty; and by this means an exemplification may be afforded of the method in which, in any given part of it, the process by which these first lines of the Encyclopædical tree have been constructed, may at pleasure be carried on to any further length.

For distinguishing *Fluxional* from *Common* Algebra, take, for the distinctive property of *Fluxions*, the fiction by which in this case, for the production of the quantities in question,—for the *genesis* or *generation* of them (to use the language of Mathematicians)—*motion* is supposed. If this assumption be admitted as correct, *Algebra* being taken for the immediate *trunk*, here then we have,—for the *positive* branch *Cinesiopseustic*, *(motion-feigning;)* for the *negative* branch, *Acinesiopseustic (motion not feigning.)* By him, by whom, being considered in the *Newtonian* point of view, the subject of the branch in question is accordingly treated of in the *Newtonian* language, the propriety of the denomination thus proposed for the positive branch, will not, it is believed, be considered as being exposed to dispute. Whether for the same branch, or at any rate the correspondent branch, if considered in the *Leibnitzian* point of view, and in the Leibnitzian language, (*that* being the language mostly employed on the Continent,) styled the *Calculus differentialis et integralis*, (in French, *Calcul differentiel et integral*,) the same Encyclopædical *division*, with or without the same *nomenclature*, would, and with equal propriety might, be made to serve, is an inquiry which stands too wide of the present disquisition to be endeavoured to be comprised in it.

‡ [*Distinctness*] See above, p 101, Note, on the word [*proposition*]

with the correspondent negative, a greater quantity of instruction might, in a given compass, be conveyed: the other was—that, in some instances, doubts seemed to hang over the question, which of the two contradictory properties should be presented in the *positive* form; which in the negative: and, on whichever side the determination might happen to fall, for explaining the grounds of such determination, more words might become necessary than could well be spared. Of the plan of nomenclature here pursued, the characteristic property accordingly is—*not* that, in the composition of either name of the pair, the criterion in question—the sign of the contradictory formula—has in every instance been *actually* employed; but that, in the character of a *test* of the all-comprehensiveness and distinctness of the division, in the expression of which these names have been employed, a pair of names, in one of which this sign is employed, may, without misrepresentation, in every instance in which it has not been thus employed, be added or substituted.*

Of the lights, which the nature of the work admits of and requires, the Encyclopædical names thus provided, though they are the only *instruments*, are not, it should be observed, the only *objects*. Other objects, for the illustration of which the demand, as being much more general, is accordingly still more urgent, are those *current* names, examples of which have just been brought to view; and which, wheresoever they could be found, have been sought out, and put by the side of those Encyclopædical names, with the imports of which their respective imports seemed to approach nearest to a coincidence.

Unfortunately, that this coincidence should be perfect, is in many instances plainly impossible: such it will be seen to be in every instance, in which the import attached to the current name is in any degree *indeterminate;* and the further this import is from being determinate, the further will the agreement be from amounting to a perfect coincidence. Unfortunately, again, these instances are at present but too numerous: of one of these mention has already been made; and, without need of looking elsewhere, among such of these names as are comprehended in this Table, other instances will, it is believed, be found observable.

To the satisfaction of the reader, that, in so far as it has place, observation of the impossibility in question should be taken, is highly necessary: otherwise, where everything has been done that can be done, it may appear to him that nothing has been done. To give determinateness to the import of an appellative of his own framing depends upon the author; not so as to that of any of those which he finds already made. Towards effecting that coincidence, which, as above-mentioned, is so highly desirable, all that depends upon *him*, is, in the first place, to give to the appellatives of his own framing that degree of determinateness which the nature of the case admits of; and, in the next place, among those which he finds ready made, to choose for synonyms to those of his own making, such trivial names, the import of which appears, upon the whole, to come nearest to that of his own, being at the same time, if in any, in the smallest degree indeterminate.

For securing determinateness to those of his own framing, the established logical expedient of the *distinctive property* afforded to the author of this Table an effectual means: for choosing out of the existing stock of trivial names such as should stand least exposed to the imputation of indeterminateness, no equal security could be afforded by the nature of the case.

In this way, though by no direct and immediate means can determinateness be given to the import of those current names, of which at present the import is indeterminate, yet in time, and by means of the instrument of fixation here brought to view, an object so desirable may gradually perhaps be accomplished. By the supposition, a standard of comparison and reference will have been set up; supposing it to be what it is intended to be, and, in the nature of the case, well capable of being made, supposing it to be in itself clear, and as near as may be to the range of the variable one, conformity to this standard will be found matter of general convenience; and in proportion as the fixed import comes to be adopted, the varying one, in all its variations, will drop out of use.

What if, in this way, and by these means, the import of all words, especially of all words belonging to the field of Ethics, including the field of Politics, and therein the field of Political Religion, should one day become fixed? What a source of perplexity, of error, of discord, and even of bloodshed, would be dried up! Towards a consummation thus devoutly to be wished, there does seem to be a natural tendency. But, ere this auspicious tendency shall have been perfected into effect, how many

* Thus it is, that, in every instance, the proposed *test*, and the capacity of the division to endure the application of it, have been kept in view. The difference is—that, in some instances, in the composition of the appellatives in question, the application of this test has been actually made—made by the author himself,—in other instances left to the reader. If, in the eyes of any student in logic, this work should happen to find favour, the application of this test would, it is believed, be found capable of affording him a not altogether uninstructive exercise. But if, by the mere use of this instrument, in its present shape, instruction may thus be gained, much greater is the degree of instruction capable of being gained by the endeavour to improve upon it: and with whatsoever degree of success it may happen to any such endeavour to be attended, any labour thus employed, he may be well assured, so far as instruction to the labourer himself is a gain, will not be lost.

centuries, not to say tens of centuries, must have passed away!

All this while, on the nearness of the approach made to a perfect coincidence, depend the strength and utility of the mental light capable of being reflected upon each other's import, by the two denominations, the *Encyclopædical* and the *trivial*. Hence comes the need of a *memento*, to which expression may be given by the following rule.—For determining the contents of the two *branches*, into which the *trunk* in question is to be divided, look out for that *distinctive property*, by the application of which such a pair of branches shall be produced, the imports of which shall come as near as possible to the imports of the two appellatives already in current use.

Of the above rule, in no instance will any neglect be followed by impunity. He who, taking up a word, gives a definition of it, issues thereby a requisition, calling upon as many as read or hear of it, to use the word in that sense. Let the word thus defined be a word of a man's own creation, in this case, if so it be, that for this new-invented instrument an adequate use can be found—provided also that the newly-attributed import is not contradictory to any import already attached to it,—if both these conditions are fulfilled, then so it is that for any expectation he may happen to entertain of seeing the requisition generally complied with, a substantial ground has been laid. On the other hand, if it be a word in common use, in that case, if the import thus newly endeavoured to be attached to it be to a certain degree at variance with common use, the consequence is—what!—that, against the sort of *law*, which he is thus taking upon himself to enact, he finds (nor is there any reason why he should not find) as many *rebels*, as there are persons, by whom, in its old established sense, the word has been in use to be employed.

Fixation, yes: this may be endured: comparatively at least, the thing is not difficult: the use is manifest. *Substitution*, no: the difficulty is extreme; and that difficulty not atoned for by any the smallest use.

1. Define your words, says the capital rule, laid down, and so much insisted upon, by *Locke*.—Yes: define your words.—But, in addition to this rule, a subsidiary one there is, the demand for which will, it is believed, be scarcely found less imperative.

2. In defining a word, if it be a word in current use, be it your care, that the import you are thus endeavouring to attach to it, be not only *determinate*, but as near to the *current* import, as a determinate import can be to an indeterminate one.

In the character of a distinguishable addition to the mass of instruction afforded by means of the *contradictory formula*, may perhaps be mentioned the series of those *definitions*, which thus in substance, and almost in form, presenting themselves at every joint, give to the whole system a degree of precision and compactness, altogether incapable of being infused into it by any other means. So many pairs of *branches* or *minor aggregates*, so many pairs of *definitions: major* aggregate, at each joint, a *genus*. its two immediate branches the two *minor* aggregates, its *species*· the *distinctive property*, with its negative, the two *specific* or *differential characters*. To this advantage a brief reference has been already made, viz. in the section (§ 9.) in which the particular characters of the Encyclopædical tree are brought to view.*

Such being the advantages, indicated by the terms *all-comprehensiveness*, *distinctness*, and *instructiveness*, as applied to a scheme of logical division,—in the next place comes the question—in what way, if in any, is the existence of these advantages attached to the use of the *bifurcate*, as contradistinguished from the *multifurcate* mode?

To this question the answer has probably, in the mind of many a reader, already presented itself. To the *bifurcate* mode alone, to the *bifurcate* mode, and not to the multifurcate, is the test of all-comprehensiveness and distinctness, viz. the *contradictory formula*, applicable.

After the explanation above given, exists there any person, in whose eyes, when compared with the *bifurcate*, the multifurcate mode would be preferable? To a tree, or any part of a tree, once constructed in the *bifurcate* mode, might be substituted a tree constructed in the multifurcate mode, without trouble and almost without a thought. Throw out the Encyclopædical names, put together the current names—the thing is done. The plan of division pursued, suppose it all along all-comprehensive and distinct, the all-comprehensiveness and the distinctness would, after this change,

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* [*Definitions.*] These definitions present themselves naturally in the character of *answers* to so many *questions*, which, in a course of instruction, administered in the mode now so well known by the name of the *interrogative* mode, might be applied to the matter of any such scientific tree And thus, pursuing the phraseology, as well as the method applied in the *National Society* Schools to the *Church-of-England Catechism*, we have the matter of the *tree of art and science* "*broken into short questions.*" In what degree soever, on the superior ground of importance the matter of this Encyclopædical tree may fall below the matter of that consecrated formulary, on the ground of facility of intellection it will scarcely be thought to yield to it.

1. What is Mathematics? *Answer.* The branch of art and science which has for its subject *quantity*.

2. What is the Encyclopædical name for Mathematics? Answer. *Posology*.

3. What is *Geometry*, expressed in the Encyclopædical language? Answer. *Morphoscopic Posology*.

4. What is *Arithmetic*, expressed in Encyclopædical language? Answer. *Alegomorphic Posology*.

To the above will be added, of course, the questions adapted to the extraction of the requisite ulterior explanations But of these the above sample will, it is believed, be found to suffice.

remain to the matter as expressed in the multifurcate mode; but the *proof* of its being *all-comprehensive*, the *proof* of its being *distinct*, and the *instruction* afforded by the language by which this proof is expressed, all this would be gone. After these deductions made, by this means, out of a system constructed and exhibited in the *bifurcate* mode, you might have remaining a system equally good, constructed, or at least *exhibited* in the *multifurcate* mode. Constructed? Yes; but in what manner? Exactly in the manner in which, in his oration given to an audience of *Shoemakers*, *Orator Henley* showed them how, by one man, a gross of *shoes* might be made in a day: viz. by cutting them out of a gross of *boots*.

Of this conversion the converse would not be altogether so easy. Nor indeed, without addition, supposing the multifurcate tree to be, in any one of its ramifications, less than all-comprehensive, would it be possible. On the opposite supposition, however, i. e. if in every one of its ramifications it be supposed to be all-comprehensive, the converse would be possible. Of the required *bifurcate* tree, the matter would, on this supposition, *in part*, though only in part, be given; and, as to the mode of filling up the deficiencies it has already been explained, and may be seen exemplified in the Table.

Of a division, which in the article of *all-comprehensiveness*, is *deficient*, an example, should any person be desirous of it, may with equal facility be extracted from the same Table. Take, for instance, *Natural History* · branches, upon the multifurcate plan, supposing it in the execution all-comprehensive, *three*, viz. *Mineralogy*, *Botany*, and *Zoology*. Suppose any one of them left out, thus, instead of the *all-comprehensive* division, you have an imperfect,* or, as Euclid might have said, a *deficient one*.†

That, for obtaining a clear, correct, all-comprehensive and commanding view of the contents of any logical aggregate or whole, *bifurcate*, in contradistinction to *multifurcate*, is the only adequate mode, another consideration may perhaps help to satisfy us. Of two objects, and no more, can the eye of man, (whether it be of the bodily and real, or the mental and fictitious organ, that the word be understood as designative,) obtain any usefully distinct view at the same time. Vibrating, as it were, between the two; and at each vibration, *applying* (as *Euclid* might have said) to the *impression* made by the one, the still vivid *idea*‡

* Of an imperfect division, *Watts*, in his Logic, undertakes to give an example. But on this occasion he seems not to know very exactly what he is about. The sort of *aggregate*, which belonged to his subject, was a *logical* aggregate—a *genus* · such as this Table exhibits in every part of it. The sort of aggregate which he employs for his example is a *physical* aggregate:—an *individual*—any individual of the genus *tree*. The division which he gives, as an example of an imperfect one, is that of a *tree* into *trunk* and *leaves*. What in his view renders it an imperfect one, is but the want of mention made of *root* and *branches*. Not to speak of other parts, two much more important deficiencies are, the want of *flowers* and *fruit*. But the lights struck out by *Linnæus*, had not as yet shone upon the field of *Physiurgics*.

Immediately afterwards, he takes up, indeed, a *logical* aggregate: viz. *Logic* itself. But, for want of some words, perhaps, that were necessary to complete the expression, instead of light, the result is thicker darkness *Logic*, he supposes, divided into *apprehension*, *judgment*, and *reasoning*. This division gives us another example of an incomplete one: for, to render it complete, *method*, he says, should have been added · of the *art* in question (meaning *logic*,) *method* (he says) is a considerable part. Be it so: but *apprehension*, is it also an art? No, surely. Of the art and science of logic it may be taken for one of the *subjects* ·—true.—but itself it is neither *art* nor science. Thus, confounding the *subjects* of an *art* with the *art* itself, what he gives as an example of the division of a logical aggregate, is—a division of it into four parts, of which no more than one can, with any sort of propriety, be spoken of as a part of that same whole. No; nor even *that*, without a force put upon the import of the word. To express a species of *art*—to express an *operation*—*methodization*, not *method*, was the proper word: *method* is—not the *operation* itself, but the *result* of it.

† Elements, book vi. p. 28.

‡ *Impression*—viz. the effect produced in the mind, at the very time when the object, which is the source of it, being present to bodily sense, is actually the object of the faculty of *perception* — *idea*—viz. the effect produced when the object, not being so present, is—or rather the impression made by it as above, is—the object of the faculty of *memory*. The first writer, it is believed, by whom this distinction, so necessary to every clear and correct perception of the phenomena of the human mind, was held up to notice, was David Hume. A consequence is—that, where *observation* is made, of the existence of this or that *relation*,—and, on that occasion, *comparison*, as above, is spoken of as being made, or *distinction* as having place,—if the number of the objects in question is greater than *two*, he, who has to speak of the *relation*, the *comparison*, or the *distinction*, finds himself in a very awkward dilemma. By the preposition *among*—it being scarcely in use for this purpose—scarcely is the import in question presented to view. Comparison of object *with* object, yes: comparison *between* object and object, yes · comparison *between* objects, yes: comparison *among* objects—comparison, for example, *among those three objects* —scarcely: So as to *relation*. Relation of object *to* object, yes: relation *between* object and object, yes: relation *between* objects, yes relation *among* objects—relation *among these three objects*—scarcely. And so, in the instance of the word *distinction*. In these cases what shall be the word employed? —Shall it be the word *among*? Scarcely is the import conveyed · or, if it be, it is not without the idea of impropriety for its accompaniment, that the conveyance of it is made. *Comparison*, *relation*, *distinction*, among these three?—scarcely will any such phrase be endurable. Shall it be the word *between*? *comparison between three*? *relation between three*?—the hue of self-contradictoriness

of the other, one by one it *can* compare them; but if any greater number, say *three*, be presented to it at the same time, then so it is, that, for any such purpose as that of obtaining a perception of those reciprocal points of coincidence and diversity, ere it can bestow upon them a steady and persevering consideration, it will find itself under the necessity of dividing them, in the first place, into *two* lots; in one of which it will place one of them, and in the other lot either it will place one alone of the two remaining objects, or if both, then, for the purpose of comparing the other object of the comparison, the *two* will be put together, and, by conjunction in the same lot, be in imagination reduced to *one*.

Endeavours are used (suppose) to consider and compare all three at the same time. What will be the consequence?—that, while any two of them are thus kept in comparison, the third, before any clear and decided judgment can be formed in relation to these two, will be obtruding itself. Confusion will thus ensue: and a necessity will be found of recommencing the comparison: and so *toties quoties*.*

One word more on the subject of *instructiveness*. In the exhaustively bifurcate mode,—in and by means of the ramified chain of virtual definitions which have been brought to view,—at each joint a pair or rather a triplet of *relations*, has been brought to view: viz. the relation of each *minor aggregate* to the immediate *major aggregate*, and the relation of each *minor aggregate* to the *other* · the two first, relations of *identity* and *coincidence*; the third, a relation of *diversity* and *separation*. But, of every object of the understanding, be it what it may, the nature is the more thoroughly known, the greater the number is of those *relations*† which it is seen to bear to *other* objects: and, were it only in virtue of its being *an object of the understanding*, every such object bears some *relation*—in truth a multitude of relations to every other. By *Algebra*, whatsoever riddles are solved, are solved—whatsoever is done, is done—by the converting of this or that *unknown* quantity into a *known* one: a conversion, which neither is, nor ever can be, effected in any other way, than by means of a *relation* which it bears, viz. the relation termed the relation of *equality*,‡ (which, in a case that affords nothing but *quantity*, is the same as the relation of *identity*,) to such or such other quantity or quantities, which were known already.

No object is known, but in so far as its *properties* are known: and, for every property, the manifestation of which depends upon any other object, a correspondent *relation* between

presents itself upon the very face of the phrase. By one of the words in it, the number of the objects is asserted to be *three* · by another it is asserted to be no more than *two*.

Be this as it may, the confirmation which, from this particularity in the language, though it should be found to be in no more than one language, the notion in question receives, seems equally manifest. To the use thus exclusively made of the word *between*, what could have given rise, but a sort of general, howsoever indistinct, perception, that it is only *one to one* that objects can, in any continued manner, be commodiously and effectually compared.

* On the very face of the portion of language, with which the hand of custom has covered this part of the field, may be seen a testimony—nor that a weak one—in favour of the conception thus hazarded. *Distinction between* is the phrase, not distinction *among* · *comparison between*, not *comparison among*.—Why?—*Answer*. Because it is only *between two* objects that any clear *perception* of distinction can be obtained at the same time·—because to no greater number of objects than *two* can the *faculty* and correspondent *operation* of *comparison* be applied at exactly the same point of time.

Many, in a word, are the occasions on which,—it being supposed that of certain objects a survey is to be taken, and that survey a *conjunct* one,—it will be found, that, of the two words here in question, viz. *between* and *among*, it is the former only that can with propriety be employed: and, besides these just mentioned, on many others, if not on all occasions, will the like testimony, it is believed, be seen to be afforded.

The truth is—that, on this ground, the English language labours under a defect, which, when it is compared in this particular with other European languages, may perhaps be found peculiar to it. By the derivation, and thence by the *unexcludible* import, of the word *between*, (i. e. *by twain*,) the number of the objects, to which this operation is represented as capable of being applied, is confined to two. By the Latin *inter*—by its French derivation *entre*—no such limitation seems to be expressed.*

† [*Relations .. to other objects.*] When first penned, the passage stood as follows:—"*It is only by means of such relations as it bears to other objects, that any object can be known.*" .. Without explanation, this (it might have appeared) would have been going too far: for, supposing the object in question to contain *parts*, on this supposition the relations which it bore to other objects would not comprehend more than a portion of the whole number of relations of which it was susceptible: in addition to them, there would remain the relations borne to each other by its several *parts*. The only supposition, therefore, on which the position thus discarded would be strictly true, is this, viz. that the subject of it is an *atom*·—an object too minute to be divisible into parts. On this supposition, if deduction were made of all relation, borne by this atom to objects exterior to itself, after such deduction there would not remain any relations at all. For in the very import of the word *relation*, two objects at least, between which it is considered as having place, are comprehended. No *powers*, for example, could the *atom* have: Why? Because no subject would it have to operate upon.

‡ Hence the term *equation* applied to algebraical propositions.

* To the *Greek*,—the set of *prepositions* which that language furnishes being wretchedly ambiguous, unappropriate, unexpressive,—in vain, on such an occasion, could any reference be made.

the two objects must be acknowledged to have place.*

Section XIII.†

Exhaustiveness, as applied by Logical Division —the idea whence taken—Saunderson's Logic —Porphyrian or Ramean Tree—Hermes.

To the author of these pages, the first object by which the idea of *exhaustiveness*, as applied to *logical division*, was suggested, was a chapter of Saunderson's Logic, which has this operation for its subject. Much about that *same* time, viz. some four and fifty years ago, on the occasion of a set of College-Lectures, in which that book of Saunderson's was employed as a text-book, the copy of it, now lying on the table, received in manuscript a copy of a diagram of a logical tree, therein called *Arbor Porphyriana*—the Porphyrian Tree—exactly

* *Caution, to prevent that misconception, by which* Aristotle, *after bewildering himself, kept the thinking part of the world bewildered for little less than two thousand years—by which he put out the eyes of the otherwise powerful mind of* James Harris—*and which, by* Bacon *and* Locke, *has scarcely ever yet been completely done away.*

Lest, to the instrument here employed, viz. the *contradictory formula*,—employed as here in the character of a *test* of, and *security* for *all-comprehensiveness* and *distinctness*, in a logical division,—any extraordinary powers, beyond those which really belong to it, should be ascribed—lest, by being employed in the composition of propositions wearing on the face of them the form of *demonstration*, a degree of conclusiveness, independent of *observation* and *experiment*, and superior to anything which by means of those instruments of knowledge can be produced, should be supposed to be attainable,—this caution is subjoined:—a caution, which, however, to those who by an adequate conception of, and a sufficient attention to, the discoveries made in the region of mind by Bacon and Locke, have learnt to recognise the emptiness of the Aristotelian philosophy, will at the utmost be no more than a *memento*.

Yes, upon *observation* made of individual *perceptions*, and upon the correctness with which it has been made, and the judgments grounded on it deduced, will depend, in every instance, the truth of whatsoever propositions of a *general* nature can, upon that part of the field of thought and action, to which these same individual perceptions and judgments appertain, be framed and delivered.

By general words, a truth, in so far as ascertained by individual observation, may indeed be *expressed*: but, it is not by stringing together general words, be they what they may, or in what number they may, that truth can be *proved* i. e. that sufficient ground for regarding any one of these propositions as true—any of the properties in question as really appertaining to the subject in question—can be afforded.

Of the formulary, here proposed in the character of a *test* of *all-comprehensiveness* in the division to which it is applied, what then is the real function and use?—*Answer.* To point the attention of the reader to the individual matters of fact, on which the possession of this property depends: to point the attention to them, viz. by the means of a pointed form of words, by which the existence of them in all the individual subjects in question is asserted in explicit terms.

That all *living bodies*, (turn here to the Ramean tree, Table IV.) that all *living bodies*, other than those that are *sensitive*, are *insensitive*,—this, for example, is what can be neither denied nor doubted of.—Why? Because the assertion thus brought to view has, in truth, for its subject, nothing more than the import of certain words, compared with certain others:—words, the import of which is on both sides fixed by universal usage

But that all the *living bodies*, which are called *animals*, are *sensitive*, i. e. possess the property of sensation,—of this proposition the truth depends upon individual observation: viz. partly upon the observation, that bodies, which at first view have been supposed to possess sensation, have upon further observation and experiment been found to give further indications of that property; partly upon the observation, that,—in whatever instance body has been found or supposed to be possessed of that same property,—*animal*, and not *plant*, has, of these two correspondently extensive names of classes, been the name to which it has been wont to be referred, as well as the name by which, in common language, it has been wont to be designated.

Of these two observations, the first is an observation relative to the *nature of things*; and the field it belongs to is that of *Natural History*: the other is an observation relative to the *import of words*: i. e. relative to the usage which, among that portion of the human species, by which the language in question has been employed, has obtained in respect of the *things*, or real objects, for the designation of which the *words* in question have been wont to be employed; and the *field* it belongs to is that of *Language*.

It was by fancying that everything could be done, by putting together a parcel of phrases, expressive of the respective imports of certain *words*, mostly of certain *general* words, without any such trouble as that of applying *experiment* or *observation* to *individual things*,—that, for little less than two thousand years, the followers of Aristotle kept *art* and *science* nearly at a stand.

In the present instance, what may be seen is—that, already, in whatsoever may have presented itself in the character of a *demonstration*, among the *data* of it, the existence of the property, the existence of which is the object of such demonstration—the existence of that property in the *subject* in question, viz. in the *division* in question—is virtually assumed. In and by the remainder of the process—in and by the demonstrative part itself—what then is it that *is* or *could be* done? Nothing more than to show, that to the two *branches* or *minor aggregates* in question that *formula* is truly applicable, which, wherever it is found to be truly applicable, is received,—or at any rate is fit to be received,—as a compendious *indication*,—and, in so far as the individual assertions included in it are *true*, i. e. agree with the nature of *things* on the one hand, and the usage of

† For further elucidation on the subject of this and the succeeding sections, see the subject of division, as treated in the work on Logic in this volume.—*Ed.*

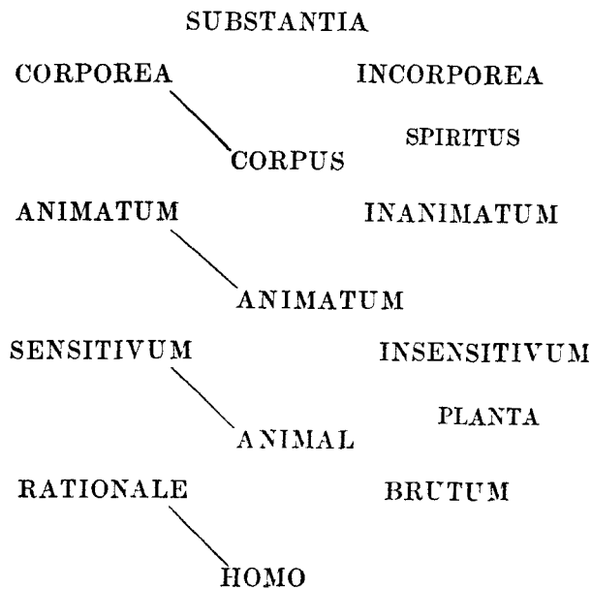
TABLE IV.

ARBOR PORPHYRIANA, *seu potius* RAMEA:

Being a Diagram, contrived for exhibiting at one view the principal Divisions of the Aggregate Mass of real Entities, as designated by the word *Substantia*, employed by the Latin Logicians, in imitation of their Grecian masters, as the name of a correspondent *Genus*, styled the Genus Generalissimum: such Divisions being designated by their several *single-worded*, *trivial*, or *current* names; preceded by their several *many-worded* names, herein termed *Encyclopædical* names, by which are expressed the mutual relations borne by one to another of the several assortments of objects so denominated: such assortments being the results of the several corresponding divisional operations, to which the matter of the whole Aggregate Mass has been subjected. N. B. 1. This Diagram exhibits the earliest example known of a system of Logical Divisions, executed in the *exhaustively-bifurcate* mode, with the test of exhaustiveness applied to each joint or ramification; such test being in each instance expressed in and by the denomination given to the *negative* one of the two *branches* or *minor aggregates*.—N. B. 2. Of the system in question, an explanation is given by PORPHYRIUS, one of ARISTOTLE'S Commentators, in his *Isagoge*, i. e. Introduction to the *Organon* of ARISTOTLE, as it stands in the edition of those same works, printed at *Frankfort*, anno 1597. To the Letter-press is there attached a sort of Diagram (p. 9); but, darkness rather than light being the effect of it, it is not here inserted.—N. B. 3. As to the word *Genus*, considered as one single object, the object designated by it is a *fictitious* Entity: although the individuals, to the designation of each of which it is applicable, are so many *real* Entities. Concerning this Diagram, see Chrestomathia, Appendix, No. IV. pp. 110–112.

No. I.

The ARBOR PORPHYRIANA *in its original form*, being the forms in which it was transcribed from the copy exhibited in the course of a College Lecture, delivered, Anno 1761, at Queen's College, Oxford.



NOTES.

Explanatory of the Differences by which this amended Form, No. II., is distinguished from the original Form, No. I., together with the Reasons of those Differences.

[*Planta—Vitale—Vivum—Animatum*] 1. Taking for the subject the aggregate here in both forms, designated by the word *Planta* (*Planta*, the name of the logical *genus* in which all *individual* plants are included) to the application made of the word *vivum*, as designative of the *superior genus* or *major aggregate*, in which this *inferior genus* or *minor aggregate* is included—to the application made of this word in the character of a substantive, together with the corresponding word *vitale*, in the character of an adjective, as in No. II., there seems no objection: not so in regard to the word *animatum* employed in the original Diagram, No. I.

2. Compared with *vitale*, *vivum* presented itself as having, in this as in the other instances, the advantage of varying the sign, where the object to be designated is different: it moreover seemed rather better adapted than *vitale*, to the purpose of officiating in the character of a *substantive*.

3. In the original Table, the use which, in this one alone of the four ramifications, is made of one and the same word, for the expressing of two different objects, viz the objects designated by the two different parts of speech, a *noun adjective* and a *noun substantive*, presented an anomaly, which, by the substitution of the word *vitale*, for the one purpose, while the word *vivum* was employed for the other, is, in the Diagram as here amended, avoided

4. In this second joint, the place for the single-worded and trivial name of the *negative* minor aggregate being in the *original* Diagram left blank, so is it in the *amended* Diagram: the language, as it should seem, not affording any such trivial name.

No. II.

The ARBOR PORPHYRIANA *in a supposed amended form*: more explicit, and supposed to be, in other respects, now somewhat improved.

I. SUBSTANTIA *est*

vel corporea, viz. *CORPUS*; *vel incorporea*, viz. *SPIRITUS*.

II. CORPUS *est*

vel vitale, viz. *VIVUM*, *vel non vitale*,

III. VIVUM *est*

vel sensitivum, viz *ANIMAL*; *vel insensitivum*, viz. *PLANTA*.

IV. ANIMAL *est*

vel rationale, viz. HOMO; *vel irrationale*, viz. BRUTUM.

in the state in which it is represented in Table IV., No. I. In Table IV., No. II., it is exhibited with some little alterations, which, on the present occasion, might serve, it was thought, to render it somewhat more readily intelligible.

In this same work of *Saunderson's*, in a list given of the commentators of Aristotle, the very first place is occupied by this same *Porphyrius*. Yet, useful as it not only is in itself, but more particularly useful as it might have been made, to the purpose of affording exemplification and illustration to some of the instructions contained in that same work of Saunderson's, in no part of that work is any reference to it to be found.*

By every eye, by which this prime and most ingenious example of logical analysis is glanced at, the divisions made by it may at one glance be seen to be, at each step, *bifurcate*. By every one who, in this point of view shall have had the patience to examine into it, it will be found to be at every such step *exhaustive*.

On the subject of *Division*, Saunderson has —for, in following out and paraphrasing the system of Aristotle, he could not fail to have— a chapter. Amongst other rules for the performance of this operation, he requires that it be *exhaustive*—that it possess this property. In that chapter, had it occurred to him to avail himself of the exemplification thus already given of this his own rule, he might have exhibited to his readers a specimen of division, which, being throughout *bifurcate*, is throughout *exhaustive*. In so doing, after causing his readers to observe, that it is *bifurcate*, he might have shown to them, in the first place, that it is *exhaustive*, in the next place, that it is by its being bifurcate that it is rendered capable of being proved to be so; and, lastly, that by the mutual contradictoriness of the two propositions, the import of which is suggested by the pair of denominations presented by each pair of branches, the proof of its being so is actually afforded.†

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language on the other,—as a commodious *test*, and *provisional proof*, though no more than a *provisional proof*, of the existence of the property in question in the subject in question: viz. in the present instance, of the property termed *all-comprehensiveness* or *exhaustiveness*, in the system of divisions supposed and asserted to be possessed of it.

It is from such truth as there is in the included *particular*—yes and even *individual*—propositions, that whatever truth there is in any more general one is originally perceived,—not *vice versâ*. A general proposition is but an aggregate of individual ones: it can only be in so far as the individual propositions contained in it are true, that in the general proposition by which those individuals are contained any truth can be to be found.

The case is—that all *perceptions* are not only particular but *individual*. In so far as it goes beyond actually existing individuals on which the actual observation has been made, every general proposition,—how well warranted soever the *induction* is by which it has been formed,—how useful soever it is when applied to practice,—and how truly soever the sensation it produces in the mind is different from that produced in the same receptacle by any one of the individual observations of which it contains the assertion,—is still but a figment—the mere figment of the imagination.

Hence—once more, and for the last time—it is only in the character of a *provisional* test that this *general* formulary is presented. In *observation* and *experiment*—observation and experiment having for their subjects *individual* objects—in these are the only *original*, and in case of dispute or doubt, the only *definitive* tests to be found.

To give to mere assertion the appearance, and for that purpose the *name* of *demonstration*, is a contrivance, invented and brought forward, probably without seeing the hollowness of it, by *Aristotle*, and which, down to the present day, either from inability or from unwillingness, to recognise the hollowness of it, polemical writers have not yet prevailed upon themselves to abstain from the use of. The proposition which a man stands engaged to support, is in its nature a self-contradictory one, and thereby a mere heap of nonsense,—expressive neither of truth nor even so much as of falsehood?—Nothing will serve him but he must give *a demonstration* of it. The more palpable the absence of all genuine instruments of persuasion, the more urgent the demand for fallacious ones.

* From the Greek of the *Isagoge* of *Porphyrius* —i. e. his Introduction to the Aristotelian System of Logic—this diagram is supposed to have been translated. But it was the Latin translation, as it stands in No. I.—a Latin translation in manuscript, and not the Greek original in print—that was put by the tutor into the hands of his pupils: nor has it ever happened to this one of them to have had a copy of it under his eye.

† Since what is in the text was written, an opportunity has been obtained of consulting the work of *Porphyrius:* and the result is—that most improperly has this diagram been ascribed to that wordy and cloudy pre-expounder of a nebulous original.

An edition of *Aristotle's Organon*, (i. e. *System of Logic*,) to which is prefixed the Introduction, ascribed to *Porphyrius*, is now on the table: it is that published by *Pacius*, with a Latin Translation, at Frankfort, Anno 1597. In the Greek there is no diagram. In the Latin alone is there any diagram.[a] But, in the Greek, what is described is—not *a tree*, but a mere *nest of boxes*, one within another. In the Latin diagram, the image presented has in it something of *a ladder*, but nothing at all of *a tree*.

The truth is—what is brought to view by *Porphyrius* is not a system of *divisions;* it is nothing more than a system of *logical subalternation*. Of the materials of the diagram here exhibited, it has not any of the *negative* branches: it has none but the *positive*. Genus Generalissimum, Ουσια. next to and within ουσια, σωμα: next to and within σωμα, εμψυχον σωμα. next to and within εμψυχον σωμα, ζωον: next to and within ζωον, λογικον ζωον: next to and within λογικον ζωον, ανθρωπος. To Grecians it will, without explanation, be manifest enough, how clumsy and incorrect the workmanship is of this *nest of boxes:* how much inferior to that of the *Latin tree:* to non-Grecians, it seems

[a] Pp. 8, 9.

Planted and firmly rooted, by the logical work of Saunderson, the conception of the necessity of the property of *exhaustiveness* to an adequate division, received, at a later period, further confirmation, as well as illustration, from the grammatical work of *James Harris*.

Upon reference now made to that work, no such word as *exhaustiveness* or *all-comprehensiveness* has been found in it; but by the word ALL, repeatedly decked out in emphatic capitals, and reinforced by the word *whatever*, together with the division made of the contents of it, by the words *either* and *or*, the idea was plainly meant to be conveyed, and was accordingly brought to view. Whether in the instance of every one, or so much as any one, of the divisions there exhibited, that quality is given to it, has not, for the present occasion, been thought worth inquiring into. What is certain is, that, for proof of the existence of that quality, neither the *test* here in question, nor any other, is there brought to view. What is also certain is, that, be they as they may in regard to *exhaustiveness*, or say *all-comprehensiveness*, in regard to *distinctness*, the divisions exhibited in *Hermes* are stark naught.

Under the name of *attributives of the second order, adverbs*—all *adverbs*,—are there given as being in their import, *distinct* from the three parts of speech following: viz. from *substantives*, for example *place* and *time;* from *attributives* of the first order, for example the pronoun adjective *this*, and from *connectives*, for example the preposition *in*. Unfortunately, to look no further, in the import of every adverb designative of *place*, and in that of every adverb designative of *time* may be found the several imports of the three several parts of speech, from the imports of which, the import of an attributive of the second order had, in that division of Harris's, been represented as distinct. Adverb of place, *here;* i.e. *in this place:* adverb of *time, now;* i. e. *in* or *at this time:* and so in regard to QUALITY, MANNER, and so forth.*

SECTION XIV.

Imperfection of the current Conceptions relatively to Exhaustiveness and Bifurcation;—ex. gr. 1. *in Saunderson's Logic.*

Of the systems of logical division, which, for one purpose or other, are so abundantly framed, and so continually observable, many there are, which, in some of their ramifications, particularly those which are the nearest to the trunk, will be seen to be *bifurcate;* nor can it be doubted, but that of these again a large proportion would, upon the application of the above test, be found to be *exhaustive:* and, lamentable, indeed, it would be, if—in those arrangements, by which, on all sorts of subjects, men's conceptions are settled and determined—a property which by all logicians, has been acknowledged to be the inseparable ac-

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scarcely worth explaining. Thus it appears, that, of this admirable instrument, scarce a trace is to be found in the work of this *Porphyrius*, by whose name it has been found designated. No ramification, no division, is to be found in it: no ramification, consequently no place for that *contradictory formula*, by which the relation of the contents of the branches, to one another and to the trunk, is so satisfactorily expressed.

Wonderful, therefore, it is, how, among logicians,—or from the pen of so much as a single logician, of the Aristotelian School,—the diagram in question should have been ascribed to this Porphyrius. The probability seems to be, that the inventor of it was no other than *Peter Ramus:* that *Ramus*, whom we have seen, and shall see again, so slightingly spoken of for the use he made of it.*

In the text of this section,[b] when, from the name under which it was handed down, the diagram was concluded to have been the invention of *Porphyrius*, it was mentioned as matter of surprise, that Saunderson had made no use of it. Though the ascription of it to Porphyrius was, as above, the result of misconception, the ground for surprise remains without much alteration. To *Saunderson* the works of *Ramus* were known, for he refers to them. By *Ramus*, what is certain is—that for the bifurcate mode of division a strong predilection was entertained, and abundant use made of it: what seems highly probable therefore, is—that the divisions, thus made by him, either, were, or were intended to be, exhaustive.

According to *Moreri*, (verbo *Ramus*) on the subject of *Logic*, (for he wrote on *Mathematical* and other subjects) the works he wrote were intitled *Institutiones Dialecticæ*, and *Aristotelicæ Animadversiones*, Anno 1543:—his books were condemned, and he turned out of his Professorship, he not being at that time more than twenty-eight years of age. Being the declared opponent of Aristotle, the wonder is how, for that time, he escaped with life.—Being moreover a Protestant, he suffered for both sins at once, being comprehended in the Bartholomew-tide Massacre, Anno 1572.

In some of our public libraries, not to speak of private ones, these works of the ingenious Frenchman—gallicè, Pierre Ramée, latinè, Petrus Ramus—would be to be found of course. What he found to say against *Aristotle* would at least be matter of curiosity, though, considering at what time of day he said it, probably not of much use.

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* The Porphyrian tree, in its usual Latin form, is found in use before the time of Ramus: *e. g.* by Boethius and others.—*Ed.*

[b] P. 111.

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* Some five-and-forty years ago was the discovery of this imperfection made. What led to it was this. Observing that, to the divisions made in that work, the quality of *all-comprehensiveness* was therein ascribed,—and concluding that accordingly, in the contents of it, matter, fit for the being represented as endowed with that quality, would throughout be to be found,—thereupon, by way of exercise, taking the text of it in hand, the author of these pages set himself the task of exhibiting it in the form of a *Ramean* tree: but, not to speak of anterior sources of perplexity, no sooner did the *test* come to be applied to the *attributives of the second order*, than the delusion vanished, and the operation was found to be impracticable.

companiment of a good and adequate system of division, and thence indisputably necessary to a complete and sufficient comprehension of the subject, were not frequently to be found.

Not very frequently, however, in giving denomination to the component parts of the division, are those names employed, those correlative and contrasted names, by which, as above, the test of plenitude is actually applied.

On this occasion three institutes of logic have been referred to: viz. *Bishop Saunderson's*, in Latin; *Dr Watts'*, in English; and the view given of the Aristotelian Logic, by *Dr Reid*, in *Lord Kaimes's History of Man*.

Of all the views that have ever been given of Aristotle's System of Logic,—concise, nervous, compact, methodical, well-divided,—*Saunderson's* would, it is believed, be found by far the best; several others, which for this purpose were taken in hand, seemed far inferior to it.

In England, at any rate, *Watts'*, as being in English, and furnished with familiar illustrations,—*Watts'*, though diffuse, and teeming with anilities, appears, by the multitude of the editions, to have been the most in use.*

Posterior, by a generation or more, to Watts', as that is by several to the Bishop of Lincoln's, the view given in the work of *Kaimes* presents in conjunction the authority of two distinguished Scottish writers.

To no one of all these writers does the utility and excellence of the exhaustively bifurcate method, or so much as the use actually made of it in the *Ramean tree*, appear to have made itself sufficiently sensible. By all of them the bifurcate method is indeed mentioned.—Mentioned? But for what purpose? Scarcely for any other purpose than the being slighted. By *Reid* and *Kaimes* it is even taken for a subject of pleasantry: but of pleasantry (it will perhaps be seen) not very happily applied.

1. First, as to *Saunderson—Lib.* i. *Cap.* 18. *De Divisione.*

After stating, that, on the occasion of *division*, the *whole*, (say rather the *aggregate*,) which is taken for the subject of the operation, is called the *divisum*, (say rather *dividendum*,†) and that the *parts* into which it is divided (viz. the *parts* which are the results of the operation) are called the *membra dividentia*,—(he immediately after designates them by the more expressive adjunct *condividentia*,) i. e. the *divident*, or, more expressively, the *condivident* members,—he proceeds to give his *rules of division*: the rules, in conformity to which, the operation should, according to him, be carried on. They here follow in so many words.

1. *Membra* ABSORBEANT *totum divisum. Let* the *members* absorb (i. e. include, comprehend, comprise) the whole of the *dividendum*; in other words, let the division be *exhaustive*. Let the division be performed in such a manner, that, if of the parts, which are the result of it, the contents are summed up, in the sum of them, the whole sum of the contents of the dividend will be found.

2. *Divisum esto latius singulis suis membris; adæquatum universis.* Let the *dividendum* be more extensive than each of its members; *equal*, or say *commensurate*, to all of them put together. After laying down the first, to add, in the character of a distinct one, this second rule, was sad trifling; it shows, as it should seem, that, on this subject, the ideas of the author were far from being clear ones.

Two separate parts does this rule of his include; each of them in its form a distinct rule. But in substance and import, the second part of this second rule is identical with the first rule; and the other part is as obviously as it is necessarily included in both: in the first rule, and in the second part of this same second rule.

To say of *a part* that it is *equal* to *the whole*, would be neither more nor less than a self-contradiction *in terminis*—a self-contradictory* proposition.

* Of all the colleges in the university of Oxford, Queen's College was, in the year 1761,—and, for aught the writer of this has heard, continues to be,—the one, in which the art and science of *Logic* was and is cultivated with most attention. In those days, Saunderson's and Watts', as above, were,—and, for aught he has heard, continue to be, on this subject,—employed there in the character of the earliest, if not the only institutional writers.

† *Dividendum*, rather than *divisum*, seems to be the more proper term, in so far as the *time*, at which the subject is taken into consideration, is anterior to that at which the operation has been performed upon it: and the first-mentioned is the time which seems to have been in view on the occasion of some of the ensuing rules.—The *dividendum*, not the *dividend*, for fear of running foul of the Threadneedle-street *Bank*.

* By this unfortunate mass of surplusage, another source of confusion will be seen to be opened.—On the supposition, by which the field for the application of these rules is marked out, a *problem* is proposed. Of this problem the *subject* is supposed to be already determined, viz. the *aggregate*, of which a division is to be made. Upon this subject it is, that, according to this same supposition, an operation is to be performed, viz. that of *division*. Of this operation, when performed, the *condivident parts* or *members* will be the *results*: of which several results the contents will, of course, respectively depend upon the scheme or mode of division, which shall have been pursued. Here then all that is supposed to depend upon the operator, is the *mode* of *the division*, and therefrom the *results* of it: that which, as being, by the supposition, already determined, is supposed *not* to depend upon him, is,—the *dividendum*—the aggregate upon which the operation—the division—is to be performed. Of these conditions of the problem, necessary as is the perception and comprehension of them to any clear and correct conception of the nature of the operation and the work, so it is, that by this institutionalist no clear conception seems, on this occasion, to have been entertained. Addressing himself to the operator, the direction which on this occasion he gives is—how to frame his *dividendum*.

3. *Membra condividentia sint contradistincta et opposita;* to which, by way of explanation, is added, *ita ut confundi nequeant vel coincidere.* Let the condividents members be contradistinct (viz. from each other) and opposite; in such sort that they shall not coincide or be capable of being confounded.

By this explanation no very clear light seems to be thrown upon the subject. What seems to be meant is, that, after the division has been made, things shall be in such a state, that of no one of all the several distinguishable articles or masses of matter, contained in the whole dividend, shall any portion be found to lie, part in one of the members, other part in another. In so far as any such incongruity is found to have place, the division, it is evident, is *indistinct,* and, being indistinct, is therefore *imperfect;* the operation has not been completely performed. On the subject of *distinctness,* see above, § 12.

4. *Divisio fiat in membra proxima et immediata, et (quam fieri commodè potest) paucissima.* Let the division be made into the nearest and (so far as convenience allows) fewest members. Then immediately after, in the same paragraph, and under this same 10th head or rule, he goes on to say—*A proximis porro ad remotiora et minutiora descendendum per subdivisiones.* From the nearest, (viz. members,) to those which are more remote and *minute* (say rather *less extensive*) let descent be made by sub-divisions.

In the instance just brought to view, of the second of these rules, the substance of one rule being, in other words, given over again, was given in the character of a distinct and different rule. In the instance of this 4th rule, two rules, perfectly distinct, are confounded under one head, and represented as constituting but one and the same rule. On this last occasion, a new case, or state of things, is brought upon the carpet: viz. the case, in which, by the repeated application made of the operation of division, to the results of a former division, the operations with their results are thus carried on as it were in the form of a *chain,* or rather (as hath been seen) in the form of a *tree.*

Dichotomiæ (he goes on to say) *sunt laudatissimæ, ubi commodè haberi possunt; non tamen nimium superstitiosè et anxiè ubique venandæ; quod faciunt Ramæi.* For division, the dichotomous (i. e. the bifurcate, or two-pronged) mode is most to be commended, when it can conveniently be employed; but it ought not to be everywhere hunted out too superstitiously and anxiously, as it is by *the Rameans.* In this translation, the expression, it will be seen, is bad enough; and in the original it is still worse. It is composed of a cluster of *tautological,* or (as they are also called) *identical* propositions; a sort of verbiage, the natural growth of a weak mind, and of which every mind, that is not a weak one, will, as it values its character, avoid being seen to make use. What ought not to be employed, ought not to be employed. On an occasion on which it *ought not,* an instrument of the sort in question *ought not* to be employed. *What ought not to be done, ought not to be done.* This is the language of a driveller in his dotage.

This instrument, which, at the first mention, is pronounced to be a commendable one, and of which therefore it cannot but be true that, on some occasions at least, the employing of it is a proper course to take, what are the occasions on which it is convenient, and thence proper, what the occasions, on which it is not convenient, and thence not proper? Such are the questions, by the answers to which, and not otherwise, the reproach of *tautologism,* incurred as it is by the observation, as it stands, might have been wiped away.

Section XV.

II. *Watts' Logic.*

In his chapter, intituled *Special Rules to direct our Conception of things,* Sect. 8. *Of Division and the Rules of it,* Watts delivers on this subject a set of rules; of which, according to his numeration, the number is *six.* But in that which calls itself the sixth, may be seen two perfectly distinct ones.

By anything like a thorough examination of them, much more room would be taken up than can here be spared. The fourth, and the last part of the sixth, are the only ones that have any direct bearing on the present point.

1. "Let not sub-divisions (says the fourth) be too numerous without necessity." Here we have *anility* in a still worse form, than as above in *Saunderson.* Anile tautology patent; self-contradiction latent. "*Let them not be too numerous:*" this is plain *identicalism* and nothing more: add, "*without necessity,*" the identicalism is now topped by self-contradiction. Good simpleton! what mean you by the word *too?* Know you then of so much as an imaginable case, in which there is a "*necessity*" that anything should be "*too*" anything? in which that which ought *not* to be done *ought* to be done?

2. Lastly, as to that second part of his Sixth Rule—"*Do not,*" says he, "*affect Duplicities, nor Triplicities, nor any certain number of Parts in your Division of Things;*" "*For,*" (continues he, and then come reasons, in which not much application to the subject has been perceived) "*yet,*" (continues he,) "*some persons have disturbed the Order of Nature, and abused their Readers by an affectation of Dichotomies, Trichotomies, Sevens, Twelves, &c.*"

The section then concludes with another

But, on this same occasion, according to the conditions of the problem, he is not to frame it at all: it is ready framed to his hands.

Upon the whole, what seems evident enough is —that, taken in both its parts, this second rule is worse than useless, and that the complete erasure of it would be an improvement.

effusion of *anility*, condemning what he calls "a too nice and curious attention to the mere formalities of logical writers, without a real acquaintance with things."

What applies more particularly to the subject here in hand, is, that this division, into no more than *two* parts at each operation, is, in the scale of usefulness, placed by him upon a level, not superior to that of division into any other number of parts; to this or any one number, in comparison of any other, any preference that can be given is equally ascribed to no better a source than *affectation*. Thus what is plain is, that to his *eyes*, as already observed, the matchless beauty of the *Ramean* tree, the test which it affords of exhaustiveness, had not displayed itself.*

Section XVI.

III. *Reid and Kaimes, in Kaimes's History of Man.*

In Lord Kaimes's work, entitled *Sketches of the History of Man*, is contained "*A Review of Aristotle's Logic*," which he declares to have received from Dr Reid. In general, the account there given of that work, is, it may be presumed, correct. But, in the particular passage which now stands for consideration, his lordship's froth seems, in a dose more or less considerable, to have mixed itself with the phlegm of Dr Reid.

On this occasion the exhaustive mode came under his review:—he begins with a declaration of its usefulness: he ends with an attempt to turn it into ridicule.

He acknowledges it to be good: but, at the same time, finding the use of it to be attended with some difficulty, and *that* a difficulty with which he did not feel himself in a condition to cope, he vows revenge, and, to accomplish his vow, applies to *Momus*.

Ascribing it, and as it should seem with reason, to the above-mentioned Ramus, he calls it *new*: in that character it becomes fair game for ridicule; and with ridicule it seems to him that he has completely and sufficiently covered it, by a proposal, that, for the purpose of exhaustion, in a series of divisions, carried on in this dichotomous mode, to one of the two members an *et cætera* should in each instance be substituted.

Here then, according to this pair of Logicians, the Latin phrase *et cætera*, in English, *and the rest*, might, on every occasion, and with equal advantage, be substituted to the name of either, or at least to that of one, of the branches in each joint of a system of logical divisions, framed and denominated in the exhaustively bifurcate mode. But is this so? No: not on any occasion, with any such advantage. Why not? *Answer*. Because, by an &c., substitute it to which of the two names you will, though you may make your division *equally exhaustive*, you can neither *make sure* of making it *equally distinct*, nor *can* you (see § 12.) render it equally *instructive*.

In the name, which, upon the *Ramean* plan, you give to each branch, viz. the *two-worded* name, be it *positive*, be it even *negative*, you bring to view *two properties*: one, in respect of which the individuals contained in both branches *agree* with one another; another in respect of which they *differ* from one another: those of the one *having* this latter property, those of the other *not*. But an *et cætera*?—what are the properties of an *et cætera*?

Let it not be said, that the name, the two-worded name, of a *negative* branch, shows no property. For, in the first place, it shows that property, which the individuals belonging to *that* branch possess in common with those that belong to *the other*: in the next place, it shows *another* property: for, to the purpose of instruction, concerning the nature of the object, even the *non-possession* of this or that property, is itself a property.

Under the assurance afforded by the bifurcate mode, when it is declaredly exhaustive, viz. the assurance, that, at each *joint*, in the composition of the two-worded name of either of the two branches, if the sign of negation is not actually employed, it may, without impropriety, be so employed at pleasure, under this assurance, so it is that they may either, or both of them, be employed as trunks, and, in that character, may be subjected to ulterior division. And in this way accordingly it is, that, in several instances, in the annexed sample of an Encyclopædical tree, both branches may be seen employed.—But an *&c.*?—the phrase *et cætera*?—in what way could these Logicians have made it serve in the character of *a trunk*? In what way could they have divided it into *branches*?

Of what one sort of aggregate is *et cætera* the name? Yet, according to them, with as much propriety as any given number of other names, an *et cætera*, if repeated that same number of times, is capable of giving denomination to all sorts of aggregates.

By the *contradictory formula*, which, in every ramification, if performed in the Ramean mode, is, as above, either expressed or implied,—an assurance is given, that the mode of division pursued is meant to be *exhaustive*, and to that end is rendered *bifurcate*. But if, in the instance of either branch, in the room

* From the fifth of these his rules substantial and useful instruction will, however, be found obtainable:—"Divide," says he, "every subject, according to the special design you have in view." Then immediately follows an observation, which, with perfect propriety, might have been made to constitute a distinct rule. "One and the same idea or subject," says he, "may be divided in very different manners, according to the purposes we have in discoursing of it;" whereupon, by way of exemplification, he adduces the several purposes, which, in regard to a book, it may naturally happen to the *Printer*, the *Grammarian*, and the *Logician*, to have in view.—Of this rule of his, two exemplifications may have been observed in the Encyclopedical Table here exhibited.

of a significant name the insignificant name *et cætera* is employed,—in this way, what assurance is given that the mode employed will be bifurcate? True it is, that, in the case supposed by *Reid* and *Kaimes*, the mode (it seems to be taken for granted) *is* the *bifurcate* mode. But in the nature of their *et cætera*, there is nothing to hinder its being employed when the mode is *multifurcate:* whereas, as hath been seen, it is the property and excellence of the *contradictory formula*, that it cannot be employed but that the mode of division is, at the same time, *bifurcate* and *exhaustive*.

More misconception—more confusion. Of the confusion made by Watts, for want of his being sufficiently aware, that what belonged to the subject was, not a physical and real whole, but a logical and fictitious aggregate, notice has been taken in § 12. Exactly into that same inadvertence may Reid and Lord Kaimes be seen to have fallen in this place. "*Division of England into Middlesex and what is not Middlesex:*"* this is what they give as an example of the only sort of division here in question, viz. a *logical* one. But, agreeing in this respect with the vegetable body called *a tree*, the portion of the earth's surface, called *England*, is a physical and real whole, not a logical and fictitious aggregate.

In a logical division, performed in the exhaustively bifurcate mode, the two-worded name of each branch gives intimation of two properties belonging to all the individuals contained in it: one, in the possession of which they *agree;* another, by the *possession* and *non-possession* of which they are *distinguished*. But, of no one property,—whether as possessed, either by all "*England*," or by itself, or by anything that "*is not*" itself,—does the word "*Middlesex*" give any intimation. "*It is evident*" (say they) "that *these two members comprehend all England*." True. "*In the same manner*" (say they) "*we may divide what is not Middlesex into Kent, and what is not Kent*." True again. "*Thus*," (continue they) "*one may go on by divisions and sub-divisions* that *are absolutely complete*." True, once more: but while, for your subject, instead of a logical aggregate, you take a physical whole, although those divisions will indeed be as trifling and useless as to yourselves they appear to be, being so, will they prove what you bring them to prove? Not they indeed. Why? Because they are nothing to the purpose. "This example" (they go on to say) "may serve to give an idea of the spirit of Ramean division." How far this purpose is really served by it, the reader may now judge.

A curious circumstance is, that it is in the character of a source of objection to this mode, that his lordship brings to view the train of false "*conclusions*" that, in relation to this subject, "*philosophers*, ancient and modern," have, according to him, in great abundance, fallen into: fallen into, and from what cause? From the having made use of this security against error? No: but from their having (says he) omitted to make use of it. To the "*divisions*" of their making, the fault he ascribes, is that of being "*incomplete*." Of the mode of division, which he is thus holding up to ridicule, the distinctive character is, that it is capable not only of being *rendered*, but, wherever it is so, *proved* to be complete. Yet the mode is (according to him) a bad one. Why?—but because *by* pursuing it?—no: because, *for want* of having pursued it,—certain persons have made bad work.

So much for the objection, which, by this pair of Scottish philosophers, we have seen made to the scheme of logical division, which, in that age of comparative darkness, was invented, as it should seem, by the ingenious French Logician, *Pierre Ramée*.

As to any of those applications which by him (as we are told) were made of it, that at *this* time of day, unless it be from seeing how the instrument itself was managed by him, any useful instruction should be derivable, there seems no great reason to expect. *Observation* and *experiment*,—in these, as above observed, (§ 12.) may be seen the only sources of all real knowledge. In the days of *Peter Ramus*, anterior as they were to those of our Lord Bacon, scarcely, unless it were here and there by accident, had these funds been, either of them, so much as begun to be drawn upon. Of *Logic* with its divisions, all that it is in the power to do is, to arrange and display in the most instructive manner whatsoever matters have been extracted from those sources. What it can do is, to *methodise;* and in that unimmediate way *promote creation*:—what it can *not* do is, *to create*.

Section XVII.

Process of exhaustive bifurcation, to what length may and shall it be carried?

In the division of a logical aggregate, *exhaustiveness* can never fail to be useful and instructive: to afford assurance and demonstration of its existence, bifurcation can never fail to be necessary. By this time these propositions may, it is hoped, be assumed as truth. There remain however still, on every occasion, two questions: viz. how far this useful process can be, and how far it ought to be carried on.

By these questions the answers are suggested. Two bars present themselves, by either of which, where it has place, the employment of these instruments may be effectually opposed. One is *impracticability*, the impracticability of the operation: the other may perhaps be termed the *uneconomicalness* of it: being that which has place, where, whatsoever may be the value of the benefit, the value of *labour* necessarily attached to it

* Kaimes's Sketches, book iii. Sk. i. p. 163.

—labour of creation, communication and receipt included—would be still greater.

I. As to *impracticability*. Of impracticability, in this case two causes present themselves as capable of having place: viz. *uncognoscibility* and *unexpressibility*.

1. As to *uncognoscibility*. It is only in so far as the properties, of the aggregates or classes of things in question, are known, that, for the purpose in question, or any other, any one such aggregate, with its branches, can thus be exhibited: this or that property being stated as having place in all the individuals contained in one of the two branches, and as *not* having place in any of those contained in the other. Take, for example, *Natural History*, and therein *Botany*. Forty thousand was, some years ago, stated as the number of supposed different *species* of plants (exclusive of *varieties*) at that time more or less known to the botanic world. But, at that time, the utmost knowledge obtained of them by any person was not, to any such degree clear, correct, and complete, as to enable him, in this way, to show, of every one of them, in any such concise mode, its points of agreement and disagreement with reference to every other. And even if, in and for any one year, the distinctive properties of the whole multitude of individuals contained in the whole multitude of species then known, could have been exhibited in this systematic form, the sketch given of them, if with regard to the whole number of species of plants then existing it professed to be, and even if it really were, an exhaustive one, would, in and for the next year, no longer possess that quality.

2. The quantity of *surface* necessary to the exhibition of such a diagram, presents another circumstance, by which, long enough before the number of the extreme branches had reached to any such number as forty thousand, as above, not to say the tenth or the hundredth part of it, the bar of *impracticability* would be opposed. Number of the extreme branches being 40,000; and this number, being the last term of a series of multiplications in which *two* is the *common multiplier*, what would be the sum required of the number of the intermediate branches, which being to be interpolated between the first term, viz. 1, and the last, viz. 40,000, would be to be added to the sum of those two numbers? To this question the answer is left to be found by any ready arithmetician, in whose eyes the profit would pay for the trouble.*

II. As to *uneconomicalness*. To perform the comparatively small number of ramifications exhibited by the annexed sample, was found to have imposed so heavy a labour, that over and over again, the thought of having undertaken it has been matter of regret. In comparison of the labour necessary to the execution of such a work, the mere labour of perusing it is obviously nothing. Yet even with this comparatively slight burthen, it is only in the instance of a very small proportion of the whole number of those by whom this volume may happen to be opened, that any expectation of their charging themselves with it can reasonably be entertained.

To those who have inclination and leisure, an assurance is here ventured to be afforded, that whatsoever may be the information derivable from the perusal of a work of this sort, to whatsoever subject applied, much greater will be the profit derivable in that same shape from the execution of it.

As to the length to which the operation shall be pursued, each individual will in both instances be determined by his own feelings in regard to net profit and convenience. But in one thing all persons, it is supposed, will be agreed, viz. that of the whole number of ramifications, which in this way it might be possible to exhibit, it will in most instances be no more than a part and that in most instances a small part, of the whole field, that will be found to afford adequate payment for the trouble.

On the other hand, the more extensive the *universal trunk*, the more extensive will be the quantity of information which, in and by each such ramification, will have been obtained and communicated; the more extensive the field, the greater will be the profit derivable from this mode of cultivation.

In the fields of *Noology* and *Ethics* it is, in contradistinction to that of *Somatology* (including Natural History and Natural Philosophy) that the nature of the field will, it is believed, be found to afford the greatest profit. Why? Because, for example, in Natural History, the knowledge of the utmost number of peculiar properties that could in this way be brought to view, would be but inconsiderable, in comparison with the number of such properties as are seen really to have place; and for which, though in each instance they might be exhibited, as they are actually exhibited in a simple list,—no place could be found in any such Table.

The objects, of which the words that belong to Noology and Ethics are the names, are chiefly the works of man, the products of his mind. In multitude and variety the works produced by this instrument are as nothing in comparison with those produced by the hand of Nature.†

* No, (says he,) the conditions are inconsistent. —First term 1; Common multiplier, 2; No number of terms will give 40,000 for the last. the two nearest will give—the one a less number, the other a greater Hence a demand for discussions, the profit of which would not pay for the place occupied.

† In various parts of the field of art and science, in his own instance, towards giving clearness, correctness, and completeness to his own views, the writer of these pages has found it—so at least it has seemed to him—of the greatest use. For this

Section XVIII.

How to plant a Ramean Encyclopædical tree, on any given part of the field of art and science.

Having, during a long course of years, and on a great variety of occasions, if his conceptions on this subject are not altogether illusory, derived much advantage from the use of the Ramean tree, the author is unwilling to quit this part of the field altogether, without having first thrown out a few hints, which have occurred to him, as capable of affording more or less assistance, to any other person,* who, on any occasion, may feel inclined to make trial of the old logical instrument, thus newly offered to notice.

1. As far as they go, employ such materials as you find ready provided to your hands. These materials are such words as, in relation to the subject in question, are to be found already existing in the language: the *words*, and thereby the *relations*, in the designation of which they are respectively employed. Set them down together, one after another, for example in columns, as many as in the first instance you can think of or find, adding from time to time others as they occur.

2. When you have got enough of them to begin upon, whatsoever be the field of which you were then endeavouring to take a survey, among the words the import of which is contained within the limits of it, look out for the one of which the import presents itself as most extensive. See whether it exactly covers the whole extent of the proposed field of your survey. If yes, employ it for your universal trunk; if not, you must frame some word which, by its import, shall, after what explanation may be found necessary, present to view, in the most effectual manner, the whole contents of that same field.

3. The universal *trunk* being thus found or made, for the first pair of *branches* look out for the two words, the imports of which present themselves as being both of them contained in the trunk, and at the same time the most extensive of all those that are; applying to them the test herein described, observe whether within their imports, taken together, the whole matter of the trunk be comprehended: if yes, there is your first pair of *minor aggregates* given, your first *ramification* made.

4. If no two such words can be found, then take the one the import of which—it being, (as it naturally will be,) the name of a *positive* property—appears, next to that of the above-mentioned trunk, the most extensive. Taking this for the name of one of your two minor aggregates, branches of the first ramification, the sign of *negation* added to it gives you the other.

5. The test always in hand or mind, proceed in the same way, carrying on your series of ramification as far as you find convenient: at every joint, for your two branches looking out for a pair of names, both of them in common use: taking up with only one such name, and for the corresponding name adding to it its *contradictory*, in those cases alone in which no such already existing pair of *trivial*, but at the same time all-comprehensive names are to be found.

6. For each such branch, if you see occasion, in addition to such its *two-worded* name, framed as last-mentioned, find or frame a *single-worded* name;† which will thus stand as a *synonym* to the just-mentioned Encyclopædical two-worded name, and will for ordinary use be a commodious substitute.

7. If, under any trunk, whether by *finding* them or by framing them, you provide yourself, in the first instance, with a pair of single-worded names, then, for purely Encyclopædical synonyms, you will have to frame for each a *two-worded* synonym: if, in the first instance, the pair of two-worded Encyclopædical names are those with which you provide yourself, then, for Encyclopædical use, or trivial use, or both, what you will have to do is, as above, to find or frame, as the case may be, one or two *single-worded* synonyms.‡

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purpose he had even brought together a few exemplifications. But, seeing to what a length they had led him from the main purpose, and considering that where, by any person by whom, after such particular discussion and explanation, the reality of the benefit is not recognised in that part of the field which has here been operated upon, still less reasonable would be the expectation of seeing it recognised on any other ground, of which no more than the slightest and most general view could be presented, he struck them out.

Without any such trouble as that of exhibiting them in this particular view, other exemplifications may, however, perhaps, be seen to be afforded by some of the subsequent Numbers of this Appendix.

* The reader will probably find a convenience in having open before him the diagram of this *Encyclopædical Tree*, and occasionally to turn to the *Explanations* given, in relation to it in § 9.

† Of a word thus framed, an exemplification may be seen in the *Encyclopædical Tree*, in the word *Eudæmonics*.

‡ An instance, in which the pair of names first provided were *single-worded* names, and these *trivial* names, is afforded by the words *Geometry* and *Arithmetic*:—an instance, in which the names first provided were indeed *single-worded* names, but those *not trivial* names, but names framed for the purpose, are *Posology* and *Poiology*. From *thence*, by the addition of the name of the *trunk*, were made,—as may be seen both in the diagram and the explanation of it,—the two two-worded Encyclopædical names, *Pososcopic Somatics* and *Poioscopic Somatics*.

To either of these two Encyclopædical two-worded names, in the structure of which the *contradictory formula* is not expressed but only implied, had it been deemed necessary to substitute two names, in which that *test of all-comprehensiveness* is expressed, the following is the mode in which it might have been effected:—*Pososcopic* being continued, to *poioscopic alegoposic* might have been substituted. In this case, the existence of all-comprehensiveness would have been effected,

8. On proceeding in this track, what will be very apt to happen to you is, the finding that, after you have thus found places in your system for a certain stock of appellatives, growing always in number greater and greater, but in point of import each of them less and less extensive as you advance, a number of appellatives, more or less considerable, the imports of which are more extensive than those of some to which you have given admittance, have been left behind. These imports, however, being, by the supposition, included, every one of them, within the limits of the field which you are thus surveying, will not present to you any new difficulty. By the imports of *these* words, as well as by those of the others, will the field be divisible: only, for the making of your divisions, you must look out for some one or more other *sources*.*

9. In these cases, as in those first mentioned, these sources will be furnished by so many *distinctive properties*: which accordingly you must be on the look out for, and for each of which, if it have not a name already, you must make one.

10. Having found or made names for all these several sources of division, set them down one after another in one list; which done, for exhibiting the relation which the objects so denominated bear to one another, you will probably find some means of comprising, in one and the same system of divisions, the whole list of those *sources of division*, in the same manner as you have comprised in one such system the results of the several divisions from the first of all these several sources.†

11. On looking over the stock of words, belonging to this your field, you will probably find, in a number more or less considerable, pairs or parcels of words, which with relation to one another are *synonymous*. These, as they occur, you will pick up, and, in that character, note them, and set them down. Examples of words thus related may also be seen in the *Table*.

12. Whatsoever they may be in other respects, it was impossible these directions should be made anything like complete for use, without some intimation given of the distinction between names of *real entities* and names of *fictitious entities*; a distinction which, in some of his Encyclopædical remarks, D'Alembert was, it is believed, the first to bring to view, and which will be found to pervade the whole mass of every language upon earth, actual or possible. Names of *bodies*, for example, are names of *real entities*;‡ names of qualities and relations, names of fictitious entities. The names, by which the branches of the *Porphyrian* or *Ramean* tree are designated, are names of *real* entities.§ The names of the branches of the Encyclopædical tree *here* submitted to view, are names of *fictitious* entities; though to a considerable extent included in them, as will be seen, are references made to correspondent names of real entities.

Names of real, names of fictitious entities, in the division thus expressed, may be seen one exhaustive division of the whole stock of *nouns substantive*. Strict, to the highest pitch of strictness, as is the propriety with which the *entities* here called *fictitious* are thus denominated, in no instance can the idea of *fiction* be freer from all tincture of blame: in no other instance can it ever be equally beneficial; since, but for such fiction, the language of *man* could not have risen above the language of *brutes*.

The above seemed as little as could be said, to prevent the whole field of fictitious entities from presenting itself to the eye of the mind in the repulsive character of an absolutely

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and that (it is supposed) with truth. But that *instruction* would not, upon the face of the ramification, have been stamped, which, by exhibiting *Posology* and *Poiology* together, in the character of two branches, comprehending between them the whole contents of the trunk *Somatology*, seems to be afforded.[a]

* Take an apple. Cut it once through with a knife: by cutting it in this one direction, you divide it into two parts. Put the parts together again, you may in like manner cut it again into two other parts. If those produced by the former division are considered as united, you have still but two parts: if not, you may have four parts. Correspondent to the different *dissections* taken by the instrument of division in the case of this *physical* whole, are the different *sources* of division in the case of the *logical* whole. In both cases the division is equally *bifurcate* and *exhaustive*.

† Of divisional operations, performed on the same subject, from divers sources, examples may be seen in the Table.

[a] Neither is *quantity* so perfectly out of the question in Natural History and Natural Philosophy, as *quality* is in Mathematics. Scarcely, therefore, could *Allegoposic Somatology* have been employed as the two-worded synonym of *Poiology*. Here there may be seen an instance of those imperfections which in such a case it seems impossible altogether to avoid.

‡ Even by *Bishop Berkeley*, by whom, as if to out-scepticize the sceptics, and foil them at their own weapons,—the existence of the table he was writing upon was denied,—the *name* of the table would have been allowed to be—in common intendment at least—the name of a *real entity*: and, even in his own view of the matter, the table (an utensil, which required wood to make it of, and a saw, &c. to make it with,) would have been allowed to approach somewhat nearer to the state of reality, than a sort of entity, such as a *quality*, as a *relation*, in the making of which *thoughts* have been the only *materials*, and *words* the only *instruments*.

§ Say, strictly speaking, names of so many aggregates or classes, of objects *in* which *real entities* are included: for, strictly speaking, *individual* objects are the only real entities: considered in themselves, the *aggregates* or *classes* in which those *real entities* are regarded as included, are no more than so many *fictitious bodies*, put together by the mind for its own use. See above, Note *, pp. 210-211, and below, § 19.

dark spot. More cannot be said, without wandering still further from the main subject, and trespassing beyond hope of endurance upon the reader's patience.

The endeavour to trace out, throughout the whole of their extent, the principal relations between the field of *thought* and the field of *language*—comprising, of necessity, the leading principles of the art and science of *universal grammar*—have been the business of a distinct Essay, which it has been, and continues to be, the wish of the author to include within the limits of the present work. And in that work, in addition to the discoveries, half concealed or left unperfected, by *Horne Tooke*, the distinction, between names of *real* and names of *fictitious* entities, will constitute a capital and altogether indispensable instrument.* Almost all names, employed in speaking of the phenomena of the mind, are names of fictitious entities. In speaking of any *pneumatic* (or say *immaterial* or *spiritual*) object, no name has ever been employed, that had not first been employed as the name of some *material* (or say *corporeal*) one. Lamentable have been the confusion and darkness, produced by taking the names of *fictitious* for the names of *real* entities.

In this misconception may perhaps be found, the main, if not the only source, of the clouds, in which, notwithstanding all their rivalry, Plato and Aristotle concurred in wrapping up the whole field of *pneumatology*. In the phantoms generated in their own brains, it seemed to them and their followers that they beheld so many realities.

Of these fictitious entities, many will be found, of which, they being, each of them, a *genus generalissimum*, the names are consequently incapable of receiving what is commonly understood by a *definition*, viz. a definition *per genus et differentiam*. But, from their not being susceptible of *this* species of exposition, they do not the less stand in need of *that* species of exposition, of which they are susceptible.†

By any person,—should there be any such person to whom the ideas thus hazarded, present themselves as having a substantial footing, in the nature of *things* on the one hand, and the nature of *language* on the other,—it will probably be admitted, that a demand exists for an entirely new system of *Logic*, in which shall be comprehended a *theory of language*, considered in the most general point of view. For the construction of such an edifice, a considerable proportion of the *materials* employed in the construction of the *Aristotelian* system of logic, would be indispensably necessary. But in this very supposition is included the necessity of *taking to pieces* the whole mass of that most elaborate, and, considering its date, justly admired and venerated monument of human industry and genius.

As to *Plato*, when in the vast wilderness of words with which, by this spoilt child of Socrates, so many shelves and so many brains have been loaded, and in which so many wits, beginning with those of Cicero, have been lost, when among all these *signs*, so much as a single thought, which is at once clear and instructive, shall have been pointed out, it will be time enough to steal from the examination of Aristotle's Logic, either a word or so much as a thought, to bestow upon his master's eloquence.

With some modifications, which reflection will suggest, and which it would take up too much time and room here to endeavour to particularize, the method herein above proposed, as applicable to *names of* objects, to those elementary parts of *propositions*, which by logicians are distinguished by the name of *terms*, would be found applicable to *propositions* themselves: to those propositions, for example, by which, under some such name as *Contents*, intimation is given, in general expression, of the matter contained in any literary work, and more particularly in any work of the *institutional* kind: and thus it is, that to the view taken of any such portion of the field of art and science, may be given, in the promptest and most commodious manner, any degree of extent of which the existing state of the materials, collected by observation and experiment, has rendered it susceptible: and in truth, *terms* being the matter of which *propositions* are principally composed, by any arrangement given to those principal ingredients, an arrangement is already in some sort given to the whole matter of all the several propositions, into the composition of which those elementary articles are capable of being made to enter.

In the explanation above given of the manner in which, out of such terms as, in any given part of the field, the existing state of the language furnishes, a system of exhaustively bifurcate division may be formed—it has been seen how it is that, in a number of places more or less considerable, for want of such names, already in use, gaps will be left in the work: gaps, for the filling up of which instructions are thereupon given.

By the powers of the imagination, working with *analogy* for its instrument as well as its guide, *words*, especially where, in some orderly manner, spread out, a number of them, together on one and the same surface, before

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* See the several works on "Grammar," "Language," and "Ontology," in this volume.—*Ed.*

† Examples of these *undefinable* fictitious entities are—

I. PHYSICAL fictitious entities—*motion, rest, quality*, &c.

II. ETHICAL fictitious entities—*obligation, right, power*, &c.

III. ONTOLOGICAL fictitious entities—*condition, certainty, impossibility*, &c.

Of the demand for a *species* or *mode* of *exposition*, adapted to the nature of this class of appellatives, hints may be seen in an anonymous tract published by the author, A° 1776, under the title of "*Fragment on Government*," &c., p. 179 to 185. It has this long time been out of print.—[See this collection, vol. i. p. 283, *et seq.*]

the eye, will bring to view, each of them, not only the particular object, which in common discourse it is employed to designate, but an indeterminate multitude of other objects which, by means of some *relation* or other, stand, each of them, in some way or other associated with it. In this way it is, that by means of some indication, afforded by the import of this or that article belonging to the existing stock of names, the filling up of a gap of the sort just described will be effected: and by every gap thus filled up, precision at least, and frequently *extension*, will, if the operation be properly performed, be given to the conception entertained of the contents of that part of the field: and thus may be seen, according to the nature of the branch of art and science which is in hand, one way at least in which *inventions* may be, and doubtless have been brought to light, and *discoveries* made. *Quodlibet cum quolibet*, is a motto that may serve for every discovering, and every inventing mind.

Section XIX.

Logical Mode of Division—its Origin explained and illustrated.

For facilitating the execution of a work of the sort here in question, viz. a system of logical division in the exhaustively bifurcate mode—a few instructions, such as they have been seen, have just been hazarded. The topic was upon the point of being closed, when, by a dip taken into Condillac's little work on *Logic*, an addition was suggested, which now seemed indispensable. The only sort of *analysis*, which in the present work hath as yet been in question, is of that sort, of which not so much as the conception could have presented itself, but in a considerably matured state of the human mind. But in that little work of Condillac, under the same name *analysis*, was observed to be brought to view a sort of logical operation, to which that appellation could not, it seemed, with propriety, be refused, but of which it was at the same time evident, that it could not but have been in use in the very earliest stage of human existence: a stage so early, that although the operation must, in its extension, have kept pace with that of language, yet in part the existence of it must have been anterior even to that of the earliest formed raw materials, of which language was gradually composed: since those materials are not, any of them, anything but signs of ideas, and it is only by the sort of analysis now in question—viz. the *primæval logical analysis*, performed by the mind upon individual objects in the character of physical wholes, that those ideas were supplied.

Of every *logical analysis*—of every system of logical divisions—the subject is a *logical whole*. But, any such logical analysis, nowhere could it ever have had a subject, but for that system of *primæval* logical analysis, which has had for its subjects *physical wholes*, and for its *results* those ideas, which at the very moment of their conception, were respectively accompanied and fixed by so many *names* or *denominations*:—signs, by means of which, in so far as those signs were the sort of names called *common* names, those ideas were as it were tied up into bundles, called *sorts, kinds, species, genera, classes*, and the like: the connexion being effected by another sort of logical instrument, which, as will be seen, is not *analysis*, but its converse, *synthesis*.

Of this double course—a course of *analysis*, conjoined with a correspondent course of *synthesis*—the commencement must have had place in the very infancy of society; and neither to the continuance nor to the extension of it can any conceivable bounds be assigned, other than those which apply to the extension and continuance of society itself.

1. Difference between a *physical whole* and a *logical whole*; 2. difference between *physical analysis* and *logical analysis*, when both have for their subject a *physical whole*; 3. difference between logical *analysis* and logical *synthesis*; 4. operation and instrument by which *logical synthesis* is performed; 5. necessity of an antecedent logical *analysis*, performed upon a physical whole, to the previous *formation*, and thence to the subsequent *analysis* of a *logical whole*; 6. necessity of an act of logical *synthesis* to the formation of such logical whole: such are the points, on all which, as soon as the definitions of the two species of *wholes* have been given, a conjunct illustration will be attempted.

By a *physical whole*, understand any *corporeal real entity*, considered as being in one mass, and without any regard paid at the instant to any parts that might be observable in it: for instance, this or that individual *plant*.

By a *logical whole*, understand that sort of fictitious *aggregate*, or *collection* of objects, for the designation of which any one of those names which, in contradistinction to *proper* names are termed *common* names, are employed; for example, the aggregate designated by that same word *plant*. The common name *plant* is applicable to every individual plant that grows; and not only to those, but moreover to all those which ever grew in time past, and to all those which will grow in time future; and in saying, of any one of them individually taken—viz. of those that are now growing, *this plant exists*, there is no fiction. But the *aggregate*, conceived as composed of all plants, present, past, and future put together, is manifestly the work of the *imagination*—a pure fiction. The *logical whole*, designated by the word *plant*, is therefore a *fictitious* entity.

For the illustration of these several points, follows now a short history, which though at no time perhaps realized in every minute particular, must many millions of times have been exemplified in every circumstance, which, to the purpose of the present explanation, is a *material* one.

Walking one day over his grounds, a certain husbandman observed a plant, which was not of the number of those which he was employed in cultivating. Overhanging some of them, it seemed to him to impede their growth. Taking out his knife, he cut the plant off just above the root; and a fire, in which he was burning weeds for the ashes, being near at hand, he threw it into the fire. In so doing, he had thus in two different modes performed, upon this physical *whole*, the physical *analysis*. By being cut as it was, it became divided into two parts, viz. the *root*, and that which was above the root: and thus in the *mechanical* mode was the physical analysis performed upon it. By its being thrown into the fire and there consumed, of the portion so cut off as above, part was made to fly off in the state of *gas*, the rest staid behind in the state of *ashes:* and thus in the *chemical* mode was the physical analysis performed upon it.

Not long after, came a daughter of his that same way, and a plant of the same kind which her father had thus cut down being left standing, her *attention* was caught by the beauty of it. It was a sweet-brier rose, of which one flower had just expanded itself. All parts of the plant were not alike beautiful. By one part her attention was more forcibly engaged than by the rest. It was the flower. To examine it more closely, she plucked it off, and brought it near her eye. During its approach, the scent of it became perceptible; and thus another sense received its gratification. To prolong it, she tried to stick the flower in a part of her dress that covered her bosom. Meeting with some resistance, the stalk to which, with a few leaves on it, the flower was attached, was somewhat bruised; and now she perceived and distinguished another odour, which though not less agreeable, was somewhat different from the first.

All this while she had been performing upon this physical whole the logical operation termed *logical analysis:* performing it not the less, though, as in *Moliere's Bourgeois Gentilhomme* Monsieur Jourdan when talking *prose*, without knowing it. The *instrument*, by which this mental *operation* was performed by her, was the fictitious entity *attention*. By the attention which she bestowed upon the flower, while no equal degree of attention was bestowed upon any other part of the plant, she analyzed it—she mentally *resolved* or divided it—into *two* parts, viz. the *flower*, and all that was not the flower: and thus she distinguished part from part.

Again. By applying her attention, first to the *beauty* of the flower, composed as it was of the beauty of its *form* and the beauty of its *colour*, she performed in this same original subject *another* analysis, which though still a *logical* analysis, was productive of results somewhat different from those produced by the former; for thus, in the same *part* she distinguished two *properties* or *qualities;* viz that of presenting to the sense of *sight* a peculiarly agreeable *appearance*, and that of presenting to the sense of *smell* a peculiarly agreeable *odour*. The *parts* were both of them *real* entities: the *qualities* were, both of them, *fictitious* entities.

Eager to communicate the discovery to a little brother of her's, she took him to the spot: she showed him the *plant* from which the flower had been plucked. The flower had already become a subject of conversation to them: that part had already received the name of *flower:* not having equally engaged her attention, the other part, like a sheep in a flock, or a pig in a litter, remained without any distinctive name.

Ere long her sweet-brier rose put forth two other blossoms; being so little different from the first, each of these became *flower* likewise. From a *proper* name, *flower* thus became a *common* name.

In the course of another social ramble, a *mallow* plant, with a flower on it, met her eye. At a distance the flower was not yet distinguished from that of the *sweet-brier rose*—"*Ah*," (cried she,) "*here is* flower *again*." The *sweet-brier*, on account of its scent, which continued after the flower was gone, had been preserved: the *mallow*, having nothing but colour to recommend it, was neglected.

These rambles had not continued long, before other sweet-briers and other mallows met her eye. The former being regarded with interest, the other with comparative indifference, the occasion for distinguishing them in conversation was not unfrequently recurring. The *rose flower* became a *rose flower*, the *mallow flower* a *mallow flower*.

When the flower first observed was named *flower*, as yet nothing but *analysis—logical* analysis—had been performed: no operation of the nature of logical *synthesis:* of one individual object it was and no other, that the word *flower* had been made the name. But, no sooner was the *second* flower observed, and the same name *flower*, which had been applied to the first, applied to this other, than an act of logical *synthesis* was performed. The *proper* name was thus turned into a *common* one; and the fictitious entity, called a *sort*, a *kind*, a *species*, or a *genus*, (call it which you please) was created.*

The *fictitious* entity being nothing at all, and the two *real* entities being each of them something, the *fictitious* entity itself did not contain within itself the two *real* entities, or either of them. But the name, which, after having occasionally been applied to each of

* *Genus* and *species* are words which cannot, either of them, be employed without impliedly asserting the existence of the other. Both are aggregates, or names of aggregates: *genus* is the whole, of which *species* is a part. Suppose but *one* aggregate, either of these names may as well be applied to it as the other; or rather, and for the above reason, neither can with propriety be applied to it.

the two *real* entities, became, by degrees, designative of the *fictitious* entity deduced from them, as above, by abstraction, continued to be employed for the designation of *either* of them, and occasionally for the designation of *both* of them together: and thus, in a sense, which, although not strictly proper, has the advantage of conciseness, the one *fictitious* entity, the *species*, may be said to have contained, and to contain, the two individual *real* ones: to *contain*, viz. though not in a *physical*, in a *logical* sense.*

The analysis thus unconsciously performed by the maiden on the first-observed sweetbrier rose, viz. by applying her attention to one part, while it was not applied to the other, had for its subject the *real* entity, the physical whole. It may be termed, the *primæval* or *primordial* analysis: for by no other sort of logical analysis will it be found capable of having been preceded. The analysis, by which the rose-flower became *rose-flower*, and the mallow-flower, *mallow-flower*, had for its subject no other than the *fictitious* entity, the *logical* whole, viz. the *whole* designated, fixed, and, as it were, created, by the denomination *flower*, so soon as, after having been employed merely as a *proper* name, it had come to be employed as a *common*, and thence as a *specific* or *generic* name. It may be termed the *secondary* analysis, or analysis *of the 2d order*. In her young mind, and in this its simple form, this secondary mode of analysis had nothing in it of science, nothing of system. But, in it may be seen the germ of all those systems of division, which, being framed by scientific hands, have spread so much useful light over every portion of the field of art and science.

The maiden had for her sweetheart a young man, who, though not a member of the Com-

* Thus it is, that, considered as distinct from the individuals contained in them, these aggregates, as above, are but *fictitious entities*:—the *names*, employed in the designation of them, so many *names of fictitious entities*. But, when compared with names of fictitious entities at large, these may be seen to have something peculiar in them, which, if he would avoid confusion and disputation, it seems necessary a man should have in mind. In this case, the same word which is employed to signify the *fictitious entity*, viz. the *fictitious aggregate*, is also employed to designate any one of the *individual real entities*, of which that aggregate is regarded as being composed: an homonymy, which may be seen not to have place in the instance of any other sort of fictitious entity, such as a *quality*, a *property*, a *relation*, and the like. Nor let it be said, that, because it contains real entities, the aggregate, called a *species*, a *genus*, a *class*, is itself a real entity. For by the word *plant*, taking *plant*, for example, for the aggregate, are designated—not only all plants existing at the time of the speaking, or the writing of that word, but also all plants that ever have existed,—and all plants that ever shall exist in future,—and even all plants that, without existing, shall be but conceived to exist: and to these last, at any rate, the term *real entity* will hardly be regarded as properly applicable. But though, in addition to the several individual objects, to which the word *plant* is applicable, no real entity, corresponding to it, has place *out* of the human mind,—yet, *within* that receptacle, by this same *name* of a *fictitious* entity, a *real entity*—a *general idea*,—an entity, which though not *corporeal*, is not less *real* than that which is produced in it by the sight or touch of an individual plant,—is produced. To convince himself of this, the reader need but ask himself—whether, after, and by thus reading the word *plant*, his mind is not put in a state more or less different from that which it was in, before this word was read by him. If this be not enough, then let him say, for example, whether by the proposition, *plants have a property which minerals have not*, three distinguishable mental sensations at least—not to speak of any others—have not been produced in his mind: three perfectly distinct *ideas*, each of which is of that sort which is termed a *general* or *abstract* one. Yet, to some philosophers, it has, somehow or other, been matter of supposed discovery, that there are no such things as general or abstract ideas: not considering that, if this position of theirs were true, nothing that they say in proof of it would have so much as the least chance of being productive of the effect they aim at: or, to speak still more generally, scarcely would anything they say be productive of any more effect than would be produced by so much nonsense. Yes:—by the word *plant*, or the word *plants*, when read, an effect, a sort of *feeling*, or *mental image*, is as really produced, as by the sight of any individual plant,—and it is a clearly different one. In the one case it is an *abstract idea*; in the other case, an *impression*: but in the one there is just as much reality as in the other. Of the evidence of the existence of the general idea, the probative force is even nearer, and more promptly and surely satisfactory, than that of the existence of any individual *plant*, from which, by abstraction, that general idea was deduced. In the former case, the evidence is *perception*: in the other case, it is but *inference—ratiocination*: and *that* such ratiocination, as many an acute mind (Bishop Berkeley's for instance) has not been satisfied with.

In speaking of *genera* and *species*, two sources of indistinctness and confusion, and (if observed) of perplexity, are continually presenting themselves. One is—the difficulty which, on the appearance of a generic or specific name, is found, in determining whether it is the fictitious entity—the aggregate *itself*,—or only the *name* employed for the designation of it—that, in the character of the subject of the proposition, the word is intended to bring to view. The other is—the penury and imperfection, under which language—the best constructed not excepted—still labours: viz. in respect of its furnishing no more than these two names, for the designation of the results of any number of ramifications, which, in a system of logical division, there may have been occasion to bring to view. Hence it is, that the same word, which, with reference to this or that other is a *generic* term, is *specific* with reference to a third. Hence again the continually recurring question—is this a *generic* or a *specific* name? and the dispute with what that question is pregnant, is altogether an interminable one.

pany of Apothecaries, (for the company had not yet received its charter,) had, on his part, been engaged in a little train of observations, to an improved and extended series of which, together with the experiments which they suggested, some thousands of years afterwards that most useful and respectable community became indebted for its establishment.

He had observed his dog, after a full meal, betake itself to a grass-plat, and gnaw the grass: a sort of article which, when hungry, it had never been seen to meddle with. To this sagacious swain the maiden was not backward in reporting her above-mentioned discoveries. It might, perhaps, have been not altogether impossible to obtain a communication of some of those observations and discoveries of his, for the purpose of adding them to hers. But, for the explanation of what has here been endeavoured to be explained, what has already been reported of the damsel's will, it is hoped, be found to suffice, without any further trial of the reader's patience.*

* In their present shape, the conceptions above brought to view would not have been formed, nor consequently would this section have been penned, but for a very recent glance cast on the *Logic* of *Condillac*. More than once, at different times, had that little work been glanced over, or at least glanced at: never without its presenting itself in the character of a mass of confusion, from which little or no information was to be reaped. *Analysis* is the name there given to the instrument, by which everything is there supposed to be done: everything by that *one* instrument; in every case that one instrument the same. Language-making was *analysing:* and "*analysis* itself was but a *well-made language.*" (Pp. 88, &c., 121, &c.) On looking at the work once more, observation was made of such passages, in which—always under this one name, *analysis*—an explanation is given of the mode, for the distinguishing of which the epithet *primæval* has herein-above been just employed. Now, for the first time, presented itself to view, matter which seemed capable of being put to use. A resolution was accordingly taken, to endeavour to derive such instruction as might be found derivable from it. Its claim to *attention* being now recognised, thus it was that, by a closer application of that faculty, those distinctions, which have above been seen, were brought to view. *Logical analysis* of the *physical whole*, *logical synthesis*, performed upon the *qualities*—upon the *parts* which had been produced by that logical *analysis*—these, —together with the *logical analysis* of those aggregates which were the products of that *logical synthesis*,—were, in the logic of Condillac, seen, all of them, designated by, and confounded together under, the one undiscriminating term *analysis*.—For the subject of the *primæval* analysis, Condillac, before he came to the *plant*, had employed a magnificently furnished *château:* for the present occasion, a couple of plants seemed quite sufficient, without any such encumbrance as the *château*. Moreover, of the sort of work here in question, abundance must have been done, before there were any such things as *châteaux*.

Yes, (says somebody;) and so there was before husbandmen's daughters amused themselves with gathering flowers. The ancestors of husbandmen were shepherds: the ancestors of shepherds, hunters. In certifying this genealogy *Geography* joins with History.

Assuredly (it may be answered) man had need to provide food, before maidens had need to gather flowers. But, to provide food, man must, somehow or other, have been in being, and able to provide it. Here then the explanation would have been entangled in the mysteries of *Cosmogony*—a subject, which, besides its inexplicability, is altogether foreign to the present purpose. No doubt that, for *attention*, and thence for *analysis*,—to be performed, as above, upon these *physical wholes*,—and thence for *synthesis*, and thence for *logical analysis*, to be performed upon the *logical wholes*, results of these *logical syntheses*,—demands much more urgent, as well as much more early, must have been produced by eatable *fruits* and *roots* than ever can have been produced by *flowers*. But, by any such illustration, we should have been sent to the Garden of *Eden:* and of that garden no map being to be had, sufficiently particular for the present purpose, there we should have lost ourselves.

Pluming himself, as it should seem, upon the discovery, and bringing it to view as such thrice in two small 12mo pages, *Condillac* (pp. 114, 115) will have it, that languages are but so many *analytic methods—methodes analytiques:* meaning, as far as he can be said to mean anything, the results of so many analytic—purely analytic—processes. He sees not, that, so far from being an analytic process, the process, by which the principal and fundamental materials of all languages—viz. *common* names—are framed, is of a nature exactly opposite to that of *analysis;* viz. *synthesis*. True it is, that this *synthetic* is necessarily preceded by an *analytic* process · viz. by the one above explained under the denomination of the *primæval* or *inerudite* analysis:—a *logical* analysis performed upon *physical wholes*. True it also is that, to the *wholes*, which are the results of this synthetic process,—with the exception of those *minimums*, which are in immediate contact with individuals,—another analytic process may, to any extent, be applied, viz. the scientific or *logical* analysis, performed upon these logical wholes. But, how promptly soever they may succeed to each other, *disaggregation* and *aggregation*—putting asunder and putting together—never can be one and the same operation —never can be other than opposite operations: and, but for and by means of the aggregative process, not a single word—not a single instrument—would the philosopher have had, wherewith to put together this his not sufficiently considered account of the formation of language.

Some thousands of years after appeared *Linnæus*. In the course of that interval, not

One of these days—the sooner the better—by a still closer application of the faculty of *attention*, a more discerning eye will, perhaps, discover and bring to light similar imperfections in the account given of the matter in these pages: and thus it is, that,—by still closer and closer application of that same faculty,—additional *correctness*, *distinctness*, and *comprehensiveness*, is given to man's conceptions, in relation to each and every portion of the field of art and science.

Of the aggregations thus formed, some have been better made, others worse. Those which he regards as having been better made, were (he assures

only in the language in which he wrote, but in every lettered language at least, not indeed with perfect steadiness, but still without much dispute or variation, a name corresponding to the word *plant* had been in use to be employed in the designation of any one of those physical objects, to which, when individually taken, that same denomination continues to be applied.

For the same length of time accordingly, a *logical whole*, possessing this vast extent—a *logical whole*, formed by the logical process called *synthesis*—had been in possession of the sort of existence which the nature of an object of this sort admits of.

For the purpose of distributing, according to such of these properties, as were at the same time most easily observable, most steady in their union, and most interesting to man, whether in the way of use or harm, such individual plants as from time to time should come under observation, and *this* to the end that such names might be given to them, whereby, for the purpose of putting to use their useful properties, or excluding the operation of their pernicious properties, they might, when seen, be recognised,—various sources of division had occurred to various scientific observers. By none of them had this useful object been completely accomplished. To *Linnæus* it appeared, that it was in the *flower* that the most apt source of division was to be found: inasmuch as, for the determination of the principal and most comprehensive divisions of a vast logical whole, certain differences, in respect of the form in which that part manifests itself, might be made to serve with as yet unknown advantage. Why? Because, with those differences in respect of the flower, other differences in respect of some of the properties most interesting to man—differences pervading the entire mass of each individual plant—had been observed to be conjoined. Thence, by seeing what sort of a thing the plant in question is, in respect of the flower, a guess may be formed, better than can be formed by any other means, what sort of a thing the plant is in other respects.

From this view a conception may be formed, of the disadvantage, under which every system of logical division comes to be framed. In this way no two things can be put asunder, but what have first been put together. To no other objects can this mode of *analysis* be applied other than to *logical wholes*—objects which are altogether the product of so many antecedent logical *syntheses*. But, in the first place, the *primæval logical analysis*, performed upon individual objects—this process, notwithstanding this its scientific name, having taken its commencement at the very earliest stage of society, cannot but have had for its operators the most unexperienced, the most

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us) the work of *Nature*: those which were worse made, the work of learned men: meaning such whose labours in this line he saw reason to disapprove of. *Nature* being a sort of goddess—and that a favourite one—by ascribing to this goddess whatsoever was regarded by him as good, he seems to have satisfied himself, that he had proved the goodness of it. and, by so concise an expedient—an expedient, in the employment of which he has found but too many successors, as well as cotemporaries and predecessors—he has saved himself no small quantity of trouble.

Nature is a sort of fictitious personage, without whose occasional assistance it is scarce possible (it must be confessed) either to write or speak. But, when brought upon the carpet, she should be brought on in her proper *costume*—nakedness: not bedizened with *attributes*—not clothed in *eulogistic*, any more than in *dyslogistic*, moral qualities. Making minerals, vegetables, and animals—this is her proper work; and it is quite enough for her: whenever you are bid to see her doing *man's* work, be sure it is not *Nature* that is doing it, but the *author*, or somebody or other whom he patronizes, and whom he has dressed up for the purpose in the goddess's robes.

One word more, on the subject of a former topic, before this philosopher is parted with.—In § 7, p. 74, may be seen the result of the provisional attempt towards an enumeration of the distinguishable *operations*, and correspondent *faculties*, of the mind. In number they were *seventeen*. *Condillac* (ch. 7. p. 61) makes but *six*: viz. 1. Attention. 2. Comparison. 3. Judgment. 4. Reflection. 5. Imagination. 6. Ratiocination. It might be an exercise for a student—nor would it surely be a useless one—to compare these six with those seventeen:—to observe, whether, in this longer list, there are any articles that do not properly belong to it—and if not, whether *Condillac*'s shorter list be, in any particular, defective or not:—whether, for example, *memory* has not been *forgotten* by him:—and if not defective, in which of the articles of his shorter list those of the longer list are respectively comprised.

On considering the catalogue once more, it seems as if some such article as *analogization* or *analogoscopy*—i.e. *observation of analogies* might form a useful addition to it. Not but that, in the explanation thus given, the phrase, *observation of analogies* is already to be found. But,—so distinct from *simple abstraction*, *analysis*, and *comparison* are those abstractions, analysis and comparisons, which have *observation of analogies* for their result,—and so powerful and perhaps indispensable an instrument is the faculty so denominated in the hand of *Invention*,—that a separate denomination would, it should seem, be not ill bestowed upon it. Note, that to the above catalogue of the distinguishable operations and correspondent faculties of the human mind, the so-often-mentioned *test* of distinctness and all-comprehensiveness has not been applied. It is the result of no other operation than the analysis above distinguished, by the name of the *primæval* analysis: and (unless the title by which it is thus designated be regarded as the result of an act of *synthesis*) not subjected to any synthesis; nor consequently to any *scientific* analysis, as above distinguished.

Hence it cannot be given in any other character than that of a collection of raw materials, not so much as attempted to be made up into a finished work. The task was too heavy to be attempted in a parenthesis. But if, in the materials thus brought together, any addition should be found made to

uninformed, and unskilful hands. In the next place, the *synthetic process*, by which the results of that analysis, fragments detached, by abstraction, from these physical wholes, were placed as it were under so many different common names, and by those names bound together by so many logical ties,—this likewise was a work, which, though not yet concluded, nor in a way to be soon concluded, must in its commencement have been coæval even with that of the *primæral* process, to which it has been indebted for all the materials on which it has had to operate: coæval with the very first crude effusions, of the results of which the matter of spoken, and thence of written language, came, by continual additions, to be composed.

Thus stands the matter, in regard to those names of aggregates, in the signification of which are comprised such individual objects as are purely corporeal. How then stands it (says somebody) in regard to objects of the *pneumatic* cast, *real* and *fictitious*? The answer is—to apply to this division of the objects of thought the triple process, just above described, would require a full and detailed explanation of the nature of those *fictitious* entities, which, by reason of the similarity of the aspect of their names to that of the names of corporeal objects, all which names are *real* entities, are so continually confounded with real ones. But to suggest the question is almost all that can be done here. To attempt anything like a complete answer, would be to transgress beyond endurance the proper limits of this work. A few words, for the purpose of affording an indication, how faint soever, of the only track, by the pursuit of which, a satisfactory answer would, it is supposed, be to be found, may be seen in the concluding note.*

Section XX.

Proposed new Names—in what cases desirable—in what likely to be employed?

Among the new names, here proposed for Encyclopedical purposes, are there any, of which it is *desirable* that they should come to

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those which had already been brought together by other hands, it will be not altogether without its use.

* According to that conception of the matter, which is here alluded to and assumed, entities are either *real* or *fictitious*: real, either *perceptible* or *inferential*: perceptible, either *impressions* or *ideas*: inferential, either *material*, i. e. *corporeal* or *immaterial*, i. e. *spiritual*. Material are those of which the principal divisions are exhibited in the *Ramean* tree: of such inferential real entities as are immaterial, examples may be seen in the Almighty Being, and in the human soul, considered in a state of separation from the body.

By *fictitious entities* are here meant, not any of those which will be presented by the name of *fabulous*, i. e. imaginary *persons*, such as *Heathen Gods*, *Genii*, and *Fairies*, but such as *quality—property*, (in the sense in which it is nearly synonymous to *quality*) *relation*, *power*, *obligation*, *duty*, *right*, and so forth. Incorrect as it would be, if the entities in question were considered as being, in point of reality, upon a footing with *real* entities, as above distinguished, the supposition of a sort of *verbal* reality, so to speak, as belonging to these fictitious entities, is a supposition, without which the matter of language could never have been formed, nor between man and man any converse carried on other than such as hath place between brute and brute.

Fictitious as they are, entities of this description could not be spoken of at all, if they were not spoken of as *real* ones. Thus a *quality* is spoken of as being *in* a thing or a person: i. e. the thing or the person is spoken of as being *a receptacle*, and the *quality* as being something that is contained *in* it.

As in the case of all words, which have an immaterial, as well as a material, the root of the *immaterial* will be found in the *material* import; so, to explain the nature and origin of the idea attached to the name of a *fictitious* entity, it will be necessary to point out the *relation*, which the import of that word bears to the import of one or more names of *real* entities: i. e. to show the *genealogy*, or (to borrow an expression from the mathematicians,) the *genesis* of the fictitious entity.

From the observation, by which, for example, the words *duties* and *rights* are here spoken of as names of fictitious entities, let it not for a moment so much as be supposed, that, in either instance, the reality of the object is meant to be denied, in any sense in which in ordinary language the reality of it is assumed. One question, however, may be ventured to be proposed for consideration, viz. whether, supposing no such sensations as *pleasure* or *pain*, *duties* would not be altogether without *force*, and *rights* altogether without *value*?

On this occasion, in the case of the name of a fictitious entity, a distinction requires to be made between the *root* of the *idea*, and the *root* of the *word* by which it is designated. Thus, in the case of *obligation*, if the above conception be correct, the root of the *idea* is in the ideas of pain and pleasure. But the root of the *word*, employed as a sign for the designation of that idea, is altogether different. It lies in a material image, employed as an *archetype* or *emblem*: viz. the image of a *cord*, or any other *tie* or *band*, (from the Latin *ligo*, to bind,) by which the object in question is *bound* or fastened to any other, the person in question bound to a certain course of practice.

Thus, for the explanation of a fictitious entity, or rather of the name of a fictitious entity, two perfectly distinct species of operations, call them *paraphrasis* and *archetypation*, will, in every case, require to be performed; and the corresponding sorts of propositions, which are their respective results, formed; viz. the *paraphrasis*, performing the function of *a definition*, but in its *form* not coinciding with any proposition to which that name is commonly attached.

The *paraphrasis* consists in taking the word that requires to be expounded—viz. the name of a *fictitious* entity—and, after making it up into a *phrase*, applying to it another phrase, which, being of the same import, shall have for its principal and characteristic word the name of the corresponding *real* entity. In a *definition*, a phrase is employed for the exposition of a single word: in a *paraphrasis*, a phrase is employed for the exposition of an entire phrase, of which the word, proposed to be ex-

be employed for ordinary use? Among these again, are there any which present any *chance* of their being so employed?

In answer to both these questions, a very few words are all that can be afforded.

Geometry, Arithmetic, Algebra, Fluxions—for familiar use, what seems as far from being desirable as from being probable, is—that terms, of all which, though only one of them is exactly and originally expressive, the import is so well fixed, should be expelled by new ones.

To *Mathematics*, considered as a branch of art and science, in which all those others are included—to *Mathematics*, howsoever in its original import misexpressive, the same observation may be extended. Not but that *Posology*, should it ever be its lot to come into use,

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pounded, is made to constitute the principal or characteristic word.

Archetypation (a word employed, for shortness, rather than *archetypophantia*, i. e. indication of the archetype or pattern) consists in indicating the *material image*, of which the word, taken in its primæval sense, contains the expression.

Thus, without being drawn out into form, (an operation for which a multitude of distinctions and discussions would be found requisite,) in the case of the word *obligation*, both the *paraphrasis* and the *archetypation* may be deduced from what is indicated above.

Rhizophantia, indication of the *root*, might serve as a common or generic term applicable to both.

To return to *analysis*. It is by an operation of the nature of *analysis*, *primæval* analysis, that the ideas, designated by the several names of *fictitious entities*, have been formed. Unfortunately, in the case of these *fictitious* objects, the description of the way in which the analysis must, or may have been performed, will be matter of much more difficulty than in the case of the above-mentioned *real* ones.

Not to leave the field of fictitious entities, and with it the corresponding part of the field of *logical analysis*, in the state of an utterly *dark spot*, thus much has here been hazarded: and here it is high time that what has been said on the subject of *analysis* should be brought to a close.

Unfortunately, here are not only *new words*, but these in a multitude, greater by the whole number than would have been employed, could the ideas intended have, at any cheaper rate, been conveyed. But he who, in any branch of art and science, *ethics* itself not excepted, is resolved not to have anything to do with new words, resolves by that very resolution to confine himself to the existing stock of ideas and opinions, how great soever the degree of incorrectness, imperfection, error, and mischievousness which may in those ideas and opinions happen to be involved.

One parting word in relation to *D'Alembert*: lest, from the indication given in a preceding section (§ 7,) of the imperfections observable in his *Encyclopædical tree*, any unduly unfavourable estimate of the instruction derivable from the philosophical works of that illustrious Frenchman, should be deduced.

With the exception of that which contains the *Encyclopædical tree*, the five volumes of *Miscellanies*, which comprise his *philosophical* works, had not been opened for some thirty or forty years, when, in expectation of finding in one of them the germ of what has here been said on the subject of *fictitious entities*, it was thought necessary to run over it.

In that particular the search has not been successful. But, in the course of it, ample ground has been seen for the conclusion, that although, with eyes closed by prudence, or rather by necessity, treading in the steps of his illustrious precursor, he, on that occasion, kept himself below the level of his own age, yet, on every succeeding occasion, he may be seen rising high above it.

In the two last of those five volumes are contained applications, successively, and everywhere more or less successfully made, of the all-comprehending and all-commanding art of Logic, to every subjacent part of the field of art and science.

By a recent but still imperfect review of it, (such as time and eyes would allow of,) much regret has been suggested at the thoughts of its never having yet, it is believed, been brought within the reach of the English reader: for even at the present comparatively advanced period, much useful instruction, as well as, to a comprehensive mind, much gratification, might surely be reaped from a critical perusal of it.

Consummate surely is the originality, the comprehensiveness, the penetration, the discernment, the moderation, the prudence, the elegance of expression, and, amidst surrounding dangers, the steersmanship manifested in that work. It is, for that age, what for the present generation the present work would have endeavoured to render itself, could any such endeavour have found a ray of hope to animate it. Of those volumes, the fourth has for its title, *Essai sur les Elémens de Philosophie, ou sur les principes des Connoissances humaines*: the fifth, under the name of *Eclaircissemens*, &c., contains supplements to some of the principal articles of the preceding Volume. It speaks of itself as having been written at the desire of *Frederic the Great* of *Prussia*. In a translation, the supplements might with advantage, it is believed, be worked up along with the original articles: and prefixed to both might be the contents of the first Volume of the five: viz. the preliminary discourse attached to the first French Encyclopædia, and the Preface to the third Volume of that great work.

On the subject of *analysis*, however, the conceptions of *D'Alembert*, (iv. 157, 257, 287, &c.) seem not much more correct than those of *Condillac*. By their manner of speaking of it one would think it was a sort of instrument by which everything is done. In general the attention paid by men of science to the Greek language, seems not to have been so general in France as in Britain, particularly as in England. Yet even in the Logic of *Saunderson*, who can scarcely be suspected of not being well conversant with Greek, the account given of *analysis* and *synthesis*, (for by him they are both spoken of,) has not been found a clear one. By an observation taken of the *archetypal image*, had this use of the correspondent operation been sufficiently understood, all this observation might have been prevented. In the case of every name of an *immaterial object*, the *archetype* is at once an *index* and a *holdfast* to the sense of it. In the case of every name of a *fictitious* entity, the only sure test of intellection is *paraphrasis*.

would form a more instructive, and, to all by whom its original import is borne in mind, a more satisfactory name.

Being in their original import so misexpressive,—and, even in respect of present import, one of them at least so indeterminate,—that *Natural History* and *Natural Philosophy* should give way to appellations fixed in their import, in some sort instructive, and at the worst not misexpressive, seems at any rate to be wished. Whether to be looked for seems not equally clear. To a grecianized ear in the first instance, and to an ungrecianized ear when explained to it, *Physiurgic Somatology* and *Anthropurgic Somatology* are expressive, —but then they are not single-worded. *Physiurgics* and *Anthropurgics* are, each of them, when separated from *Somatology*, single-worded. To the use of these, what seems to be the only obstacle, or at any rate the only assignable objection, is—that, being expressive of *accidents* without a *subject*—being substantives formed out of an adjective without a visible substantive—they might, for some time, fail of being sufficiently *expressive*. In themselves, (not to speak of *Algebra*, which, in its original import, is all darkness,) they are, however, in this respect, but upon a par with *Fluxions*. Even *Physiurgic Somatics*, or *Physiurgic Somatology*—*Anthropurgic Somatics*, or *Anthropurgic Somatology*—even these, though, as touching their *two-wordedness*, they are in no *better* case than *Natural History* and *Natural Philosophy*, yet in that respect they are in no *worse* case; and, in respect of *determinateness* and *instructiveness*, they stand in that so much better case, which in Section the fourth has been brought to view.

In all these instances, for presenting the import desired—the import for the presentation of which the demand is continually occurring—words, howsoever originally unexpressive or misexpressive, are—and without any very considerable inconvenience—already in universal use. Not so in the case of that branch of *Ethics*, for the designation of which the word *Deontology* has here been ventured to be proposed. Under the undiscriminating import of the word *Ethics*, a branch in itself so perfectly distinct, and which in practice so frequently requires to be distinguished from, and put in opposition to, that which joins with it in forming the two branches of the common trunk, is at present continually, and, but for those many-worded explanations, which are never given, and scarcely ever so much as thought of, irremediably confounded.*

For exemplification, thus much may perhaps have its use. To examine, in this same view, every new appellative which the Table furnishes, would surely be superfluous.

APPENDIX.—No. V.

SOURCES OF MOTION.

ANALYTICAL SKETCH of the several *Sources of Motion* with their correspondent *Primum Mobiles*.

Of *Motion in general—its generation and extinction.*

In the masses of matter with which man is conversant, and on which for his being, as well as his well-being, he is at all times dependent, whatsoever change is effected—this change is either itself some motion, or owes its origin to some motion of which it is the result.

Motion is the motion of some *body* or *bodies*; of some portion or portions of *matter*, of the aggregate mass of matter with which man is conversant.

Of this aggregate mass no particle can at any time, or in any place, in any direction, enter or be made to enter into a state of motion, without having to encounter a perpetual and indefatigable antagonist styled *Resistance*.

According to the commonly received distinction, this Resistance is susceptible of two

* Some fourscore years ago, by *David Hume*, in his *Treatise on Human Nature*, the observation was, for the first time, (it is believed,) brought to light—how apt men have been, on questions belonging to any part of the field of *Ethics*, to shift backwards and forwards, and apparently without their perceiving it, from the question, what *has been done*, to the question, what *ought to be done*, and *vice versâ*: more especially from the former of these points to the other. Some five-and-forty years ago, on reading that work,—from which, however, in proportion to the bulk of it, no great quantity of useful instruction seemed derivable, that observation presented itself to the writer of these pages as one of cardinal importance. To every eye, by which those two objects have not been completely separated from each other, the whole field of Ethics, in all those divisions of it, which the Table will show, must ever have been, —yea, and ever will be,—a labyrinth without a clue. Such it has been in general, for example, to the writers on *International Law*: witness *Grotius* and *Puffendorf*. In their hands, and apparently without their perceiving it, the question is continually either floating between these two parts of the field of Ethics, or shifting from one to the other. In this state of things, a name, which, such as *Deontology*, turns altogether upon this distinction—suppose any such name to become current, the separation is effectually made, and strong and useful will be the light thus diffused for ever over the whole field. That this distinction should, on every occasion, be clearly perceived, is (need it be observed?) the interest of the great bulk of mankind. Unfortunately, this most extensive interest finds opposed to it a cluster of particular interests, which, though so much narrower, being but the more concentrated, have ever been acting against it with proportionable advantage, and hitherto with irresistible effect. One day these particular interests will be recognised. On the present occasion, to attempt bringing them to view would be consistent neither with the unity of the design, nor, perhaps, with prudence.

different modifications; viz. 1. *Counter Motion*, i. e. active; and 2. *vis inertiæ*, or purely *passive* resisting force. But, perhaps, upon a closer examination it might be found, that that which presents itself in the character of a purely passive resisting force, is no other than an actively resisting force, produced by the elasticity of the mass to which the moving power is applied; that is, the repulsive power, the countermotion, or tendency to countermotion, of the particles of which the mass acted upon by the moving force is composed.

To one or other of these powers, if between them there can be any real difference, will be to be referred that cause, to the designation of which, when cessation of motion is considered as the effect of it, the word *friction* is applied.

For the purpose of rendering, in the best manner in which we are able, an account of the motion of such bodies as are in motion, and of the rest of such as are at rest, certain fictitious entities are, by a sort of innocent falsehood, the utterance of which is necessary to the purpose of discourse, feigned to exist and operate in the character of causes, equally real with, and distinct from, the perceptible and perceived effects, in relation to which they are considered in the character of causes.*

All bodies we are acquainted with, it is universally agreed, are compounds, as it were, of solid matter and empty space. All bodies, viz. the ultimate particles of solid matter which enter into their composition, are separated by intervals of space, in which no matter at all, at any rate none that we have any acquaintance with, is contained. To the different distances at which, in different states of its existence, the component particles of the same body are placed, are owing, in some degree, the different textures of which it is susceptible, and which, under different circumstances, it exhibits to our senses.

Take, for example, any mass of matter whatsoever: suppose an apple; the apple let it be from which Newton derived the first hint of the attraction of gravitation; the ever memorable apple which, as an object of worship to the latest posterity, ought to have been preserved from corruption in a hermetically sealed glass-case; ought to have been transmitted as an object of worship to the latest inheritors of this our globe:—the particles of solid matter of which this apple is constituted are, each of them at a certain distance from each of the several others. How happens it that they are not more distant. What is the cause of such their propinquity? The necessary fiction above spoken of provides an answer and says, *the attraction* of *cohesion* is the cause by the operation of which they are thus kept together. How happens it that they are as distant as they are? What is the cause of such their distance? Here again steps in the same useful respondent, and answers, It is by mutual *repulsion* that they are thus kept asunder.

It is to distinguish it from the attraction of *gravity*, of which presently, that the attraction, termed the attraction of cohesion, has acquired that name. Of this species of attraction, repulsion, it has been seen, is the constant companion, and antagonist; each of the opposite and mutually balancing effects have equal need of a fictitious cause. Repulsion is the generic name applicable to other cases. *Attraction of cohesion* is a specific one. To match with this its antagonist, the particular species of repulsion here in question requires its specific name. Repulsion corresponding to the attraction of cohesion, let this be that specific name; or rather an appellation thus multitudinously worded, being too cumbersome for use, say, the *repulsion of cohesion*: and though taken by itself, and without explanation, the appellative would, upon the face of it, be self-contradictory, yet by this explanation, to which by its texture it would naturally point, it may perhaps be found not altogether unfit for use. Instead of this appellation, or

* The necessity to which we are subjected by the imperfection of the instrument for the purposes of discourse, the necessity of mixing falsehood with truth, on pain of being without ideas, as well as without conversation, on some of the most interesting of the subjects that lie within the pale of our cognizance, is productive but too abundantly of misconception and false reasoning; and this not only in the physical department of the field of thought, discourse, and action, but also in every other. On pain of having some of the most interesting subjects of thought, discourse, and action undiscoursed of, and even unthought of, we set to work the powers of our imaginations in the creation, as it were, of a multitude of imaginary beings, all spoken of as if they belonged to the class of bodies or substances; and on the occasion, and for the purpose of this creation, we attach to them a name or sign, called a part of speech: viz., a species of word, termed a noun substantive; the same species of word as that of which, in the character of a common name, we make use for the designation of real entities, appertaining strictly and properly to the class of substances. Beholding at a distance, in the dress of a man, sitting and playing upon an organ, an automaton figure, constructed for that purpose by the ingenuity of the mechanist, to take this creature of human art for a real man, is a sort of mistake which, at a certain distance, might happen for a time to be made by the most acute observer. In like manner, beholding a part of speech cast in the same mould with the name of a real entity, a really existing substance, no wonder if, on a variety of occasions, to the mental eye of a very acute observer, this fictitious entity thus accoutred, should present itself in the character of, and be regarded and treated as if it were a real one. How should it be otherwise, when on every occasion on which, and by every person by whom it is spoken of at all, it is spoken of as if it were a real entity? and thus in a manner an universal attestation is given to the truth of a set of propositions, the falsity of which when once brought to view, cannot in any instance fail to be recognised.

for variety along with it, if for attraction of cohesion, the appellation internal attraction, or intestine attraction, be employed; for repulsion of cohesion, the term internal repulsion, or intestine repulsion, may be employed.

In the *Attraction of Gravity* may be seen one of the fictitious entities, to the operation of which, in the character of causes or sources, the birth of motion, howsoever modified, may, as far as we are acquainted with it, be referred. To the repulsion of cohesion—to this one simple cause, will, it is believed, be found referable, with equal propriety, the death of all these several motions; which, at the conclusion of the conflict maintained by the various species of attraction, endowed with their several unequal degrees of force, remains, constituting the only force by which matter is retained in that state of composition above-mentioned, which seems essential to its existence; and by which the whole multitude of its particles are prevented from being crowded together into one mass.

To account for the difference of bodies in point of distance, a sort of nominal entity is feigned, to represent the cause of it, and Motion is the name by which this imaginary cause is designated. Motion is thereupon considered (for such are the shifts that language is reduced to) as a sort of receptacle in which bodies are lodged; they are accordingly said to be *in* motion, as a man is said to be *in* a house.*

By laying out of consideration everything that concerns the particular nature of these bodies respectively; everything, in a word, concerning them, but the difference between the distance or interval between them at the one time, and the distance or interval between them at the other, we obtain the abstract idea, for the designation of which the word motion is employed. In speaking of it, we speak of it as if it were itself a substance: a hollow mass into which the body, the really and independently existing body, whatever it be, and how vast soever it be, is capable of being put, and which is capable of being communicated to that body, and so in regard to bodies in any number.

A philosopher, says the old Greek story, denying the existence of Motion, another to refute him, got up and walked. Good for a practical joke, not so for a serious refutation. Of the existence of the faculty of locomotion, the denier of the existence of motion, was not less perfectly aware before the experiment than after it. What he denied was,—not the universally exemplified, and universally known, and acknowledged matter of fact, that the same body is at one time in one place, at another time in another, and in that sense the existence of motion—but the existence of any real entity, corresponding to the appellation motion; any entity real and distinct from the body or bodies in which the motion is said to have place.

Thus early (as appears from this story) had a conception, however narrow and inadequate, been formed of the distinction between names of real entities and names of fictitious entities;† a distinction by which much light has already been thrown, and by degrees much more will be thrown on the field of language; and through that medium, on the field of thought and action; and, in particular, on the nature of the relation between *cause* and *effect*. Cause, when the word is used in its proper signification, is perhaps in every instance the name of a fictitious entity; if you want the name of the correspondent real entity, substitute the word *author*, or the word *instrument*, to the word cause.

Rest is the absence, non-existence, or negation of this imaginary receptacle. When, after observation taken of the two bodies in question, at two different points of time, no such difference of distance is found, they are said to have been during that length of time each of them at rest. Rest is thus a sort of imaginary pillar, or anchor, to which, in the English language, they are considered or at least spoken of, as being fastened.‡

Enclosed in that receptacle, or fastened to this pillar or anchor,—one or other is at every point of time the condition of every object to which the name of *body* has been attached.

The truth is, that absolutely and properly speaking, in as far as observation and inference have extended, motion is the state or condition in which, at every point, every body is, and so for ever is likely to continue. Rest is not the state of our own sun, about which the planet that we inhabit moves. If a state of rest were predicable of anything, it would be of the ideal point in the expanse of space, the *centre of gravity*, as it is called, about which, the sun on the one part, and the planets on the other, are observed or supposed to turn. The observations and inferences thus applied, in the first instance, to our sun, have been extended to those other bodies to which, to distinguish them from those companions to our earth called planets, we give the name of fixed stars; but which, determined as they have been by these observations and these inferences, it has seemed good to our astronomers not to tie to the above-mentioned pillar, but to put all together into the above-mentioned receptacle.

So it is then, that, for the purposes of discourse, as well as of thought and action, the

* The idea of *motion* is capable of being deduced from difference of position, without any difference of distance, as well as from difference of distance; but being much more complicated, the description of that case is, on that account, omitted.

† See this division discussed at length, under the head of Ontology, in this volume.—*Ed.*

‡ Not so in every language, in the French, for example, (*en repos*) *rest*, is also a receptacle.

pillar is not less necessary to us than the receptacle. For this purpose, rest requires to be distinguished into *absolute* and *relative*. Absolutely speaking, as above, no one body is at rest; but on this our little planet, the theatre of all our little doings and sufferings, bodies in abundance are to be found, which, as between any two given points of time, having been at the same distance from each other, have, during these two points of time, together with the whole interval, if any, that has been between them, been at rest. Upon the whole, then, absolute rest is not exemplified anywhere; but, on the surface of our planet, exemplifications of relative rest may be found everywhere. These things considered, henceforward as often as *rest* is spoken of as having place, relative rest, and that alone, will be intended.

The motions in which the various effects, as yet observed by us to be produced by the powers of nature, modified or not modified by human art and industry, have their essential causes, are derived from various sources. Of these motions, obvious, as when once brought to view, the task of giving a list may seem to be—obvious, and, by its conduciveness to the purpose of instruction, presenting an incontrovertible claim to the notice of the institutional writer, who, for the theatre of his labours, has chosen the field of Natural Philosophy,—the task of giving such a list, hath, it is believed, as yet, been undertaken by no one. No work in which that task has been executed, or endeavoured to be executed, is as yet anywhere to be found.

Consideration had of the utter absence of all information from more competent hands, to the author of these pages, how little soever accustomed to apply his industry to this department in the field of science, it occurred that an attempt to afford, in a manner however inadequate, a supply to this deficiency, might have its use, were it only by attracting to so interesting a subject, which presents so strong a claim to their notice, the attention of those from whose more adequate learning and ingenuity it may receive more correct and complete explanation.

Of these various sorts of motions, some are, as far as we have reason to believe, in their nature perpetual, unintermitting, or, if a common figure of speech may be allowed, immortal. Others, and by far the greater number, in their nature mortal and perishable.

Of these two so materially different heads, Which come under the former? Which under the latter? In any attempt to give answers to these questions, an answer to the question concerning the existence of what is called *perpetual motion*, is necessarily involved.

Of the following sketch the design is, in the first place, to perform the enumeration of the several distinguishable sources of motion, considered as it is wont to be produced, or capable of being produced by human art, in some determinate direction, for the purpose of accomplishing some determinate object or end in view. In the next place, by means of a systematical sketch, to bring to view the several points of relation between these several sources of motion,—the points in respect of which they agree with one another, and those on which they differ.

By this means a facility, it is hoped, will be given to the decision on the question, whether, in the preceding enumeration all such sources, actual and possible, are included; or whether any, and what are omitted.

Primum mobile is a term already in use; and by it, in each instance, is designated that mass of matter, which, when from the particular source in question, motion is considered as derived, is considered as being of all the bodies by which the motion is experienced, which, at the time in question, issues from that source, the first in which it has place. Accordingly, corresponding to every distinguishable source of motion, a *primum mobile* will be to be brought to view.

Of the two expressions, viz. sources of motion, and primum mobiles; the latter is the one, principally, if not exclusively, in use. To the other the preference has, notwithstanding, here been given, and that on several accounts.

1. It is only in as far as it points to the source whence it is derived, that the question, *what* or *which* is the *first mover*? (the body which, on the occasion in question, is of all the bodies in which the motion is observed to have place, the first in which it makes its appearance,) is an object of regard. In the class of objects designated by the generic word *motion*, men behold the cause of every effect, desirable or undesirable, which they perceive to take place. But various are the sources whence this important agent is seen to be derived. An object of anxious and continual research cannot but be, the determining, on every occasion, from which of all these sources, the article thus in universal demand, may be derived to most advantage.

Of this inquiry, source is the only direct and intrinsically important object: the primum mobile is so no otherwise than either in respect of its affording indication of the source, or, in respect of the need there is of commencing with this article, the plan of the operations instituted, for the deriving down to the ultimate object, whatsoever supply there may be occasion to draw from this source.

2. In many instances in which the source is sufficiently distinguishable to admit of a separate name, the primum mobile is altogether undiscernible; or, to speak more properly, a primum mobile is a thing that has no existence,—two bodies, or sets of bodies, move each of them towards the other, both beginning at the same instant of time; as is plainly the case, for example, in all those minute motions or dances of atoms, which belong to the experience of the chemical branch of science.

In a word, of the phrase, source of motion, the applicability will be seen to be universal; that of primum mobile, very confined; so much so that it is only in deference to usage, that any notice is here taken of it.

Sources of motion, enumerated with their corresponding *Primum Mobiles:* a sketch supposed to be all-comprehensive, and now, for the first time, attempted.

I. *Selenic,** *Selenigenous,*† or simply mechanical source of motion.

By the appellation *Attraction of Gravity*, stated also simply *Gravitation*, is designated the species of force by which, as far as observation or induction have extended, all particles of matter, without exception, are drawn towards one another: the heavenly bodies, commonly termed in contradistinction to planets, fixed stars, (they being comparatively such,) among the rest our sun, not excepted.

On this our earth a body is said to *fall*, when it is understood to come nearer to the centre of the earth than it was before. When to any mass of matter in the liquid state, it happens to fall otherwise than by means of the removal of some mass of matter in the vessel or state which had served for the support of it, in such case, antecedently to such its fall, it has by some assignable cause been made to *rise*. The only constantly, and regularly, and universally operating cause by which, on this our earth, water is raised, is the action of the moon. The mass of matter contained in that secondary planet, the motions of which are principally determined by those of that which we inhabit, operating in virtue of the universal principle of *gravitation* upon the whole mass of matter contained in ours. But in our planet, that part of its mass which is in a state of liquidity, or in a gaseous state, is free and able to yield, while that which is in the state of solidity, being kept together by another source of attraction, called *Attraction of Cohesion*, is not able to yield, any otherwise than the whole of it together. Hence, as the moon moves, while the solid part of the earth's substance remains relatively and apparently stationary, the fluid part of the mass is perpetually in a state of relative motion, which is determined by that of the moon, and which, bating the disturbance it receives from *winds*, of which further on, would be a perfectly regular one.

In these circumstances, as it rises, any solid body floating on its surface is made to rise with it, and, as it falls, to fall; and thence in both cases, to operate with a force proportioned to its weight upon any body with which it is connected; and thus, from body to body, through any series of bodies, till the motion thus produced reaches that body or assemblage of bodies, on which, for the purpose of the practical use in question, the ultimately serviceable impression is intended to be made, to the end that the form adapted to that use may be given to it.

Laying out of the account *temperature*, and *changes of temperature*,—i. e. the quantities of perceptible heat in particular places,—viz. in the air, or other bodies, by which these places are respectively occupied;—laying out of the account temperature, and those other meteorological circumstances by which the fall of water, as will presently be mentioned—the fall of water in the shape of rivers—is produced, it is only by the attraction of gravitation, that has place between the earth and the moon, that this source of motion is afforded. Selenic or Selenigenous, is, therefore, a term which, if employed for the designation of this source of motion, will serve to indicate the characteristic nature of it.

Corresponding *Primum Mobile*, in this case the *Moon: Secundum* mobile, the water so made to rise and sink: *Tertium* mobile, the solid body which, floating on the water, is made to rise and sink with it: *Quartum* mobile, that part of any system of machinery with which the *Tertium* mobile is in immediate communication. The system of machinery in which use is made of this source of motion, and its corresponding Primum Mobile, is called a Tide-Mill.

II. *Hydropiptic,*‡ *or Chemico-Mechanical* § *source of Motion.*

A river is a mass of falling water—*i. e.* a mass of ice which, by mixture of a certain proportion of the matter of heat, is brought into a liquid state, and having, in such its liquid state, or at first in its state of solid ice, been dissolved in the air of the atmosphere and so raised aloft, is by means of a diminution in the proportion of caloric mixed with it, changed from the gaseous state into a liquid state, and by the attraction which, in common with all matter stationed at the surface, it has for the centre, of the earth, runs down till it arrives at a spot at which it finds its further immediate descent prevented by such portions of the matter of the earth as are in the solid state. In so doing, it acts and presses upon all bodies opposed to it, in such manner as to communicate, or tend to communicate, to them a quantity of motion not greater than that which it of itself possesses.

Corresponding *Primum Mobile*, in this case the *falling water*. *Secundum* Mobile, any moveable solid body placed, as in the case of the mainwheel of a water-mill, in such sort as

* [Selenic.] From a Greek word which signifies the moon.

† [Selenigenous.] From two Greek words; the first of which signifies the *moon*, the other, *originating in*, or *sprung from*.

‡ [*Hydropiptic.*] From two Greek words, the first of which signifies *water*, the other *falling*.

§ [*Chemico-mechanical.*] Because, in this case, it is only by means of the chemical operations of solution and precipitation that the mechanical power is produced.

to receive the motion which it is capable of communicating; and, therefore, to communicate it onwards according to the nature of the practical effect which, by the use of the water-mill, is intended to be produced.

III. *Stereopiptic** source of Motion.

If, as in the case of water, any portion of that part of the earth's surface which is in the solid state were by any regularly operating cause disposed to detach itself from the rest, and like the sand in an hour-glass, in obedience to the law of gravitation, approach nearer to the centre of the earth; if, for example, as in Africa and elsewhere, there are seas of sand, the fall of matter thus having place in a solid state might, as well as the fall of matter in a liquid state, in the way of communicating motion for the purpose of producing useful changes in the condition of bodies, be put to use.

But of any such fall regularly produced by the unassisted powers of Nature, no instance has ever been known; nor forasmuch as nature furnishes not for other substances, any such regularly operating causes of *elevation* as she does in the case of water, could it anywhere be of long continuance. It is, therefore, only for the purpose of illustration that, in the catalogue of sources of motion, motion thus produced is inserted.

But when, by human art and industry, for any particular purpose, in the instance of any mass of matter, whether in a liquid or in a solid state, a fall or descent has been produced, in this case, there is a source of motion which, by economy, may be turned to account. On this head, see No. 15, *Economistic source of Motion.*

IV. *Anemistic, or Aeropnutic source of Motion.*

Considered *in* a state of motion, and in such quantity, and with such velocity, as to be capable of producing a considerable quantity of effect, any body, when in the gaseous state, is called *wind*. Of all bodies in a gaseous state, the only species which exists in a quantity sufficient to operate with regularity, in the character of a source of motion, is that in which by far the greater part of the contents of the atmosphere consist, viz. the mixture of oxygen gas and azote, with the occasional addition of carbonic acid gas, in considerable quantities, and many others in minute quantities.

Corresponding *Primum Mobile* in this case, the air considered as being in motion, and in whatsoever direction it may happen, viz. the wind. *Secundum* Mobile, any body which, for the purpose of receiving such quantity of motion as the wind is able to communicate, is opposed to it; for example, the *sails of a windmill*, and the sails of a ship.

V. Barometrical source of Motion.

Independently of the *Motion*, which, as in the case of wind, the air is liable to receive, from various causes, principally belonging to the head of temperature, *i. e.* change in the quantity of the matter of heat in a free state mixed with it, a motion in one particular direction, viz. a vertical one, and that as it may happen sometimes in the way of rise, *i. e.* increase of distance from the centre of the earth; sometimes in the way of fall, *i. e.* decrease of distance from the centre of the earth is almost continually impressed† upon all matter and, accordingly on all liquid matter, lying under it. If, while the quantity superincumbent on a certain portion of matter in a liquid state increases, the quantity superincumbent, on a portion of the like matter communicating with it, is kept from receiving increase, the consequence is, that the quantity of air thus insulated and detached from the rest, (being in a state of pressure determined by the altitude of the whole column of air, from the solid or fluid part of the earth's surface in that spot, to the extreme limits of the atmosphere, while the other non-insulated portion was left free to receive the increase of quantity, and accordingly did receive it,) will yield to the greater pressure, and thus suffer the liquid matter to rise in the vessel in which the air has thus been kept in an insulated state.

The nature of things will scarcely admit of the applying of this source of motion with advantage, comparison being made with the other sources of motion which have been, and those which remain to be brought to view; so great is the quantity necessary to be kept in the insulated state; so great accordingly the expense of the receptacle in which it is to be kept, compared with the smallness of the quantity of motion capable of being thus produced, and the uncertainty at what time, and for what length of time, any motion at all will be thus producible. But, in the way of curiosity, a machine of this sort was once produced, and formed one of the articles comprised in the museum, called from the maker, Cox's Museum, and disposed of in the way of lottery, under a special act of Parliament, in and by which this product of mechanical ingenuity was exempted from the operation of the law by which lotteries, made on account of individuals, stood prohibited.

In these circumstances, the air operates somewhat in the manner of the water in a *tide-mill*. Corresponding *Primum Mobile*, in this case, the air of the atmosphere considered in the state of simply vertical ascent and descent.‡

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* [*Stereopiptic.*] From two Greek words; the first of which signifies solid; the other, *falling*, as above.

† By the mere increase of the quantity resting on any given portion of the solid part of the earth's surface.

‡ [*Barometrical.*] From the instrument called the Barometer: an appellation derived from two

VI. *Thelematic*,* or *Myiobrachiatic*† source of Motion.

In all cases in which it is produced in any considerable quantity, Motion, when, by an exertion of will produced in an immediate way, or in any part of the body of a living animal, is, as far as the powers of observation extend, found to be produced by the shortening of a mass of muscular fibres.

For a long time, in all the cases in which, by the will of men, motion is to any purpose produced, for an indefinitely long period in the history of man this was the only source of motion drawn upon and employed; and in those assemblages of human beings which continue in the state of savage life, this is still the only source of motion that is employed.

In most cases, for the production of the effect ultimately in view, the motion derived from this source is employed in a direct way, and without the intervention of any such apparatus of bodies as is designated by the word instrument or machinery, employed for the gaining of power: machinery not being so much employed in giving direction or quality to motion derived from this source, as in giving direction or quality to motion derived from the above-mentioned and other more powerful sources.

But neither are instances by any means wanting, in which, even with the intervention of very elaborate and complicated systems of machinery, this source of motion is the only source employed; the machinery having for its object the production either of the particular direction desired or of velocity or time, at the expense of labour, or of quantity of matter put in motion at the expense of time, or of steadiness and regularity at the expense either of time, of labour, or of both.

By the mere contraction of muscular fibres, the greatest quantity of force employed, is that in which the animal force of some animal stronger than man—such as a horse, an ox, or an ass—is employed. In this case there are two different wills employed: that of the human being, and that of the inferior animal, whose will receives its impulse and direction from its human ruler. The will of the inferior animal is employed for giving birth to the motion; the will of the superior for giving direction to it.

Corresponding *Primum Mobile*, in this case psychological, the fictitious entity called the will; *Secundum* Mobile, the mass of muscular fibres thereby shortened; *Tertium* Mobile, the unbending parts of the animal machine, viz., the bones, according to the limb or other member on which the motion is impressed; *Quartum* Mobile, the external moveable body to which the motion thus generated is communicated in the first instance.

VII. *Parallactico-Suncrotic*, or *Alternate Gassification* and *Digassification* Source, or *Steam-Engine* Source.

Elasticity, *i. e.* that property by which, while in virtue of the universally operating principle gravitation, these, as well as all other particles of matter, are attracted towards the common centre, and thence towards one another, they are (while in this state by the introduction of the matter of heat) made to repel one another. In the case of every body, so long as it remains either in a solid or in a liquid state, the field of the operation of this property has its limits, and those comparatively very narrow ones. In the case of the same body, when in the gaseous state it has no determinate limits: and the quantity of matter of all other sorts contained in the body being given, the degree of this elasticity, and thence the quantity of motion communicated by it to any body which stands opposed to it, increases with the quantity of the matter of heat mixed with it.

When without any such change in its external texture, as among Chemists is designated by the word *decomposition*, a quantity of matter is by the mere intermixture of a quantity of the matter of heat transformed from the liquid into the gaseous, *i. e.* the indefinitely elastic state, in this case by the mere abstraction of the quantity of heat by which this effect has been produced, it is reconverted to the liquid, *i. e.* to the definitely elastic state. When, by and during the intermixture of a certain quantity of caloric, it has by the continuance of its unlimited elasticity, been generating and communicating a proportionate quantity of motion, if in a closed receptacle, by the application of a mass of matter in which a less quantity of caloric in a free state, is intermixed, it be divested of its extra quantity of caloric, and thus reduced to its definitely elastic or liquid state, it is then in a condition ready to be, by the same means, as before, converted anew into the gaseous state; and in this state, to be employed in the generation of a quantity of motion, which, if generated under the same circumstances, will be exactly equal to that generated in the first instance: and, in this way, by the alternate conversion and reconversion of the same mass

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Greek words; the first of which signifies weight, (viz. of the air) and the other a measure, or instrument for measuring. In respect to principles of construction, as in the text, that instrument and the one here described are the same. Only in the case of the Barometer, the object being not to generate motion, but merely to indicate the changes in the height, and consequent weight and pressure, of the column of air superincumbent on the place or portion of space in question at different times, no greater quantity of matter of all kinds is employed than the small quantity necessary for this latter purpose.

* [*Thelematic.*] From a Greek word, which signifies *the will.*

† [*Myiobrachiatic.*] From two Greek words; one of which signifies a set of muscular fibres; the other, shortening.

of matter, the alternation between a state of liquidity and a state of gas, between the liquid and the gaseous state, a proportionate quantity of motion may for any length of time be generated.

If, in the form of a parallelopiped, or that of a cylinder, (the most commodious, on several accounts, is that of a cylinder,) the receptacle in which the liquid (say, as being *cheapest*, the *water*) is thus converted into the gaseous, and reconverted into the liquid state, be kept to such a degree close, as that no portion of it, either while in the liquid or while in the gaseous state, can make its escape, at the same time that a mass of solid matter, one of the boundaries of which forms one of the boundaries of this receptacle, is as free to move in any direction backwards and forwards, (the most convenient is the vertical, because in that case after the occasionally generated motion, generated by elasticity, has been expended, the constantly existing force of gravity suffices to produce a correspondent quantity of motion.*)

If, of the mass of matter, while in the gaseous state, any portion make its escape, the larger the quantity which thus escapes, the larger the quantity of indefinitely elastic matter which, expending its motion upon bodies other than those to which it is intended that the motion should be communicated, is thus expended in waste.†

The system of machinery in and by which motion derived from this source is employed, is called the *Steam-Engine*. *Steam* being the name by which water (till comparatively of late years, the only species of matter which was clearly seen to be alternately interconvertible for any length of time from the liquid into the gaseous form, and *vice versâ*) was alone in its gaseous form designated.

Primum Mobile, in this case, the water while operating in its gaseous or indefinitely elastic state. *Secundum* Mobile, the mass of solid matter (called, in the steam-engine, the *piston*) to which the force thus continually generated is communicated.

Some thirty or forty years ago a source of motion, which may be considered as analogous in some respects to the barometrical, and in others to the parallactic source, presented itself to the imagination of the writer of these pages. An instrument by which application was made of it might be styled the *Flash-Pump* or *Rarefaction-Pump*.

Compared with the steam-engine, it has the advantage of being capable of being so employed as to generate within a given time, and, as it were, by one stroke, a much greater quantity of motion than within the same time, and at one stroke, could be raised by any steam-engine. But whether the advantage thus gained could, by any circumstances, be rendered such as to overbalance or balance the advantage possessed by the steam-engine in the article of quickness of reciprocation, is a question, the answer to which must be left to any person whose positive knowledge of the subject may dispose him, whilst it qualifies him, to make the requisite calculations.

The principle may be thus explained. Out of a hollow cylinder open at both ends, and in a vertical position stationed in an open reservoir of water, a portion of the air being driven out by the sudden application of heat in a manner analogous to that employed in the Montgolfier or rarefied air balloon, a correspondent portion of the water being thus made to rise and occupy its place, may, by running out, perform the office of a *primum mobile*.

For speediness of combustion a match composed of tubes open at both ends, such as would be afforded by reeds or straws, the longer the better, cut at each end close to the knot, and, after being dipped in a solution of nitre, would, whatsoever may be the case in regard to economy, at least be as well suited as any others which the nature of the case could furnish. Matters must be so ordered, as that, when the rarefication thus produced by the combustion of this match has attained its maximum, a cover shall apply itself to the top of the cylinder: and the more the degree of closeness wants of that perfection, for the designation of which the name of *hermetical* is wont to be employed, the less, of course, will be the rarity of the included air, and the less the quantity of water raised by the pressure of the air on the water of the reservoir. Matters must likewise be so ordered, as that, when the height of the column of water thus raised has attained its maximum, it shall be

* This sentence is incomplete: what was meant to be announced was, probably, that by this construction the force generated is economised.—*Ed.*

† Some thirty or forty years ago, an Hungarian of the name of Kempel, applied to me to consult with me about an invention of his which he regarded as an improvement on the steam-engine. It consisted in the omission of the piston, in such sort, that the steam, as fast as generated, and without being recondensed, should operate immediately, and in the open air, upon the float-boards of a water-wheel: in which case, before it had time to lose all its extra caloric, and with it all its elastic force, some small quantity of motion, though comparatively a very small one, might occasionally be expected to be generated. It might be termed an open steam-engine. Will it be believed? This was the same Kempel by whose inventions of the automaton chess-player, and the automaton speaking-child, the curious were in most parts of Europe so much surprised and gratified.

The chess-player in the character of a Turk was beaten by very few Christians; and I know not whether the contrivance by which the motion was communicated from the directing mind to the chessman was ever divulgated or discovered.

The child, though at the time when I saw it, it had not, by a good deal, gone through the alphabet, yet pronounced a number of intelligible words, in the composition of which consonants as well as vowels were included. To produce the sounds, he worked with both his hands at a time, concealed in a sort of satchel or leather bag.

prevented from sinking through the same channel through which it rose, and shall, by this means, be forced to fall in the direction in which, while falling it will perform the function of a primum mobile.

To give continuance to the effect, matters would require, to be so ordered, as that, as soon as the effect produced by the first match has ceased, a second shall take its place ; and so on : and, for the accension of each match, the place of human reason might be supplied by some one or other of the expeditious modes of accension already in use. While that part of the water which is performing the function of a *primum mobile*, is for that purpose descending gradually, a partition sliding horizontally must separate it from that part which is to descend suddenly to make room for the re-ascent.*

Compared with any which is employed in the steam-engine, the species of fuel would, of course, be in a very high degree, more expensive ; whether by the superiority of the quantity of water thus raised by a given weight of the fuel, that inferiority would be counterbalanced, is another point which must be left to calculation in the hands of any person in whose eyes the labour may present itself as capable of yielding a compensation.

If, upon calculation, this source of motion should, in inexperienced hands, be found to afford no promise of being in comparison of the steam-engine, capable, in any situation, of being employed to advantage, it will in this respect, stand upon a footing with the Barometrical source, the Magnetic source, and the Electric and Galvanic sources.

VIII. *Aplosyncrotic*, or *Simple-Explosion* source.

When not without decomposition, the conversion from the non-gaseous into the gaseous state is effected, reconversion cannot, by the abstraction of the extra quantity of caloric, as above, be made to take place.

By the art of the Chemist, bodies in great variety have been discovered, in the instance of which, they being, all of them, in the solid state, by the application of a certain quantity of caloric, accumulated for the moment, in a portion of matter, be it ever so small, the whole mass, be it ever so large, is with an almost instantaneous rapidity, converted from the solid, without passing into the liquid, into the gaseous state, and thereby a quantity of motion generated, proportioned to the quality and quantity of the matter in the mass thus suddenly transformed, and capable of being employed in the generation of motion, as in the *steam-engine, closed or open*, as above.

Of these compounds, the one most known, and that which being, in respect of cheapness, most advantageous, or the only one thus employed in general practice, is *gunpowder*.

In this way, viz. in the case where, antecedently to the gassification, the matter in question is not in the liquid but in the solid state, by the gassification of a given quantity of matter, a much greater degree of elasticity, and in this way a much greater quantity of motion can, in a given space of time, be produced, than by the conversion of a quantity of matter without decomposition from the liquid into the gaseous state.

But, forasmuch as in this way, instead of being employed an indefinite number of times, the mass of matter thus employed in the generation of motion cannot be made to serve more times than one, hence in cases in which, in one and the same receptacle, the generation of motion is required to be kept up without interruption for a constancy, and for an indefinite length of time, this mode of simple explosion cannot be employed with advantage.

In the cases in which it is employed, such as that of the destruction of solid bodies, dead or living, at great distances, the preservation of the gassified matter not being possible, and the quantity of motion producible by a given quantity of it, being so much greater than could, by the gassification of the same quantity of water, be produced by a steam-engine, hence it is, that to these destructive purposes, the costly matter, gunpowder, and not the cheaper matter, water, and coal for heating it, are employed.

In the case where, in a ship of war endeavouring to escape from an enemy's ship, stern-chase guns are fired, over and above the principal effect, the taking the chance for impeding the advance of the enemy's ship by damage to the ship and crew, some advantage is said to be obtained in the shape of acceleration given to the course of the ship from which these guns are fired.

Some fifty years ago, or more, a person of the name of *Moore*, a linen-draper in Fleet Street or Cheapside, formed a plan for giving motion, upon this same principle, to a carriage by land. By the description of a carriage which was to go without horses, under which was to be understood the going without the application of muscular force, the particular means proposed to be employed being kept secret, great expectation was excited, or endeavoured to be excited, as if it were an invention applicable to general use. No trial of it could naturally be made without demonstrating at the same time the possibility of the achievement, and its inapplicability to any generally useful purpose. By persons unacquainted with the general principles of mechanics and chemistry, a matchless degree of velocity was expected, and at length announced to be thus attainable. Wagers, to a consider-

* For the purpose of this separation, attached to the cylinder, during a sufficient portion of its altitude, may be a hollow paralellepedon of correspondent diameter, one side of it being constituted by the sliding partition in one piece, or as many pieces as may be found most convenient.

able amount, were, at the time, said to be laid upon the subject of it. If at any time an actual trial of it were made, the project was, of course, thereby shown to be abortive. Had gunpowder been mentioned as the source trusted to, its inutility would not, to any person tolerably well versed in mechanics and chemistry, have afforded matter for any the smallest doubt. But the nature of the source not being divulged, a man who for this or some other purpose, happened to take a comprehensive view of the whole list of possible sources of motion, would scarcely, on the first mention, have ventured to have pronounced the impossibility of the results declared to be expected.

IX. *Magnetic* Source.

After the man, the horse, the wind-mill, the water-mill, and the steam-engine, considered with a view to general and extensive use, all other sources of original motion dwindle into insignificance.

Other sources of original motion, however, still remain, which in the way of curiosity, and in a logical view, are necessary to complete the inventory of the distinguishable sources of motion, which, as being known to be in existence or in prospect, present a claim to notice.

Magnetism, Electricity, Galvanism—to one or other of these heads, it is believed, may be referred all the other distinguishable sources of motion with which we are as yet, or have any prospect of becoming acquainted.

In Magnetic attraction may be seen a source of motion, which, of a first view, is not unapt to present the idea of an inexhaustible one. To magnetized iron, power (attractive force) has, and therefore can, at any time be given superior to that of any other motive power which, for a constancy, the muscular power of man is capable of creating: a magnet never tires; and from diuturnity of action, instead of decrease, magnetic power derives increase.

Unfortunately, of any motion derivable from this source, the death is immediate and not less certain than the birth. The contact produced—the contact which it has, in a manner, for its object—all motion is at an end.

For concealing the source of motion, and in that way affording the pleasure of surprise to uninitiated minds, the use of this instrument is well enough known. If motion could for a continuance be produced by it, no source of motion could be so economical a one: but of this there are unhappily no hopes.

Contrivances, whereby to the same magnetized bar a number of plates might be presented in a circularly recurring succession, are sufficiently obvious; and that in such manner that contact never taking place between the bar and any of these plates, the magnetic appetite might still remain unsatisfied. A brass wheel, for instance, in a vertical position, turning on a fixed axis, is, say at the end of each spoke, furnished with an iron plate; up to this wheel, on a plane forming a tangent to the circumference of the wheel, a magnetized bar is slid till it arrives at the spot at which the attraction between itself and one of the plates rising from the wheel, in a position exactly vertical, becomes perceptible. By being fixed to the wheel, this plate is prevented from coming in contact with the bar, and thus satisfying the magnetic appetite. If by the action of the bar upon the plate first presented to it, the wheel with the plate on it could be brought so far round, as, after coming a proportionate way under the bar, to present to it a second plate, and so on, the circuit would thus be completed; and if once completed, would, by the operation of the same causes, be continually renewed, and thus the problem of the perpetual motion would be accomplished. Unfortunately, between the action of the magnet on the second presented plate, in a direction tending to continue the revolution of the wheel and its action on the first presented plate, after its descent, in a direction tending to prevent such continuance, an equilibrium would, at some point or other in the circle, take place; and at that point the revolution would stop.

For the prevention of this catastrophe, to a mind better furnished with practical mechanical experience than with sound theory, the resources of mechanic art might suggest a variety of expedients,* of which the insufficiency would, it is believed, be proved by experiment in each instance. But the nature of things would, it is believed, be inexorable. The track of the subject is not, however, to such a degree beaten, but that, in any institutional work on the subject of mechanics, a demonstration on this ground might, it is supposed, have its use.

X. *Electric* Source.

That the list may not be justly accused of being an imperfect one, this source of motion must be inserted in it. But compared with those that have been already mentioned, its radical inutility will be altogether obvious.

Of those which appertain to the cognizance of the Chemist, no decomposition, composition, or recomposition, can have taken place but motion must have been produced. But in all those cases the quantity of motion is at the source, by much too small, and confined within too narrow limits to be capable of being communicated to any exterior body, in such sort as to be productive of any serviceable or even so much as sensible effects.

In so far indeed as, in virtue of any such decomposition or composition, any change of matter from a solid or a liquid state into a gaseous state has place, motion in a sensible

* For instance, making the angle made by each plate with the circumference vary at different parts of the round, or the whole plate drop and form a tangent to the circumference of the wheel, instead of standing up at right angles to it.

degree is produced: but, in so far, what has place in this way comes under a head already brought to view, viz., that of the aplosyncrotic source.

Similar in this respect to the magnetic, the electric attraction extends over a space not limited, as in the case of chemical attraction, between particle and particle of a mass in the liquid state, by the sphere of attraction of cohesion. It is even, as in the case of thunder and lightning, capable of operating in the character of a source of motion with great force and through a great extent of space.

Unfortunately, in as far as it is under command, the quantity of motion derivable from this source is by far too small to be in comparison of any of those ordinary sources abovementioned, of any the smallest use; and when the quantity of motion produced by it is considerable enough to be put to use, were it but under command, it is altogether incapable of being put under command; and by this dilemma, it is completely withdrawn from use.

XI. *Galvanic* Source.

By the same consideration by which the obligation of inserting in the character of sources of motion the Electric power, the like obligation in relation to the Galvanic is created.

Already by application made of the species of physical power thus denominated has been produced a motion of long continuance, a motion which presents the idea of, and falls little if any short of, the character of a perpetual one. Though in a perpetuity so *curious*, and in that respect so desirable, a *solution* of continuity seems liable to be ever and anon produced by an untoward state of the atmosphere.

But by the irreversible laws of nature, the utmost that in the case of generating motion can be done by application of that species of power, is, in comparison with what can be done by motion derived from the ordinary sources, so completely in miniature, that all the achievements capable of being performed by power of this description, seems irrevocably doomed to be confined within the field of *curiosity* without ever extending themselves over any part of the field of *use*.

In one laboratory, twenty thousand Galvanic dishes have been, it is said, and probably at this moment are at work; and for a fruit, and at the same time a proof of their labours, a peal of bells kept ringing by them. But scarcely by a hundred times as many, could the sum of their action be brought to bear upon one point,—could any quantity of motion applicable to any purpose of vulgar use be produced.

XII. *Antactive*, or *reactive* source: the source of the application of which the use of springs furnishes an example.

In some instances when, in consequence of external pressure applied to it by another body, a portion more or less considerable of the whole mass of a body has been forced into a portion of space different from that which, antecedently to such pressure, was occupied by it, (the remaining part continuing fixed,) the part that was so removed returns into its antecedent position; in as far as this restitution has place, the body is said to be an *elastic* body, and a correspondent *fictitious entity*, a *property*, a *quality*—the property or quality of *elasticity* is said to belong to it.

An instrument to which, by appropriate configuration this property has purposely been bestowed, is termed *a spring*.

A *spring* may be defined a *reservoir* of *motion*. With reference to *motion*, it performs exactly the office which a reservoir or receptacle of any kind performs with reference to *matter*.*

A reservoir of any kind—a reservoir, suppose of water—cannot, for any purpose, supply any quantity of matter greater than has been introduced into it: a *spring* cannot supply any quantity of motion greater than has been introduced into it, viz. by what may be called the *pre-active* or *tensive* force.

In general the greatest quantity of matter which, for any purpose, a reservoir can furnish is not quite as great as the greatest quantity of matter—say of water—which, having been introduced to it, has been contained in it at one and the same time: by the attraction of cohesion, a portion more or less considerable is detained by the matter of which the boundaries of the receptacle are composed, and remains in contact with them; in like manner, the greatest quantity of motion which, for any purpose, a spring can furnish is probably not quite as great as the quantity of motion, or capacity of motion, which, having been introduced into it, remains in it; by means of the phenomenon for the designation of which, the word *friction* has been employed, a portion more or less considerable of whatsoever motion had, for the purpose in question, been infused into the spring, has been absorbed, as it were, and destroyed.

To *actual motion*, the sort of *capacity* for motion, for producing those perceptible phenomena, for the designation of which the word motion is wont to be employed—in a word, the sort of capacity for motion which is in this way kept in store, may be considered as bearing a relation similar to that which in the case of heat, what is called latent heat bears to sensible heat; it is nothing more than a capacity of affording sensible heat; and the substance with which it is combined, and in

* To the inhabitants of classical antiquity, the use of springs seems scarcely to have been known. Neither in Latin nor in Greek has any word been found that seems to have been employed in the designation of it.

In any one of the instruments found in any one of the buried cities, is any example of a spring to be found?

which it is, as it were, enclosed and imprisoned, may, in virtue of it, be considered as a *reservoir* of sensible heat.

The action and efficiency of a spring is produced by, and its efficiency depends upon, and is proportioned to the elasticity of the matter of which it is composed: the extra *elasticity*, that is, what may be called the repulsion correspondent to the attraction of cohesion; or, for shortness, the repulsion of cohesion; the repulsion by which in correspondency with the antagonizing force, viz. the attraction of cohesion, the texture of the substance is determined.

To introduce, into the substance designed to serve as a spring, the quantity of latent motion desired, some external force is and always must be applied, in such manner as to counteract and overpower the repulsion of cohesion, in virtue of which, at the spot at which the external force is made to act, the particles of the body are kept at a distance from each other. If, upon the removal of their external pressure, no other obstacle being opposed to the action of the repulsion of cohesion, the particles of matter in the spot in question arrange themselves exactly in their former places, and thence at their former distances from each other, the matter of which the spring is made, is restored to a form exactly the same as that in which it was, before the pressure. In this case the body is said to be perfectly elastic. If in any part, after the removal of the pressure, the form of the substance is different from what it was antecedently to the application of the pressure, in as far as the form is thus changed, in so far in the parts in question has a correspondent quantity or degree of the repulsion of cohesion been destroyed. In this case the body is imperfectly elastic; the degree of imperfection being in correspondency with the quantity of the repulsion in question destroyed, and the magnitude of the permanent change, which the form of the body has undergone.

The mode in which the *latent motion* is introduced into the reservoir, may be either pressure *(impulse)* or tension *(distension.)* For pressure, (impulse,) no more than one fixed point is necessary; for tension, two at least are necessary. In the case of the bow and the catapult there are three.

In the case where the latent motion is produced by tension, is it by the repulsion of cohesion alone, or by that and the attraction of cohesion together, that the reaction and consequent reinstatement is produced? Answer. It should seem by the repulsion of cohesion alone. Why? Because, in as far as the distension has place, the particles are removed from one another to a distance at and beyond which the incapacity of the attraction of cohesion to act, might be proved by juxtaposition in an exhausted receiver.

Of whatsoever sort the spring may be, and to the production of whatsoever ultimate effect meant to be applied, it cannot be put to use any further than as, whether by impulse or distension, as above,—a quantity of latent motion has been treasured up in the matter of which it is composed. In as far as any such quantity of latent motion has been injected into it, the spring may be said to be *charged*. As the spring is put to use, the motion thus treasured up is expended, or, as it were, consumed. The expenditure may be either *sudden* or *gradual*. It may be termed sudden when the time occupied in the expenditure is not determinately greater than the time that had been occupied in the infusion of it. If it be gradual, it is so in consequence of the retardation which it experiences from some opposing and gradually yielding counterforce.

The term at which the expenditure or consumption, whether sudden or gradual, is destined to take place, may be either immediately upon the termination of the winding up or other operation by which the motion is infused, and the spring charged,† or any subsequent instant of time: in the former case, the spring may be termed a spring for immediate action; in the other case, a spring for *predestinated action*.

In the case of the ordinary time-piece, the spring is a spring for immediate action; and the expenditure of the injected latent motion gradual.

When the expenditure is gradual, in the course of it, and before any fresh supply is injected, it may be employed according to the quantity of it, in the production of any effects (quantity consumed by friction deducted) to which the same quantity of original motion could be applied within the field of motion within which the process is confined. Of these effects, the most in use to be produced are the two sorts of clocks termed an Astronomical clock and a Musical clock.

An Astronomical clock is nothing more than an ordinary time-piece applied to the indication of a greater number of points of time, in the same length of time, than in the case of an ordinary clock or watch.

In a Musical clock, a system of tubes being provided, into each of which, the air being drawn at a certain aperture, a particular sound is thereupon emitted, and a constant stream of air being injected into a box (for example by a pair of bellows) in which these tubes terminate, matters are so ordered that, at preappointed times, the aperture necessary to produce the intended succession of sounds shall be opened, and, when the quantity of time allotted, in each instance, to the sound in question has elapsed, shall thereupon be instantaneously closed.

In the case when the general expenditure

† When into an electric jar an extra quantity of electric power has been infused, the jar is said to be *charged*. By analogy, a spring, when the quantity of latent motion, on which its action depends, has been infused into it, may be said to be *charged*.

being gradual, as in a time-piece, a particular effect not announced is predestined to be produced at a distant point of time, the purpose in view, howsoever in other respects susceptible of being diversified, consists in the production of surprise. In this case the expenditure applied to this particular purpose may, as well as the general expenditure, be of the gradual kind. But, generally speaking, it is rather a sudden than a gradual expenditure that is the best adapted to this purpose.

Of the sort of machine, in the construction of which the motion produced by the spring being predestinated, is instantaneous, the purpose, and that a very variable and extensive one, is *the production of surprise.*

Under the denomination of *mischief,* in some shape or other, may be included the only practical purpose to which a machine of this nature, complicated and expensive as it cannot but be, seems likely to be applied:* and for the prevention of any such mischief, divulgation, antecedent to the attempt, divulgation the more extensive the better, affords the only chance which the nature of the case admits of.

Clocks, it is said, have been made, in the instance of each of which, by means of one winding up, the motion has been continued for a twelvemonth; many a one in which, at a predestined time, a door flew open, disclosing some object or objects in motion, or at rest.

The accusation of some individual guilty or innocent; the announcement, true or false, of some catastrophe, natural or supernatural, past or future, affecting this or that individual class, neighbourhood, or whole nation, written in characters of fire; it is only in semi-barbarous society that a contrivance of this sort could be productive of any permanent bad effect. But by the combustion of a quantity of combustible matter, lodged in the machine for that purpose, a conflagration might be produced in any edifice in which, without due examination of its contents, a case containing a machine of this sort, should have been retained.

Under the name of the Torpedo, for the purpose of maritime warfare, in the war now so happily terminated, the Americans employed, or had it in contemplation to employ, a machine for the producing of subaqueous explosion or conflagration. Of a destructive machine of this sort, a time-piece would naturally be a component part.

At the siege of Troy, had this application of the spring to the production of predestinated effects, at predetermined points of time, been known, a destructive machine of this sort, instead of a party of armed men, would have constituted the stuffing of the Trojan horse.

For the purpose of a security against depredation, predestinated destructive movements have been inserted in receptacles destined for the preservation of articles of value against attempts on the part of depredators; a contrivance, for example, whereby, on the opening of the receptacle by any person who is not in the secret, a loaded pistol is discharged. In this case no demand, it is evident, has place for a time-piece. Of the latent motion, by which the purpose is effected, either the expenditure alone, or first the infusion and thereupon the expenditure is performed by the muscular exertion, by which the aperture of the receptacle is effected or attempted. For such a purpose, the spring would probably be found, in every case, a convenient instrument, though cases may be conceded in which it would not be an absolutely indispensable one.

Upon an estimate, if correctly and completely formed, of the effects of both sorts, beneficial and mischievous, in all shapes, expectable from any eventually destructive machine of this description, the probability seems to be that it is on the side of mischief that the balance would be found; and, on this supposition, it would seem that, besides treating all persons knowingly concerned in the fabrication of any such machine, on the footing of co-delinquents in respect of any mischief eventually produced by it, for the purpose of timely prevention, a lesser penalty might be attached to the mere act of him who knowingly, as above, or with just grounds of suspicion before his eyes, shall have engaged or co-operated in the fabrication of it.

In the case of the ball employed in pastime, the lateral injection or impulse is the operation by which the lateral motion is infused; and the motion is instantaneous. *Primum Mobile,* in the case in which the bound is produced by a single fall or drop, the ball itself. *Secundum Mobile,* the earth which thereupon reacts upon it, and drives it up again. *Primum Mobile* in the case in which it is struck, the instrument with which it is struck; or rather, the *Primum Mobile,* by which, in action, that instrument is moved: for example, when it is by human will that the stroke is produced, the muscular fibres, by the shortening of which the stroke is made.

In the case of the ball the whole instrument is, in every part, a spring.

When a spring enters into the composition of another instrument, it has either a single fixed point, or a number of fixed points. Of the latent motion when injected, these fixed points may, for the purpose of nomenclature, be considered as the seats, and then we have single-seated springs and double-seated ones, as in the case of the time-piece spring.

In the case of the common lock-spring, it has but one fixed point: impulse is the operation by which, in this case, the latent motion is infused; this species of spring may be called the single-seated spring.

In the case of the archer's bow, it has two fixed points, both permanent. Distension is the operation by which, in this case, the latent motion is infused.

* Alarm-clocks are innocious and useful applications of this kind.—*Ed.*

At the instant preceding that of the expenditure, an additional quantity of latent motion is infused by distension, applied at a third point between the two, and with most advantage exactly in the midway between the two.

Sound is a collateral effect producible, in certain circumstances, by the expenditure of the latent motion of a spring. It results incidentally, and without design, from the use made of an arched bow.

When the spring is applied to the production of musical sounds, this collateral effect becomes the principal one.

In the case of the Jew's harp and the musical pitchfork, the spring is of the single-seated kind.

Not long ago an instrument was constructed, a species of pianoforte, in which, instead of a string, a pitchfork was allotted to each note. No such instrument having come into use, the experiment must have been an unsuccessful one. The inventor was a musician of the name of *Claget*.

In the case of the violin, with its different enlargements,—in the case of the harpsichord and the pianoforte,—the spring is of the double-seated kind. The occasional additional tension is effected either by gradual friction, as in the case of the violin, by impulse of a plectrum passing beyond the string, as in the case of the harpsichord, or by a hooked plectrum, drawing the string and letting it go, as in the case of the harp, the lute, and the guitar, or by a hammer striking against it, and not going beyond it, as in the case of the pianoforte.

In the case of the Æolian harp, the office of an impelling plectrum is performed by the wind. All the strings are all of them tuned to the same note, and the succession of notes is left to Æolus, who in such circumstances is unable to produce any other notes than those of which the combination called the common chord is composed.

In an organ, could a stop exhibiting any pleasing variety of intonation be composed by the application of the principle of the Æolian harp? The air, by the escape of which from the common reservoir such note is formed, suppose it to strike against a string tuned to that same note?

The Pedal spring.—By this appellation may be designated the sort of spring by which a continued motion is rendered capable of being produced by the alternating tread of the human foot. The spring is in this case a *single-seated* one. To the fore end is attached an end of a cord,—by the other end of which motion is given to any system of mechanism to what purpose soever applied. A turning-lathe, diversified according to the infinite diversity of purposes to which this instrument is applicable, presents the application most commonly exemplified. The machine for grinding tools is one of them.

The use of the spring here is only after the fore end of it has been pressed down by the foot by one tread, to bring itself up to its former position, that it may be in readiness, without change of posture, to receive another tread, and so *toties quoties*.

In the action thus carried on by the foot, the force produced by the muscular action receives, or may occasionally be made to receive, more or less of addition from the attraction of gravity operating on the body.

In the case of the carriage-spring for diminishing jolts, the object is not to treasure up or direct motion, but to destroy the effect of it.

Mode in which this effect is produced.—By being communicated along the substance of the spring, the motion produced by the stereoptic effect of the attraction of gravity, is as it were impalpably pulverised. The quantity of matter being the same, the motion is divided into as many motioncules as there are particles of matter in a line measuring the altitude of the fall; and throughout the line it is encumbered by the repulsion of cohesion, by the expenditure of the latent motion infused by itself into this spring, as into a ball, as above.

To the aggregate of the exemplifications made, and capable of being made, to practical use, of the instrument of reactive motion called the *Spring*, the application of the bifurcately exhaustive mode of division may, if the mode should afford a promise of being useful, be made by any student by whom any such promise shall have been desired: and of such a labour the discovery of this or that new and useful application of the instrument might possibly be the fruit. As to the author of these pages, having already travelled in this track to a length sufficient for marking out the course to any such person as may happen to feel inclined to pursue it further, to their industry he leaves it.

It must be for *Technology*, and not here that the application of the *generalisative* mode of considering the subject must be reserved.

XII. *Eclectico-spastic* Source.

A source of changes infinitely diversified is the terminal cause which, from British Chemists, received the name of *Elective Attraction*, an expressive and correctly designative name; in the place of which the appellation *affinity* has, not only by French Chemists, but to a great degree even by British, been employed.*

* [*Affinity.*] Unhappily chosen surely, was this appellation. Instead of being expressive, (so far from being characteristic,) it seems to be not merely *inexpressive* but *misexpressive*. 1. In other cases, in the only cases which, when application of it to this purpose was first made, could have been in view, *affinity* was employed to designate the bond of connexion which has place amongst members of the same family, and, as such, designated by one common name. According to this analogy, all acids, for example, being of the same family, and designated by one common name, it is amongst these that affinity should be said to have place: amongst all these, saline bodies, how great soever may be their number; and so in regard to alkalies; and no

Limited as is the field of action belonging to this source, confined within limits not distinguishable from those by which the field of attraction of cohesion is circumscribed,—limited, and that to such a degree as to be manifestly incapable of affording, on any occasion, a quantity of motion large enough to be employed to a mechanical purpose, to any advantage, still in a catalogue all-comprehensive of sources of motion, it is not the less strictly entitled to a place.

To enable it to match with the others, it will require a Greek appellation, *eclectic*, suppose, or *eclectico-spastic*, be that name.

XIII. In some instances, when, upon the application of caloric, a body is made to pass out of the solid into the liquid form, in one word, upon its *melting*, say rather (to distinguish this mode of liquefaction from solution in a body already in the liquid form) on its being smelted, its dimensions are on all sides contracted, and this without any such change in its composition as that which has for its cause the species of attraction called *elective attraction*, as above. But, without intestine motion in some shape or other, no such change, it is evident, can take place.

Of this motion, the result being that, upon the whole, the particles of the body are nearer than they were before, attraction, and not repulsion, is, it should seem, the head to which it must be referred. * Texigenous, or, for shortness, *tictic*, present themselves as the names by either of which, if the word (idea) be put into a Greek dress, this source of motion may be designated.

XIV. In some instances the like contraction is the result, when, upon the expulsion or absorption of caloric, the body passes out of the liquid into the solid form. For designating the source of the motion which has place in this case, the appellation *Stereosigenous*, or *Stereotic*, might, with corresponding propriety, be employed.

In the opposite direction, viz. *expansion*, very considerable has been the effect produced by or on the passing of a body out of the liquid into the solid form. On the freezing of an enclosed mass of water, a thick mass of iron, in the form of a bomb-shell, has been burst.—This, for curiosity. Applied to fissures, for the purpose of detaching smaller pieces from the huge masses of stone, so denominated, motion from this source has been employed in practice in the character of an economical substitute to mechanical fissures. Thus much for illustration in this place. But, as repulsion, rather than attraction, seems to be the *genus* to which this effect properly belongs, it is under that head alone that its proper place will be to be found.

The most copious and efficient of all sources from which it is in the power of man to derive any quantity of motion, for which he has a demand, is that which has place, when in the instance of *water*, a mass of water is made to pass out of the liquid into the gaseous or pneumatic state. In the word pneumatic, or rather pneumatistic, we have, accordingly, an epithet by which this source of motion may be designated. But *repulsion* and not *attraction* is the genus to which, in this as in the last-mentioned case, the source of motion here in question seems properly to belong.

When once, by the passing of a body out of the liquid into the gaseous state, in a confined space, a quantity of motion has been generated, a correspondent and equal quantity of motion may be generated, if, in the same confined space, the same mass may be made to pass back again out of the gaseous into the liquid state. If, for designating the source of the motion which has place in the case last mentioned the term pneumatistic be employed, for the designation of that which has place in this present case, some such term as anapneumatistic or catapneumatistic might be employed.

But, to the head or genus here in question, viz. *attraction*, neither can this source, any more than that other, be referred. But for the motion which immediately precedes this recurrent motion would not have place ; and when it does take place, it is not in any local and intestine attraction, but only in the cessation of the intestine repulsion, and the consequent sole dominion of the universally acting attraction—the attraction of *gravity*, that it has its nominal cause.

To no one body or assemblage of bodies can *change* of any sort take place, but in some mass of matter or other, in some direction or other, motion *must* take place. In the case of vegetation those changes take place, by which a small seed is converted into a lofty tree. Narrow as is the field of these motions at each given instant, yet, by means of them, effects have been produced similar to, and not less than those already spoken of, as producible by the conversion of a mass of water from the liquid into the solid state. By the progress of a mass of matter, with the requisite accessions, from the state of the small seed into the state

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as between one acid, or all acids, on one part, and an alkali, or all alkalies, on the other.

2. In this case, for employing the term *attraction*, the same reason has place as in any of those other cases ; by the term, *electric attraction*, this analogy is expressed. By the term *affinity*, if the word be used in those other cases, or any of them, it is virtually disaffirmed.

3. By the epithet *elective*, intimation is given of those preferences : that prodigiously complicated system of preferences, as between element and element, by which this species of relation is so conspicuously distinguished. Of this system, by the word affinity, not any the slightest intimation is conveyed.

* In a still greater degree this contraction takes place in several instances in the case of solution as just explained; but being smelted, what is it but being dissolved in caloric ?

of the tree, fissures and separations have been made, not only in artificial masses of solid matter called *walls*, but in the natural ones called rocks.

Of the motion thus produced it seems difficult, if not impossible, to say in what proportion, if in any, it has attraction, and in what, if in any, it has repulsion for its nominal source or nominal cause.

To whichsoever of these two heads the cause here in question may be deemed to belong, or *phytobiogenous*, *emphyteutic*, present themselves as names, by the one or the other of which it may be designated.

Thus much as to that species of life which is considered and spoken of as having place in the case of vegetation.

Over and above these motions, of which so many exertions of the faculty of the will are the continually and universally experienced sources, there are others, viz. those on which the continuance of life more immediately and essentially depends, in the production of which the will bears no part.

In this case it seems altogether as difficult, if not impracticable as in any of the preceding ones, to say in what proportion, if in any, to attraction, and in what, if in any, to repulsion, the motions which in such infinite variety, as well as profound obscurity, have place, are referable. Whether it be referable to the one, to the other, or to both, *epizoic* or *zoobiogenous* present two adjective denominations, by the one or the other, or by both of which, it may, for the purpose of matching with *emphyteutic* or *phytobiogenous*, be designated. With the nominal source above designated by the term eclectico-spastic, or elective attraction, a source productive of effects so conspicuously different can scarcely be considered as identical; but to that source it seems to bear a closer analogy than to any others that have been, or to any that remain to be, brought to view.

XV. *Economistic* Source.

Magnum vectigal est parsimonia,—Economy is itself a great revenue,—was the saying of a Roman monarch, whose principles in this respect might, with so much advantage to subjects, be adopted by so many other sovereigns.

To motion, considered as a source of mechanic power,—to motion, applied to the humble purposes of mechanics, it may be applied with no less propriety than to the purposes of government.

In this way, in several instances, it has been known to be applied; and the ulterior instances in which it is capable of being applied with advantage, but in which, for want of being present to the mind, it has failed of being applied, are, in number and variety, believed not to be inconsiderable.

It consists in watching for and applying to use all such quantity of motion, and all capacity for affording motion, as, within the reach of the person in question, (afforded, either by the spontaneously exerted powers of nature, or by human industry, in the case where, in pursuit of other objects, it is occupied in giving direction to the powers of nature,) is obtainable from any of the original sources above brought to view. In it may accordingly be seen,—in the field of possibility, though not in the field of actual use,—a branch corresponding to each one of all these several original sources.

By that source of motion which is afforded by the attraction of gravity, is afforded, as will soon be seen, the most considerable part of the field in which economy can be employed in this shape.

On a slight glance at the several classes on that list, it will be evident that the *Stereopiptic*, the *Hydropiptic*, and the *Thelematic*, are the only ones from which, under the head of this source of motion, unless the *Selenic* should be considered as an exemplification of it, any considerable portion of practical use promises ever to be derived.

Of the uses derivable in this shape from falling water and from wind, every one is sufficiently aware.

Of an occasional use capable of being made of the *Stereopiptic* source, the following mementos may afford an exemplification:—

1. When from a quarry of any kind, situated on an eminence, you are conveying its contents, if circumstances be favourable, so order matters that, whatsoever sort of carriage is employed, the descent of one carriage, when loaded, shall, without the employment of any other force, produce the ascent of an empty or less loaded one.

For this purpose, all you have to do is to fix in the middle of the breadth of the road a post or a series of posts, furnished with horizontal pulleys, at the elevation of the line of draught. In these pulleys plays a rope, attached at one end to the front of the empty carriage, which is to be drawn up hill, and the other end to the back of the loaded carriage, which, by the force of gravity, is to be suffered to run down hill.

When circumstances admit, this expedient, it is believed, is in common, though probably not in universal, use.

2. When, up one and the same ascent, you have occasion to cause to be drawn a loaded carriage, such a number of times that the saving of labour made in this way will be sufficient to compensate the quantity of labour, and wear and tear of the materials necessary to the construction of an apparatus similar to the above, instead of setting your man or men, beast or beasts of draught, to walk up the slope, set them to walk down it; whereupon, by means of the rope playing on the pulley as they descend, the loaded carriage will ascend. In this way the weight will be acting in co-operation with, instead of opposition to, the muscular force employed.

In a mine one bucket is, doubtless, com-

monly on the above principle, employed in the drawing up an unloaded or less loaded one.*

Supposing any the least attention applied to the establishing of a balance between the descending and the ascending weights, a loaded carriage could, in this way, be conveyed up a declivity, beyond comparison steeper than any up which it would be possible for animals of draught to draw a carriage, even in an unloaded state.

3. When for any economical purpose, within a limited space, such as that of a mine, a manufactory, or ship, or an edifice during the process of erection, men are in the habit of ascending and descending, and at the same time of carrying to the superior level masses of considerable weight, the weight of whatsoever persons or things have to descend may, in the same way, be employed to advantage: the weight to be raised being by means of a rope, moving on a pulley, fixed above the highest point, up to which it is proposed to convey any weight: and the saving thus produced in the article of labour, will be equal to the labour of conveying to the superior spot in question, in each instance, a quantity of matter equal in weight to that the descent of which is connected with the ascent of the antagonizing mass; deducting that which corresponds to the quantity lost by friction.

Analagous to this is the expedient of saving, for the purpose of thus serving in the aggregate, in the character of a *primum mobile*, portions of water too minute to be separately applicable to any serviceable purpose. They are conducted into a bucket, which, when a quantity sufficient for the purpose has been received into it, descends, and, in its descent, raises an empty one.

The several known Sources of Motion exhibited in systematic order, in the bifurcate and exhaustive mode of division and arrangement.

The remaining task consists in the ranging these several distinguishable sources of motion in systematic order, in such sort that it may be seen in what particulars they respectively agree, and in what particulars they differ.

Archaic or original, and *Antactic* or non-original.—Applied to the word designative of *source*, the adjunct original disaffirms the generation of motion from any other source as a necessary condition: by the adjunct antastic or reactive it is affirmed; and from whatsoever original source the original first motion be derived, the antastic is equally capable of manifesting itself. Being exemplified in the sort of instrument or mechanical power called in English a *Spring*, the antastic or reactive source of motion may also be termed the *Spring source*.

Purely Physical or *Physiurgic*; purely *Psychical* or *Thelematic*; and mixed *Physico-psychical*, *Anthropophysiurgic* or *Psychothelematic*. Under one or other of these heads will all original sources of motion, it is believed, be found to be comprehended.

Geogenous, *Esoteric*, or *Indigenous*; and *Exogenous*, or *Exoteric*; *indigenous* with reference to the earth, the planet in which the motion in question is produced. To the head of *Exogenous (Exoteric,)* belongs the source above designated by the name of Selenic or Lunar.

* In the case of the streets, for example, which run at right angles between the river Thames and the Strand, if, during a certain part of the twenty-four hours, the exclusive use of the street could be secured to the coal-dealers, by whose carts coals are conveyed from the river to their destination, in the several adjacent streets and roads of the metropolis and its neighbourhood, considerable saving in the article of horses might thus, it is supposed, be made. In the way of apparatus, the rope and pulley excepted, nothing more would be necessary than a line of strong uprights, in number proportioned to the length of the street, each of which, stationed in the middle of its breadth, and turning on a hinge, might, in a direction parallel to its length, be lowered and placed in a horizontal position, on the expiration of the portion of the twenty-four hours allotted to this service.

Of these coal-carts, every one that went up full, would have to come down empty: here, then, would be an occasion in which the draught upwards might have for its assistance, if time could be made to suit, not only the weight of such horses, as belonging to that same carriage had been sent up the declivity for the purpose of drawing it up as they descended, but the weight of an empty and returning carriage, with the horses employed in drawing it.

So in regard to other goods at large, generally speaking, and bating the effect of any particular goods by which the natural equality between the weight of goods exported from, and that of goods imported to, a mass of water used for conveyance, may happen to be disturbed, for every ton of goods conveyed up the declivity, there would be a ton of other goods conveyed down it; and thus to the assistance afforded by the descending carriages would be added that afforded by the descending goods. In this way, then, supposing the circumstances to admit of the requisite agreement, amongst the several proprietors of goods, and other parties interested, calculation would soon show the multitude of horses which might by this means be saved.

In the case where no animal is employed in the draught, it has not unfrequently happened to me to be an eye-witness of the exemplification of this principle of economy. In the case where, in the production of this same effect, animal draught is employed, it has never happened to me to see or hear of any instance of its being put to use in this country. In Russia, in the year 1756, under the direction of my brother, Sir Samuel Bentham, with whom, for anything that either of us know or knew to the contrary, the idea had originated, I saw it put in practice; and it was pleasing to observe in how high a degree, while the quantity of matter conveyed up the declivity was increased, the toil of the horses was diminished.

About the year 1793, I remember his communicating the idea, by word of mouth, to the intelligent and useful servant of the public, Mr Samuel More, then Secretary to the Society of Arts; but I have not heard that, in practice, any application has been ever made of it.

In respect of texture, as depending upon, and constituted by, the result of the conflict betwixt or amongst the principles of internal attraction and repulsion, all matter to which we have access, as far as we are able to judge, is at all times in one or other of these states: viz. 1. the solid; 2. the liquid; 3. the gaseous state; and the liquid and the gaseous states are included under one common denomination, viz. the fluid state.

To each of these three states corresponds a natural (purely physical) source of motion: to the solid state, the *Stereopiptic;* to the liquid, the *Hydropiptic;* to the gaseous, the *Aerogenous.* In as far as it is set at work simply by the hand of nature, without assistance or direction given by the hand of man, it may, to distinguish it from the case in which the hand of man is occupied in the giving birth or direction to it, be termed æropnutic, *i. e.* a source of motion afforded by the wind.

Delo-diathetic or *Phanero-diathetic;* and *Crypto-diathetic.* Under one or other of these appellatives may every source of motion, which belongs to the Psychico-physical class, be designated. Under the head of *Delo-diathetic* or *Phanero-diathetic,* may be arranged those sources of motion which are produced by the powers of human invention, under the direction of human will, operating upon any one or more of the natural sources of motion above enumerated: in all which cases the motion is the result of those powers with which, at all times, and in his rudest state, man has been familiarly acquainted: viz. the powers corresponding to the different states, in all of which, as above, all matter is apt to place itself, or found capable of being placed.

Of that same Psychico-physical class of sources of motion, under the *Crypturgic* or *Crypto-diathetic* branch, are here arranged those sources of motion which correspond to so many different powers or sources of motion with which, in comparison with that which we have with those others, our acquaintance is of recent date, and, in respect of extent and clearness of comprehension, is still comparatively imperfect. Of these, the list will presently be brought to view. There are—1. The *Magnetic* or *Magnetico-spastic.* 2. The *Electric* or *Electrico-spastic.* 3. The *Galvanic* or *Galvanico-spastic.*

In this case, the source from which the division is drawn is not any property belonging to the objects themselves, but the relations which the present state of our own power bear to them respectively.

On this occasion the natural philosopher, in his character of chemist employed in the service of the mechanician, is glad to have recourse to the same shift as that which, in the instance of the class *Cryptogamia,* was employed by the natural philosopher, acting in the character of botanist,—making the most of everything, and deriving profit to science, in some sort, even from his own ignorance.

In the case in which the *Crypto-diathetic* branch of the Psychico-physical branch of the sources of motion is employed, the state in which the matter or matters in question is employed in the character in question, viz. that of a source of motion, is either a state in which at the time, during which they are put in action, they had already been placed by the hand of *Nature:* or a state in which, for the purpose, they are placed by the hand of *Art:* in the first case, is that source of motion for the designation of which the appellation of *Barometrical* is here employed: in the other, are the two sources of motion for the designation of which the two appellations *Parallactico-syncrotic* and *Aplo-syncrotic* are here employed. Parallactico-syncrotic, when, as in the instance of the *water,* which, in the case of the steam-engine, is the *primum mobile* employed,—to produce the effect ultimately desired, it is necessary that the same portion of matter should, a number of times successively, pass alternately from the liquid to the gaseous state, and *vice versâ:* aplo-syncrotic, when to produce the alternate effect ultimately desired, no more than one such transition, viz. that from the liquid to the gaseous state, is necessary: which transition is all that the nature of the species of matter in question admits of.

In the first case, for the purpose of their being placed in, and forming part of, a systematic sketch, *Ametamorphotic;* in the other case, *Metamorphotic,* is the appellation by which these several branches of the Psychico-physical division of the aggregate system of sources of motion may be designated.

1. The magnetic or magnetico-spastic; 2. the electric or electrico-spastic; 3. the galvanic or galvanico-spastic:—these, of each of which an explanation has been given above, may be considered as so many sources comprehended under the class for the designation of which the terms *Crypturgic* and *Cryptodiathetic* have been employed: itself, as above, a branch of the psychico-physical class.

These last, and themselves undivided classes or sources, three in number, are placed upon a one line as they present themselves without any attempt to apply to them the bifurcate mode of division. Their relations to one another are as yet too little understood to admit of their being thus put under subjection by the arranging hand.

As to that source of motion which, under the name of the Economistic, has been brought to view, by the account which on that same occasion was given of it, it is represented as not to be in itself a distinct one; distinct from all or any of the others. It cannot, therefore, without impropriety, be brought under any such plan of division as the one here attempted to be exemplified. But the task of bringing it to view, for which purpose it was necessary that a distinct name should be given to it, presenting itself as one that might be productive of practical advantage, it is therefore, in

the character of an appendage, placed at the end of the list of the distinguishable sources of motion, on which the bifurcate and exhaustive mode of division has here been, in the least imperfect manner which the power of the workman admitted of, exemplified.

By the above arrangements, the conception formed of the matters contained in them was in the author's own instance facilitated, and, as it seemed to him, clarified; in as far as in the instance of any other minds the like good effects shall have been produced, payment for the labour thus expended will have been made.

Detecting, and, if practicable, remedying the imperfections from which it was not in the author's power, at least with the quantity of time which he could afford to allow to the task, to clear it, might afford an exercise, and, it is imagined, one not altogether unuseful, to the juvenile vigour of the studious mind.

If from the labour thus bestowed in this field, any fruit should come to be reaped by any other mind, it may be referred to the improvement made upon an attempt to exhibit, in the form of a systematic tree, such as is here subjoined,* the arrangement made in his Hermes, by James Harris, of the grammatical parts of speech, and of the view thereby taken of the delusions into which, by his devotion to the ancients, the author, with all his ingenuity, was on that occasion found to have been led.†

MECHANICAL POWERS.

On this ulterior subject, a few loose hints are all that the writer can at present afford,—all that he can hope to find the readers, to whom he looks, disposed, on this occasion, to bestow any further portion of their notice.

To reduce to one and the same expression the description of the several sorts of instruments, which are in use to be included under the common name of the mechanical powers, seems to have been an object of desire, and, in some respects, of endeavour, with the authors of institutional works.

In any such desire, in any such endeavour, at least the notion of the practicability of the work is included.

That it may be practicable to reduce to a single expression some certain property, or certain properties common to all these several instruments, is a proposition which I see no reason, nor feel any disposition, to dispute.

But it is only in respect of the *uses* which they are capable of being put to, that for any purpose but that of barren speculation and solitary amusement or curiosity, they have any of them any claim to the attention of the ingenious, or any other part of mankind.

Now, howsoever it may be in regard to this or that speculative property, in regard to the practical applications made of them—those applications in respect of which alone they can lay any claim to the property of being of use—in reference solely to this property, what may be asserted with confidence is—that they are not capable of being reduced to any such common denomination.

Instruments for gaining force, at the expense of velocity, or velocity at the expense of force, were this a property belonging to all of them, the problem of reducing to one expression the advantage gained by them, might be a not unsolvable one. But out of the six or seven, it is to three only that this common property can justly be ascribed, viz. the lever, the axis in peritrochio, and the pulley or combination of pulleys: to the inclined plane, the screw, and the wedge, it is not applicable. In all these instances, the use derived from the instrument in practice depends upon other sources: upon properties in which the three before-mentioned powers do not any of them partake.

In the case of the lever, the axis in peritrochio and the pulley, the power of the machine finds not an assistance, but, in so far as it operates an impediment; whereas, in the case of the screw and the wedge, were it not for the power of friction, the effect aimed at would not, generally speaking, be produced.

Of the screw, though it certainly may be and actually is employed as well as the lever, axis in peritrochio, and pulley in the raising of weights, yet, the use to which it is applied with much greater frequency, and with a correspondent amount of advantage is that of *connexion*: binding for an infinity of different purposes, two or more masses of matter in a solid form into one.

So again the inclined plane. It is not for gaining force at the expense of velocity or velocity at the expense of force, that the instrument thus denominated is commonly, if ever, applied: it is for modifying direction; it is for producing in a certain direction certain results, which but for this instrument could not, in certain circumstances, by all the force obtainable by any of these instruments, be obtained.

Suppose a natural rock, or an artificial erection, having for its altitude that of one of the Egyptian pyramids, and for the boundaries of its upper surface, as well of those of its under surface, those of that same pyramid. By the application of force on one side of the parallelipedon with all the levers, wheels, and pulleys that could be collected, a man would not communicate the power of either himself mounting to the top of it, or causing a block of stone so to

* This tree has not been found among the MSS.

† Viz. the adverb represented as having an import distinct from that of the other parts of speech, and thereby from that of the preposition, that of the noun substantive, and that of the noun or pronoun adjective: whereas, in every case the import of it is resolvable into the several imports of those three parts of speech taken together: take, for example,

then, that is, *at that time*;
there, i. e. *in that place*;
thus, i. e. *in this manner*.

do. Applying an inclined plane to it, making an angle coinciding with any one of the angles made with its base, and the plane at the vertex of the pyramid by one of its present sides, the man may mount upon it, or the block of stone may be drawn up to it.

On this head the theoretical conclusion is, that in pursuing without sufficient scrutiny, and hence with too undeviating an adherence, the path chalked out by the ancients, and by them pointed out by the collective appellation of the mechanical powers,—the five or the six mechanical powers,—the progress of science has in this part of the field, as in so many others, been retarded.

So much for the theoretical conclusion: and the practical which corresponds to it, and is deduced from it, is, that some other principle of arrangement should be looked out for, and that a more comprehensive one—a principle which will afford an opportunity of placing upon the list many species of instruments which, though actually invented and in use, are not as yet put upon the list; many instruments actually known, and known to be in use, and, peradventure, other instruments which by a more correct and compiete conception of the subject may continually be brought to light. What is the principle? It consists in substituting to the present arrangement, an arrangement which shall bear reference to the several distinguishable purposes or uses, for which mechanical contrivance is in demand; in one word, in substituting the idea of uses to that of powers. Gaining force at the expense of velocity,—gaining velocity at the expense of force,—are but two of those purposes,—are but two items in an indefinitely, in an hitherto indeterminately ample catalogue; changing direction is a third; forming connexion is a fourth; dissolving connexion is a fifth; and so on. But here, on pain of losing myself altogether in a field foreign to the present purpose, I must make an end.

PERPETUAL MOTION.

In the history of the generation and extinction of the birth and death of motion, is involved the question of perpetual motion.

One species of motion there is, which, as far as we can judge, may, with good reason, be pronounced perpetual. It is that by which the bodies which compose the perceptible part of the universe, are kept whirling in their orbits. Perpetual, as far as we can judge, it must be presumed to be. Why? Because there can be discerned no cause, the operation of which should tend to make it cease. This, however, supposes the spaces in which they respectively move to be so many vacuums: for suppose them occupied with matter in any shape,—in the shape of a gas how rare soever, —in the resistance opposed by friction, by the gaseous repulsion of the particles of which it is composed, in that resistance, how distant soever the term may be, may be seen a cause fully adequate to the production of its effect.

In the instance of the stereopiptic source, numerous, it is believed, have been the contrivances produced by the hope of converting a source of short-lived motion into a perpetual one.

One consisted of a wheel, in which, along a spiral channel, a quantity of mercury was to find its way in its fall from the axis to the circumference; the longer the semi-diameter of the wheel, the longer the lever with which, when arrived at the circumference, the mass of mercury would act upon any body situated nearer to the centre. Make the diameter of your wheel *infinite*, and the force you will thus acquire will be the half of an infinite force. But, long before you had been at the trouble of giving to it any such inconvenient extent, you would have acquired force enough to pump up into the annular reservoir contiguous to the axle-tree a supply of mercury sufficient to continue the motion, and thus your motion would be a perpetual one. Somewhat in this strain seems to have been the reasoning that gave birth to this contrivance.

By the time it had reached the circumference, subtraction made of the force destroyed by friction, the mercury would have produced an effect equal to the effect produced by the same mass of mercury in falling from its position near the axis to its position near the circumference, without the trouble of taking any such sweep.

In the course of its transit from the one end of the spiral to the other, it would have to make a number of descents, as also a number of ascents, proportioned to the number of convolutions or threads in the spiral: the descents would be so many motions having for their adequate cause the attraction of gravity; the ascents would be so many motions, none of which would have any adequate cause; friction sufficing of itself to prevent the cause which in the preceding descent they respectively had from being an adequate one.

All perpetual motions having for their source the attraction of gravity, would, it is believed, be found resolvable into this mercurial one.

Some five and forty years ago, Dr Kenrick, most known by an attack made by him on Dr Johnson the Great, in an 8vo volume entituled *Lexiphanes*, took in hand the subject of the *perpetual motion*, and on this subject read, and afterwards published, a few lectures of which the effect, if any, was to render the subject somewhat more obscure than he found it. The object was to render probable the possibility of the existence of this rival of the philosopher's stone. One of the proofs consisted in some mention that was made of a certain mysterious wheel invented and manufactured by a person of the name of *Orphyonis*. By this wheel great were the wonders wrought; but, unhappily, the instrument being with prudent caution kept constantly enclosed in an

opaque and well-locked box, the invention died with the inventor, and was thus lost for ever to the world.

Not being known to the world by any other work, the inventor, Orphyonis, has somewhat the air of having been in the way of eponthesis, derived from *Orpheus*.

If any such wheel was ever made, it may be affirmed, without much danger of mistake, that the principle upon which it was constructed, was either the mercurial principle just explained, or the magnetic, of which the idea has been already given.*

By the *perpetual motion* is designated a motion, which, how ill-grounded soever, has on various occasions been espoused, by men not altogether unconversant either with the practice or with the principles of mechanics. On this part of the field, one true use of science is to render clear, and hold up to view the delusiveness of all expectations entertained on this ground, and thereby prevent the disappointments and pecuniary losses with which all such expectations can scarcely in the event of their being acted upon fail of being productive.

For any motion of any mass or masses of matter, situated within the reach of human agency, to be in the *literal* import of the word *perpetual*, it would require that the masses of matter in question should be in every part indestructible, and the particles of which they are composed, unsusceptible of being, any one of them, by means of the motion or otherwise, separated from any other. A notion to any such effect being in opposition to universal and continual observation and experience, can scarcely be supposed to have ever found admittance into any human breast.

But, independently of the operation of any such manifestly and universally operating cause, by the word *friction* as above explained, is moreover designated a cause, in which no imaginable motion, from whichsoever of the above sources proceeding, can fail of experiencing, within a very short space of time, *unless renewed*, its inevitable death.

But in any case, in which the motion can be said to be *renewed*, the motion, when the case is more clearly looked into, will be seen not to be one and the same: it is a continually successive creation of fresh motions: viz. in the case of falling water, falling earth, or wind, the motions of fresh and fresh parcels of matter, receiving motion one after another, though in the same direction; in the case of motion produced by muscular exertion, fresh and fresh exertions of the *will*, and *contraction* of the same or other *muscles*, produced in consequence.

If in the import of the words *perpetual motion*, were included the idea of any internal source of motion, by which different particles of matter, after having in any never-interrupted series been put *successively* in motion, were so to continue without end, then and in such case there would at all times be as many *perpetual motions* as there are distinguishable purely physical sources of motion (meaning individual sources, not *species* of sources) operating and producing motion, as above. But, in no one of the cases, in which a perpetual motion has been said to be invented, or said to be capable of being invented, does any such state of things appear to have been in view.

APPENDIX.—No. VI.

SKETCH OF THE FIELD OF TECHNOLOGY.

To a course such as that here proposed, a not unapt conclusion may, it should seem, be afforded by a view of what has been termed *Technology*,—General Technology,—the aggregate body of the several sorts of manual operations directed to the purposes of art, and having, for their common and ultimate end, the production and preparation of the several necessaries and conveniences of life.

Of a view of this art, the amusiveness no less than the instructiveness, will receive no small increase, if to the exhibitive description, accompanied as far as may be, with the exhibition of the instruments and operations themselves, be added an indication of the rationale of the several operations.

By the *rationale* is here meant, an indication of the end most immediately in view, and the considerations by which, as between instrument and instrument, or operation and operation, the choice appears to have been determined.

By a familiar example, what is here meant will, it is believed, be rendered sufficiently apparent. For the purpose of making holes destined to give admission to threads employed

* At that time, and for a good many years afterwards, there existed a sort of philosophical club, composed at first of but a small number of members, which, at different periods of its existence went, I believe, by different names, two or more, no one of which is at present in my memory. At that time, the number of its members was small, but antecedently to its extinction, its members, as well as its celebrity, had received considerable increase. Sir Joseph Banks, the late Dr Solander, John Hunter the surgeon, Myln the architect, the still existing and celebrated Mr Richard Lovel Edgeworth, Dr George Fordyce the physician, Jesse Ramsden the optician, Conyers the celebrated watchmaker and writer on that subject, another Conyers, Arabic Professor somewhere in Scotland, and perhaps one or two more members. I had myself, at that time, the honour of being, in this way, an associate of so many ingenious and illustrious men, together with the shame of being a very ignorant and altogether an unprofitable one. Curiosity drew to these lectures of Dr Kenrick several members of that club: two whom I recollect as being of the number, were Mr Edgeworth and the watchmaking Conyers. It was by Dr Fordyce that I was introduced.

for the purpose of junction, the instrument employed by the tailor is the needle; that employed by the shoemaker, the awl. When the needle is employed, the work, it is evident, may be made to go on with a degree of rapidity much beyond any that can be given to it by the awl. Why, then, in the case of shoemaker's work, employ the awl?—Answer. Because the habiliment fastened by the shoemaker,—having for its principal object the exclusion of water, to the action of which it is continually exposed, at the same time that the material is of that sort which, when a hole has been made in it, has but little tendency to fill up the vacuity,—could not, if the needle were employed, be made to answer the intended purpose. The needle is capable of admitting the thread only by means of a slit called the eye, made at the thickest end of the needle into which the thread is passed, and, therefore doubled. The needle is a cone, of which the transverse section is a circle. The thread, without being in some part of its length double, cannot pass through the hole made by the needle, without passing in the form of two cylinders enclosed, both of them within the circle formed by the above-mentioned section of the needle. But, in this way, notwithstanding whatsoever elasticity may happen to be possessed by the substance into which the holes are made, it cannot be but that a part, and that a very considerable one, of the circle, will remain unfilled up; and, at this part, if the habiliment be a shoe and the material leather, the water will gain entrance. On the other hand, when, for making the holes, the instrument employed is the awl, the thread is not attached to it. The thread is a strip of leather, the section of which is a square, a form by which the hole will be more exactly filled up than by any other that could be given to it. Of this square, the central part is occupied by a hog's bristle, a cylinder, which being comparatively inflexible, and of a diameter smaller than that of the hole destined for the strip of leather in which it is imbedded; a ready admission will be obtained into the hole as soon as the awl is drawn out of it.

For the purpose of such a conspectus, a work of indubitable use, would be a logical, *i. e.* an analytical arrangement of the several manual operations, employed and employable, for the purposes of the several arts considered on this occasion, and for this purpose, in conjunction: say, therefore, *of art in general.*

To any person by whom a work of this sort should be undertaken, very useful hints would be found afforded by a work of Bishop Wilkins. As a copy of that most ingenious work is not obtainable but by accident, an extract from it, containing as much as seemed applicable to the purpose in question, will be found in the Appendix to this present Essay.*

In the works of recent naturalists, chemists, and nosologists, and, in particular, in the Philosophia Botannica of Linnæus, the father, as he may be termed, of Somatological tactics, much useful instruction, many excellent patterns may be found applicable to such a work. That, in such a work, these patterns or standards of reference, cannot in any part be closely copied, will be evident enough; but that, by the aid of analogy, instruction in abundance will be derivable from them, will be found equally indubitable.

From the consideration of the purpose, together with other considerations subordinate to that leading one, mechanical instruments and operations, and their results or products, may, as well as plants or other natural bodies, be arranged into classes; those classes divided into orders, and sub-divided into genera and species; between orders and genera, other divisions, if found necessary, being interposed; and to these several aggregates, thus continued one within another, names taken for distinction sake, from one or other of the dead languages, may be attached.

Say, for instance, name of one of the genera of instruments, *Terebræ*—instruments employed for the boring of holes. Species—1, the awl; 2, the gimblet; 3, the augur; 4, the whimble, &c.

Name of another of the genera, Clavi—instruments employed for the effecting a connexion between two or more substances of a rigid texture, and for that purpose to remain inserted partly in one and partly in another. 1. The pin; 2, the bolt; 3, the nail; 4, the trenail; 5, the screwing nail, called for shortness, the screw.

Neither as being, in as far as it goes, complete, nor as being the most apt, that the nature of the case admits of; nor in any such hope as that of its being found to approach to perfection in either of these particulars, is this specimen brought to view; the object of it is merely to afford a general idea of the principles upon which it is proposed that it shall be formed.†

Not only to instruction, but moreover to improvement, to practical improvement, will be the assistances afforded by a systematical, or say an analytical, arrangement of this kind. Taking throughout, for its leading principle, the object or end in view, it will form all along, as the work proceeds, a bond of connexion, and, as it were, a channel of intercourse between art and art; artists of all sorts, how different soever the results and products of their respective arts, may thus receive instruction from each other's practice; each may thus find his mind expanded—expanded in that direction in which, being prepared for it by antecedent practice, expansion will be most easy and pleasant.

For a work of this sort, in the French,

* See Appendix, No. VII.

† See Appendix, No. VII.

"Descriptions des Arts et Metiers," * materials will be found in abundance. But, conducted upon the systematic and all-comprehensive plan above brought to view, it will possess a degree of utility beyond any to which that work so much as aimed. Of that work, the compilers were philosophers, and in that character, something in this way might not unnaturally have been looked for at their hands. But of so vast and diversified an aggregate of materials, the collection and the arrangement—the arrangement in logical order, such as is here in question, was too much to look for, not only from the same hands, but, perhaps, from the same half century. In a case such as this, the particulars required had not only to be collected upon a most ample scale, but compared and confronted, one with another, in an infinity of directions before the work of classification could be entered upon with any very promising prospect of lasting use.

Bulky to a degree of unwieldiness is that justly celebrated work. † But, even with those ample additions which, by English practice, might doubtless be afforded to the stock of the materials, it follows not that, in point of bulk, a systematical work of the kind here proposed need, by a great length, approach to the bulk of that vast and elaborate performance. By apt aggregations, infinite is the number of particulars which in such a case may be found superseded. In different trades, an instrument which, in all these several instances, is of precisely the same use; an operation which, in all of them, is of precisely the same nature, may stand designated by so many different names.

For a course of Chrestomathic instruction, as here proposed, a work of this nature would form a necessary text-book. By the indication of such a work in the character of a requisite, the possibility of commencing such a course, may seem, at first view, to be thrown forward to an immeasurable distance.

1. But, in the first place, it is not till the very end of the proposed Chrestomathic course —viz., say for seven or eight years—that any such particular course is so much as proposed to be delivered.

2. In the next place, for a commencement, an extempore work, very far not only from the utmost attainable perfection, but from the degree of perfection of which an idea can be formed at present, will be of indubitable use, and as such, presents an undeniable claim to favourable acceptance. Be it ever so little, ever so imperfect, whatsoever will in this way have been done, will be so much more than will ever have been done before.

3. In the third place, by any one by whom, to the following sketch by the ingenious Bishop, a moderate share of attention will, in this case, be bestowed, no inconsiderable portion of that appearance of extraordinary difficulty, which the subject may, at first view, have presented, will, it is believed, be seen to vanish.

* Descriptions des Arts et Metiers faites ou approuvées, par Messieurs de l'Academie Royale des Sciences.

† Nine vols. folio.—*Ed.*

APPENDIX.—No. VII.

Hints towards a system and course of Technology, from Bishop Wilkins' Logical work, published by the Royal Society, A° 1668, under the title of "An Essay towards a Real Character, and a Philosophical Language."—Pp. 243–248.

In the character of a practical project fit for use, this work, with all its ingenuity, failed in its design: being written before the discoveries made in the field of Pscychology by Locke.

It seems not likely that, by the formation of a new language, the difficulties and inconveniences attendant on the use of the collection of signs at present employed in the registration and communication of ideas would be diminished. In no other way than through the medium of some existing language, with which he is already acquainted, could any person be made to learn *any* such new formed language. The difficulty of learning this new language, in which, at the outset, not so much as one book could be found, would therefore be a new created difficulty, in compensation for which it does not appear how or where any preponderant or equivalent facility would be to be found. Enriched, partly by analogy from its own stores, partly by importation from foreign languages, dead and living, some one of the existing European languages would, it should seem, be found better adapted to the purposes of an universal language, than any new one which, in the nature of the case, could be framed. Moreover, in his explanations, the ingenious author began at the wrong end. Not, observing that it is from our corporeal ideas that all our mental ideas are derived, and that, accordingly, as far as the means of tracing them have been within our reach, all words now employed in giving expression to incorporeal ideas, were originally employed in giving expression to corporeal ideas: words now employed for giving expression to incorporeal ideas, are those which he begins with, thus putting the cart before the horse. At the time when this essay was written, the discoveries made by Locke in the field of Psychology, had not been published. If they had been known to this ingenious author, this book of his would either not have been written, or would have appeared in a form considerably different. In the complete failure of the main design, may, perhaps, be seen the cause why it is at present so little known; and why (for this, it is believed, is the fact) that, notwith-

standing the patronage and recommendation of the Royal Society, of which this Bishop was one of the most respectable members, it never saw a second edition. But, in other respects, it would be found the product of a truly original genius, abounding in ideas from which, in the fields of Logic and Universal Grammar, useful instruction may be found in abundance.

"VI. *Violent Motion.**

"The *general kinds* of Violent Motion, may be distributed according to the effects upon the thing moved, into such as denote

Translation into a new place; comprehending

Motion together; when the *Mover sustains the thing moved;* to which may be annexed, by way of affinity, that other *action, by which one* thing sustains, or *hinders the falling of another.*

1. Carrying, *bring, convey, bear, serve, import, waft, weare about one, portable, portage, porter, baggage, vehicle, fare, bier, packhorse.*
   Bearing, *supporting, sustain, hold up, prop, shore up, stay up, uphold, carry, stand under, shoulder up, bolster up.*

Amotion, when the Mover and Moved do at the beginning cease to be contiguous: or, *admotion,* when the thing moved doth end in a contiguity of something else.

2. Casting, *throwing, fling, hurl, project, inject, eject, ding, pelt, toss, coit, sling.*
   Catching, *apprehend, lay hold, snatch, lay hands on, grapple, grasp, scamble.*

Often returns into the same place; according to *greater or less degrees.*

3. Swinging, *Vibration, waving, brandish, agitate, exagitate, to and fro, flourish, rock, sway, dangling, pendulous, wield.*
   Shaking, *Quassation, concussion, jogging, agitate, dandle, wag, swag, sway, jolt, totter, flutter, shatter, waving.*

Some impression from the Mover; according to the more

General name · or *that which is from an obtuse hard body.*

4. Striking, *Percussion, smite, bang, beat, bast, buffet, cuff, dash, hit, swinge, thump, thwack, blow, stripe, slap, flap, rap, tap, kick, wince, spurn, bob, box, fillip, whirret, yerke, pummel, punch, rebuff, repercussion, collision, gnash, skittish, interfere, let fly at.*
   Knocking, *beating, Blow, butt, Mallet, battering, jobbing, Ramm.*

Particular kind; by *the end of a thing,* more *obtuse, or acute.*

5. Pounding, *braying, contusion, stamp.*
   Pecking, *Mattock, Pick-ax.*

Dissolution of Union in the same body, *according to,*

The *Stiffness* or *Limberness* of the body wherein it is made.

6. Breaking, *Fracture, Rupture, burst, Crack, Crash, Squash, Dash, Flaw, Shatter, shiver, crumble.*
   Tearing, *torn, dilacerate, rend, rent, ragged, tattered, flittered, jagged, pull in pieces.*

The figure of the body by which it is made; either *an edge* or *a point.*

7. Cutting, *Incision, gash, slash, hack, hew, chop, rip, chip, snip, slice, section, segment, carve, dissect, whittle, barb, pare, top, lop, curtail, dock, sharp, keen, Hatchet, Pole-ax.*
   Pricking, *Stabbing, Goad, pungent, runn in, thrust in, goar.*

"*Operation.*

"The Sundry kinds of *works about which men* of several callings use to *employ themselves,* are usually styled by the name of

Operation, *Labor-ious Pains, Travail, Toil, moile, Turmoile, drudge, droil, work, handy-work, Ply, co-operate, take pains, lay about him.*

Play, Sport, lusory, dally.

These are either,

More *common* and general; relating to
- Mechanical Faculties, I.
- Mixed Mechanical operations, II.

More *Particular;* belonging to the providing of
- Food, Agriculture, III.
- Houses, or Utensils, Fabrile Arts, IV.
- Clothing, Sartorian Trades, V.
- Physic, Chymical, Pharmaceutical Operations, VI.

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* The passage here copied is a mere characteristic extract, (being a portion of Part II. ch. ix.) from the elaborate work of Bishop Wilkins, which may be called an attempt to make an analysis of the whole subject matter of language, or a classification of all things whether in the material or immaterial world, to which there can be any occasion to apply words; or, as the Bishop describes it, "a just *enumeration* and description of such things or notions as are to have *marks* or *names* assigned to them."—*Ed.*

" I. Operations belonging to the Mechanical Faculties, are either such as do refer to the

- *Lever;* for the forcible motion of a thing *upwards* or *downwards.*
  - 1. Lifting, *heave, hoise, advance, elevate, exalt, Lever, Crow, Crane.*
  - 1. Depressing, *strein, stress, weigh down.*
- *Balance;* for *trial of* the *weight* of things, or the *preponderating of one side.*
  - 2. Librating, *balancing.*
  - 2. Biassing, *preponderate.*
- *Wedge;* for the *diriding of hard* tough *bodies;* to which may be opposed the *thrusting of them close together.*
  - 3. Cleaving, *rive, slit, split, Cleft, Chink, Chat, Crevise.*
  - 3. Compressing, *crib, gripe, pinching, press, squeezing, straining, wring, nip, twing, throng, crowd, crush, constipation, bulge.*
- *Pully,* when the mover and moved continue their contiguity in *admotion,* or *amotion.*
  - 4. Pulling, *pluck, tow, tug, lugg, twing, twitch, draw, drag, Draught, hale, Revulsion, vellication, distract.*
  - 4. Thrusting, *push, shove, drive, rush, justle, repell, extrude, intrude, press, throng, crowd, cramm, farce, wedge in, rennue, run at, foin at.*
- *Wheel;* by *continued turning about,* or *rolling backward or forward.*
  - 5. Vertiginating, *turning round, Revolution, wheeling, Rotation, twirl, whirl, spinn, roll, round.*
  - 5. Volutation, *tumbling, rolling, wallow, welter, rock, trundle, waddle.*
- *Screw,* to which may be adjoined for some affinity, the *action of that concave Instrument used for the projection of water.*
  - 6. Screwing, *Winch.*
  - 6. Syringing, *squirting, spirt, spouting.*
- *Spring,* wherein there is a motion of restitution ; to which may be annexed for its affinity, the *forcible putting a thing out of its natural tension* and posture.
  - 7. Springing, *elastical, fillip.*
  - 7. Bending, *bow, warp, crooke.*

" II. Those are styled Mixed Mechanical operations, which are not appropriate to any one kind of art, but are general and common to many. These do concern the

- *Uniting or separating of several bodies;* considered more
  - *Simply,*
    - 1. Binding, *gird, Band, Bond, Bundle, Packet, Fardle, sheafe, faggot, tack, lace, swaddle, swathing, trussing, girt, surcingle.*
    - 1. Loosening, *unbind, undoe, solve, lax, slack, relaxation.*
  - *Relatively* to the affections of Binding, viz. *fastning of the bond by a knot,* or *confused kinds of knots.*
    - 2. Tying, *Knot, Node, bracing, buckling, coupling, fastning, knit, furling.*
    - 2. Tangling, *entangle, hamper, ravel, perplex, snarled, felter, intricate, involved, Intrigues, extricate, complicate, insnare, Labyrinth.*
- *Concealing,* or *manifesting;* either more
  - *Common.*
    - 3. Covering, *heal, Veil, shroud, hide, whelm, stop, Canopy, Hood, Lid, palliate, cloake, overlay, overrun, overshadow.*
    - 3. Uncovering, *open, expose, discover, shew, reveal, naked, unmask, unveil.*
  - *Special,* relating to containing bodies.
    - 4. Shutting, *stop, close, inclosing, immure, exclude, seclude, recluse, obstruct, Wink, fold up, pinn up, sowe up, seal up, corke up, lute up, lock up, put to the door.*
    - 4. Opening, *breaking up, disclose, display, Expansion, gap, Slade, Aperture, unstop, expose, lay* or *set open.*
- *Putting of things nearer together,* or *farther asunder;* either
  - *More general,*
    - 5. Gathering, *Collect-ion, assemble, convene, compeile, levy, raise men or money, Receiver, rake or scrape together, rally, glean, pick up.*
    - 5. Scattering, *discuss, disperse, dissipate, sprinkle, strew, inspersion.*
  - *More particular; with reference to* the
    - *Capacity of*
      - *Consistent bodies,* and such as are not supposed to be contained.
        - 6. Heaping, *accumulate, amass, lay up, stow, pile, Stack, Mow, Cock, Rick, Shock, Drift, Dunghill, mixen.*
        - 6. Spreading, *diffuse, Expansion, display, Suffusion, strew, run, plash, lay cloth.*
      - *Fluid Bodies,* and such as are supposed to be contained in something.
        - 7. Filling, *replenish, Repletion, full, plenary, sated, staw, cram, stuff, farse, recruit.*
        - 7. Emptying, *evacuate, vacant, Vacuity, rid, void, exhaust, Chasm, clear, lanke, lave, draw dry.*
    - *Motion* of bodies, chiefly fluids ; according to the *more general name:* or that which is *involuntary, and besides intention.*

8. { Pouring, *Effusion, Infusion, gush, guggling, yewer, Tunnel.*
   { Spilling, *shedding, run out, seeth over.*

" III. Operations belonging to Agriculture, do concern either

The *Ground, or Land:* in respect of,
- *Loosening it;* either *by single persons;* or *by the help of drawing Beasts.*
  1. { Digging, *delve, break up, spit, spade.*
     { Plowing, *tilling, breaking up, coulter, share.*
- *Breaking the clods, and smoothing the surface.*
  2. { Harrowing.
     { Rolling.
- Helping or directing the fertility of the Ground, *by adding some new matter,* or *removing the impediments of noxious Plants.*
  3. { Manuring, *cultivate, dunging, marling, soiling, Tilth, culture.*
     { Weeding,

The Grane or Seed, chiefly of Herbs ; in respect of
- *Putting it into the ground,* or *taking it off from the ground* upon its maturity.
  4. { Sowing, *seminate.*
     { Reaping, *mowing, Crop, Harvest, Sithe, Sickle, stubble, swarth.*
- *Separating* of it *from the straw* or *lesser husks;*
  5. { Threshing, *Flail.*
     { Winnowing, *Fan, Ventilation.*

The *Propagation of Trees or Shrubs,* chiefly by
- *Putting the Root of the Plant in the ground* ; to which may be adjoined, *the putting of Grain segregately into the ground,* which is sometimes used for pulse.
  6. { Planting, *implant.*
     { Setting.
- *Joyning* a part of one plant to another, either *to the top of the body, or some branch being cut,* or *to the sides of the body.*
  7. { Grafting, *ingraft, Imp.*
     { Inocolating.
- *Cutting off superfluous Branches;* to which may be adjoyned, *the cutting down of the whole.*
  8. { Pruning, *dressing, cutting, coping.*
     { Felling, *grubb, Wood-fall.*

" IV. By Fabrile Operations, (*Smith, Carpenter, Mason, &c.*) are meant all such kinds of works as do primarily concern our Houses or Utensils, whether for necessity or ornament : to which may be adjoyned, those operations which concern the making of earthen ware, styled, Figulatory, *Potter.* These are distinguishable into such as denote

Dissolution of Continuity; either by
- *Separating of some thin parts* from the surface of a body by rubbing with an edge ; or *breaking the body itself into minute parts* by percussion with some obtuse body.
  I. { Shaving, *scraping, raze, razour.*
     { Contusion, *bruising, pounding, stamping, braying, morter, pestle.*
- *Dividing from a body some small part;* either *by affriction upon a stone,* or *with an iron instrument.*
  2. { Grinding, *attrition, Grist, Quern, Mill.*
     { Filing, *Raspe.*
- *Dividing the parts of a body,* by cutting it, either in *roundish cavities,* or *in oblong scissures.*
  3. { Boring, *perforate, foraminate, pierce, Bodkin, Dril, Awle, Gimlet, Wimble, Trepann, Awgre.*
     { Sawing, *Saw, whipsaw, &c.*

Uniting, either of metalline or other bodies, *by some third body adhering.*
  4. { Sodering, *Cement, luting.*
     { Gluing, *cementing, glutinous, conglutinate.*

Shaping of bodies into particular figures ; either *by*
- *Hammering* or *Melting.*
  5. { Forging.
     { Casting, *melt, founding, fusile, molde.*
- *Cutting,* either a *solid and bulky,* or *a flat figure.*
  6. { Carving, *Sculpture.*
     { Graving, *engrave, etching.*
- *Compressing* of a soft body ; or *circumagitating* either a soft, or hard body.
  7. { Kneading, *moulding, plastic.*
     { Turning, *Lathe.*

Adorning the surface of the body ; either *by variety of colours,* or *adding an external lustre to it.*

8. { Painting, *limn, draw, enamel, fucus, pensil.*
   { Varnishing, *size.*

V. Sartorian Operations do concern either the

Preparations of stuffs; by
- *Making* several vegetable or animal substances into *Thread.*
  1. { Twisting, *tortion, wreath, writhing, twine, winding.*
     { Spinning, *Spinster, Rock, Distaff.*
- *Joyning such Threads together into Cloth.*
  2. { Weaving, *Texture, Contexture, Loom, Web, braid, woven, Hurdle, Shuttle, Wicker, Matt.*
     { Knitting.
- *Thickening* and *colouring* such cloth.
  3. { Fulling, *milling, Fuller.*
     { Dying, *stain, Tincture, tinge, ingrain.*

Making of Stuffs *into Vests;* either by
- *Uniting necessary,* and *cutting off unnecessary* parts.
  4. { Sowing, *Stitch, Seam-ster, Suture, Welt, needle, dearn, quilt, draw cloth, rip.*
     { Clipping, *Scissors, shear, shorn, cut.*
- *Placing together* the parts in *greater* or *lesser plicatures.*
  5. { Folding, *wrap, lap, plait, clinching, clutching, doubling, envelop.*
     { Curling, *crisping, frizling, furling.*

Preserving of such stuffs or vests *clean;* common likewise to other things.

By the help of *water* or *liquor; either when*
- Things are *put into, and agitated in the water;* to which may be opposed the *putting upon them other bodies of a more gross consistence;* styled,
  6. { Washing, *scouring, Lotion, rince, Laver, Laundress, gurgling.*
     { Smearing, *daubing, anoint, ointment, Unction, greaze, chrism;* and many with [*be*] as *bespaul, spit, spue, sprinkle.*
- *Water is imbibed and communicated* to the thing; to which may be adjoined, for its affinity, the *putting of things into liquor in order to the communicating of some new quality to such liquor.*
  7. { Soaking, *steeping, embrewing, macerating, watering* Land, &c., *bathing, imbibe, sinke, sop, brewis, embrew.*
     { Infusion, *watering* Fish, &c., *macerate, Decoction, impregnate.*

By external Motion of or upon them, *more or less violent.*
8. { Rubbing, *scrape, Friction, Frication, scrub, chafe, Attrition, frit, gall, scowr, taw, grate.*
   { Wiping, *stroke, terse, handkerchief, towel, knapkin.*

By Instruments to separate those minuter bodies which adhere to the superficies.
9. { Brushing, *sweeping, Beesom, Whisk, Brush, Broom, Maukin.*
   { Combing, *carding, currying.*

"VI. By Chymical Operations are meant such kind of works as tend to the *changing* of bodies, with respect to the *position* and *figure of* their *minuter parts.* By this, amongst other ends, medicaments are usually prepared; for which reason those kind of operations styled Pharmaceutical, belonging to the apothecary, may be hereunto annexed.

The operations belonging to this head, do concern the changing and preparing of bodies; either *by*

Instruments, for the reduction of them into minute parts; by *compression and affriction* betwixt two hard bodies; or *by separating the parts so reduced, through a porous plain.*
1. { Grinding.
   { Sifting, *bolting, Sieve, siercing, ranging.*

Liquors; either
- *Changing* the consistence of bodies; *by reducing* them *into* a more *liquid,* or a more *dry consistence.*
  2. { Dissolution, *melt, liquifie, dissolve, thaw, fusil, flux, run about.*
     { Coagulation, *congealing, Clod, Curd, Gelly, Clottered Gore, Concretion, grumous.*
- *Dividing hard bodies* into minute parts; *by an acid liquor,* through which such parts are dispersed; or *sinking down of such parts to the bottom,* by the mixture of some other liquor.
  3. { Corrosion, *eating, fretting, gnawing, caustic.*
     { Precipitation, *settling.*
- *Separating of these parts* from the liquor; *by passing them through a porous body;* either *downward,* or *both upward and downward.*
  4. { Straining, *Percolation, squeeze, colender.*
     { Filtration, *filtre.*

Heat, applicable chiefly either to

Liquid bodies; which being kept for some considerable time in a gentle heat, upon this usually follows, either the
- *Loosening the inward parts of such bodies, so as* by agitation *they work one upon another*; styled,
  - 5. Digestion.
  - 5. Fermentation, *work, fret, Leven, Yeast, Barm, Rennet.*
- *Separating of the finer parts*, by raising them up in the form of a liquor; or, *the farther separating of the more spirituous from the watery parts of this liquor.*
  - 6. Distillation, *still, Limbeck, cohobation.*
  - 6. Rectifying.

Hard and solid bodies; either by
- *Driving away the more watery* and volatil parts *and leaving the more solid*; or, *raising the volatil parts in the form of a salt.*
  - 7. Charring, *chark, Tinder.*
  - 7. Subliming, *sublimation.*
- *Burning away the combustible parts of a body*; or *turning the parts remaining after such burning into a liquor.*
  - 8. Calcination.
  - 8. Lixiviation, *deliquiate, Lye, Buck.*"

APPENDIX.—No. VIII.

New Principles of Instruction, proposed as applicable to *Geometry* and *Algebra*, principally for the purpose of supplying to those *Superior* Branches of Learning, the *Exercises* already applied with so much success to the *Elementary* Branches.

The following principles not having any particular connexion with the New System, nor having been included in the attestation given in favour of that system by extensive experience, could not present a sufficient title to be included in the Table. In the character of candidates for examination, they are, however, submitted to the consideration of the competent authorities.

It will, at the same time, be a question for learners and adepts in the science to answer to themselves, whether, in this same method, additional promptitude may not be found, as well as positive facilities, for the arranging of geometrical ideas in their minds, and aiding the communication of them, upon occasion, to others, whether in the character of learners or adepts.

I.

Principles, with correspondent Exercises, applying specially or exclusively to Geometry.

1. *Geometrical-Relation—Verbally-Expressing, or Purely-Verbal-Expression-Maximizing, or Diagram-Occasionally-Discarding Principle.*
2. *Practical-Use-Indication-Maximizing, or Practical-Application-Maximizing Principle.*
3. *Genealogical-Table-Employing, or Synoptic-Filiation-Indicating Principle.*
4. *Special Visible Sign-Employment-Maximizing, or Verbal-Expression-Occasionally-Discarding Principle.*

II.

5. *Key-Presenting, or Contrivance-Indicating Principle.**

Among the five above-mentioned principles, of the four that apply to Geometry, between the *first* and the *fourth* an intimate relation will, at first glance, be seen to have place, they being in fact the converse of each other. But, of the *fourth*, neither the *use*, nor consequently the *nature*, can be fully explained till that of the third, to which it is subservient, has been brought to view. In the character of *exercises* or modes of *learning*, the utility of them, has, in both instances, received, though in respect of the number of the learners, as yet but on a narrow scale, the attestation of experience.

I. *Geometrical-Relation-Verbally-Expressing, or Purely-Verbal-Expression-Maximizing, or Diagram-Occasionally-Discarding Principle.*

Of this principle, the great use is, to serve as a test, and, by that means, an instrument of, and security for, *intellection*.—See above, Exercise No. 9, Princip. No. 24. (pp. 44, 51.)

Mode of Performing this Exercise.

Without the aid of any diagram, and, consequently, without the use of any of those signs, such as the letters of the alphabet, which, as often as for bringing to mind the figure in question, a *diagram* or delineation of it is employed, are necessary for designating and distinguishing from each other the parts of the figure, a *proposition* (in the geometrical sense of the word) and, consequently, the *figure* which is the subject of it, is expressed in *words* alone; which words will, of course, be such, that every *proposition* (using the word *proposition* in the logical and grammati-

* Besides those here enumerated, two other subjects are discussed in this No. of Appendix, viz. Demand for Revision of the Field of Mathematics, and Interconvertibility of Geometry and Algebra.

cal sense) which they serve to constitute, will be what is called a *general* proposition, having for its subject not merely an individual object, but a class, genus, or sort, of objects.

Without the aid of any diagram, any such description, can it then be given in such manner as to be intelligible? From his own experience,—from experiments made at his suggestion, in the instance of three persons, at two widely distant points of time,—the writer of these pages is enabled to answer in the affirmative. In the instance of two of them, the experiment began with Euclid's Elements, and went no farther than the first six books. In the instance of the other person, it began with one of the most copious, and, at that time, best approved institutional works on *Conic Sections*,* and was continued, if he misrecollects not, to the very end. In both instances the papers in which the descriptions in question are contained, are in his possession, though at this moment not accessible. In all three instances the learners were of a self-directing age. What was done, was done purely for the satisfaction as well as instruction of the operators themselves, and not in the way of exercise for the satisfaction of a teacher; for, except the learners themselves, in no one of the three instances was there any teacher in the case. In the case of the Conic Sections, though he himself neither did at that time read, nor since then has ever read, so much as a page of what was written, yet, so it was, that the whole of it was written in his presence: and well does he remember the tokens of self-satisfaction, as well as promptitude and velocity, with which the performance of the self-imposed task, continued as it was during a course of some months, was accompanied,—symptoms which, for such a length of time, nothing but the full sense of continual success could assuredly have produced.

But, without a perfect conception, or, at any rate, without the supposed consciousness of such perfect conception, a task of this kind and of this length never could have been performed. From first to last no diagram having been employed, consequently, no reference to any actually drawn diagram made, it is only by words—by words of a purely general nature, that the several relations borne by the several parts of the figures in question to each other, that the ideas in question, could have been expressed. But, in this way, the ideas in question having actually been expressed, how much superior, in the character of an *intellectual test*, this species of exercise cannot but have been, in comparison with any other, will, it is hoped, without entering into any diagrammatical exemplifications, be found sufficiently intelligible.

For this purpose a particular mode of designation, applicable to the several parts of a geometrical figure, required to be devised, and was devised and settled accordingly. For example, in order that such words of designation as *right, left, top, bottom*, and the like, might be capable of being employed, it was necessary that, of the figure of which a description was to be given, the position should be determined. But, once for all, care was taken to declare and record, that it was merely for the purpose of description and exemplification that, so far as concerned position, this declaration was made; and that, in whatsoever position the figure were placed, the species it belonged to and the properties it possessed would be the same.

I. Enunciation or enunciative part,—enunciative, viz. of the proposition to be demonstrated.†

II. Demonstration or demonstrative part. In every portion of discourse, to the whole of which the term *proposition—a proposition*—is customarily applied by geometricians, these two parts at least will be found. To these will in most instances be found added what may be termed the *direction—directive part*, or *preparatively directive part*, viz. the part by which direction is given for the operation to be performed, and for necessary additions to be made to the originally exhibited or conceived figure, for the purpose of *preparing* the ground for the demonstration.

In Euclid's Elements without exception, and for a considerable extent, if not for the most part, in other books, in the higher branches of geometry, in giving expression to the *enunciation* as above, the mode of *purely verbal designation* here proposed for all the above-mentioned parts is actually employed. But, so far as this practice is pursued, the *propositions* (taking the word *proposition* in the logical sense) are all *general;* the *ideas* conveyed by them are all *general ideas;* and in this *original* state it is, and without need of *extension*, that, in so far as they have place in the mind, they lie there ready to be applied, upon occasion, to all such individual figures as are respectively comprehended within their import.

But now, instead of being thus general, suppose the mode of designating them such, as to confine the application of them to the indivi-

* Hamilton's, as far as recollection serves.

† [*Demonstrated.*] Viz., either that what is asserted, as in the case of the sort of proposition called *a theorem*, is correct and true; or that what has been undertaken to be done (as in the case of the sort of proposition called a problem,) has accordingly been done. When any such phrase as *the demonstration of a proposition* occurs, the sort of proposition which on any such occasion is most apt to present itself, is a *theorem;* and this, not only because theorems more frequently occur than problems, but because in the case of a problem, the term *demonstration* will not apply in such manner as to complete the sense, without the insertion of a number of words, of which, in the other case, there is no need.

dual figure, exhibited by the diagram that accompanies them. For example, instead of saying, *a square having for its side the longest boundary of a right angled triangle is exactly equal to both the squares taken together, which have for their sides respectively the two other boundaries of the same triangle*, suppose the proposition worded thus—*in the triangle in question* (describing it by letters,) *the square having for its side such boundary* (describing it again by letters,) *is exactly equal to both the squares taken together, which have for their sides respectively the two other boundary lines*, (describing them also by letters.)

By such a mode of expression or designation, if it be supposed that no other more general mode is ever added or substituted to it, what general ideas—what practically applicable instruction would be conveyed? Answer:—Surely not any. For rendering the proposition susceptible of conveying any such instruction, what would be the course necessary to be pursued? Answer:—To substitute to this *diagrammatical* and *individualizing* mode of expression or designation, the *purely verbal*, and thence *general*, mode of expression or designation here in the first place brought to view. Here, then, before any real acquisition in the way of science can be made, there is an additional operation that must be performed,—an additional operation requiring much greater exertion of mind to perform it, as well as a much greater strength and maturity of mind to be able to perform it, than the original one.

This general mode of expression or designation, which, to the purpose of useful and practically applicable intellection, will, in the case of the enunciation, as above explained, be acknowledged to be, at least to a very considerable extent, absolutely necessary, will, it is hoped, in the case of the other two parts of the proposition, be acknowledged to be at least useful; useful, viz. on the supposition of its being *practicable:* and that it is practicable hath, as above, been already proved by repeated experience, without any contrary experience to oppose to it.

Diagram occasionally discarding principle: by the word *occasionally*, thus inserted in the composition of this, one of the names to be employed for the designation of this principle, intimation is given, that upon the *diagrammatical*, i. e. the ordinary mode of designation, no permanent exclusion is proposed to be put: that it is in aid, and not in lieu, of that ordinary mode, that the one proposed—the purely verbal mode—is proposed to be employed. So far is any such constant exclusion of the diagrammatical mode from being intended, that by the principle mentioned in the fourth place, this diagrammatical mode is to some purposes, by means of a set of adapted signs, proposed to be employed by itself: by itself, and thereby to the occasional and temporary exclusion of the verbal mode.

That, under the burthen imposed by the labour of forming, by means of a description given in the purely verbal mode, a conception of the figure meant to be presented to the mind, considerable relief will very frequently be afforded by a glance at the figure, cannot admit of doubt. For facilitating conception, in the first instance, the verbal mode and the diagrammatical mode will thus be employed in conjunction in conjunction, and so far, perhaps, with not very unequal advantage.

In comparison with the *diagrammatical* mode, no mean advantages will, it is believed, be found attendant on the *purely verbal* mode.

1. One is—the giving to the general ideas, the presence of which in the mind is, in every instance, necessary to intellection, a sort of perpetual and uniform fixation, by means of a determinate set of words,—thoroughly considered, apposite, and thereby, sooner or later, perfectly adequate words,—instead of leaving these general ideas to be, on each individual occasion, in a hasty, and, therefore, frequently in an inadequate manner, caught up in the way of abstraction: caught up without words for the fixation of them; and therefore, in case of error, without possibility of correction, there being no permanent or determinate object to which correction can apply.

2. The other advantage is—the saving that will frequently be made of the expense of time and labour, necessarily attached to the making out the several parts of the figure, by means of the letters employed in the designation; and, moreover, of the perplexity, and, as it were, mental stammering, with which the operation of ringing the changes upon these letters is, especially in unpractised minds, so apt to be attended. Sometimes, it is true, it may happen that, in addition to the general glance taken of the figure, recurrence to these letters may, for the purpose of forming a conception of this or that part of it, be found necessary. But at other times it may happen that no such recurrence will be found necessary: the need of it having been effectually superseded by the purely verbal description, by means of the general words contained in it.

A question here presents itself, as one which, by any learner in geometry, might not unaptly be put to the author of any institutional work, by means of which he was occupied in teaching himself. The directions and reasonings, the only use of which is to convey so many general ideas, why is it that for giving expression to them you have *not* (while in the case of the enunciation made of the proposition to be demonstrated you actually *have*) employed the correspondent general words? These general words, did you know where or how to find them? Then, why is it that you have not found them and produced them? With all its load of unavoidable and immoveable difficulty, is not the task heavy enough for us? Must this additional, this moveable difficulty, be left pressing on us? These same general

and only adequate words, is it then that you have *not* been able to find them? You, to whom, by so many years of study, and so often continually repeated applications to practice, the subject has been rendered so perfectly familiar,—with what degree of consistency can you entertain any such expectation as that *we*, to all of whom the subject is perfectly new, and many of whom are, in various degrees, dull or inattentive, or both, should be able to accomplish at the moment, and at every moment, a work, which our master has not been able to perform in so many years?*

Thus much will not, it is believed, be found open to dispute. The only idea which, in any case, is conveyed by the individual figure in question, as delineated in the diagram in question,—the individual figure, of which the parts are designated by the letters of reference,—is an individual one. But, except in as far as by abstraction from these individual ideas, general or specific ideas are formed, from no number of such individual diagrams, can any general ideas, applicable to any practical purpose, be deduced. This process of generalization, the learner in question, is he competent to the performance of it? If he is, then proportioned and equal to the number of these acts of generalization that he is competent to, and performs accordingly, is the stock of mathematical science which he actually lays up, at any rate, for the time. But, in any given instance, suppose a general idea thus formed, and for the moment laid up, note well the great disadvantage under which the operation is performed. No precise form of general words has the learner before him, by which this idea of his stands expressed, and by which, were he provided with it, the idea might, as it were, be anchored in his mind. If the occasion of making application of it recur with a certain degree of frequency, he will, notwithstanding the want of apt words for the expression of it, retain it in a state fit for use. But let it, for a certain length of time, be unemployed, the words which should have held it fast being wanting, the consequence is, it drops out of his mind, and as well might it never have been lodged there.

Whatsoever form of words is necessary and sufficient to the giving expression to the general idea, which the individual diagram with the letters which all along apply to it, are intended to convey,—now, suppose it, as in the case of Euclid's proposition as above-mentioned, ready provided, and extended not only to the *propositions*, but also to the *demonstrations*, and the directions by which the *preparatory additions* to the figure are described. Things being in this state, the idea from the very first presents itself to his mind, in all its generality: in the only garb and condition in which it is capable of being applied to use. If then so it is, that, from the proposition in question, demonstrations, as above included, he has succeeded in deducing any idea at all, that idea is a *general* one, an idea fit for use, it is not a mere individual idea, having for its necessary support the individual figure. In that case, employing the general words in question, or others that are equivalent to them, he will, in addressing himself either to a teacher for the purpose of proving, or to a learner for the purpose of communicating, his proficiency, find himself, on the occasion of any *line*, for instance, which, for the purpose of the demonstration, requires to be drawn, in a condition able to describe it by words designative of the relation which, when drawn, it will bear to the other parts of the figure: he will not say, draw A B, or draw A C, leaving it for the party addressed to make discovery of the place which the line, when drawn, will occupy; a discovery which, otherwise than by seeing the diagram, and thereupon copying that part of the diagram, he will, for want of the general words in question, find it impossible to make.

True it is, that without actually having given, either by word of mouth, or in writing, any such purely verbal description of it, to have framed and entertained a clear, correct, and complete conception of the proposition in question, be it what it may, is altogether possible; if it were not, scarcely perhaps would so much as a single person be found by whom, in relation to any such proposition, any such conception had ever been entertained. But not the less true is it, that by one who, upon being required, were to find himself ultimately unable to give, in relation to it, that sort of purely verbal description, no such clear, correct, and complete conception of it could really be entertained.

Of the *propositions* themselves (considered as distinct from the demonstrations and the introductory steps, as above) by *Euclid* a description of the sort in question—a purely verbal description—has, as in every instance, been actually given. But, when he comes to the introductory steps, (preparatory additions,) then it is, that, as if to save the trouble of finding for his conceptions an adequate assistance of general expressions, having given his diagram, it is to the component parts of that individual diagram, as indicated by the letters of the alphabet, that he refers us. Draw the line A B, or draw B C, says the direction that he gives us. But on what account was it that he required us to draw this line? Plainly on this account, and no other, viz. on account of a certain relation which the line so drawn would, when drawn, be found to bear to the other parts of the figure; it is only in virtue of some such relation that the lines, when drawn, can be applicable to the purpose. But, by the letters A B, or B C, is this relation in any degree expressed? Not it, indeed. That same instructive, that same *intellection-proving*,

* It is noticed, as the result of experience, that such a question would not be likely to be put; and that learners generally avoid verbal modes.—*Ed.*

and, at the same time, intellection-conveying mode of expression which he uniformly applied to his *propositions*,—i. e. the mere grammatical sentence, enunciative, in each instance, of the geometrical relation, the existence of which is thereby undertaken to be demonstrated—how happened it that he did not continue the application of it to his *demonstrations*, and the directions given for the preparatory steps? Had the question been put to him; *for despatch*, would probably have been his answer. But, *for want of knowing very well how*, would not improbably have been the more correct answer; and, at any rate, what should be not only a correct answer, but, moreover, an addition to such effect as would have been necessary to the forming a complete one. For the composition of a book of instruction upon that plan, the human mind had not, in his time, made sufficient advance. The mathematician is one sort of person; the logician is another. It is by generalization that all inventions are accomplished; most discoveries made. But generalization by wholesale, generalization upon an all-comprehensive scale, is the work of the logician: it is, by the same process, performed upon a comparatively small scale,—performed, as it were, by dribiets,—that the particular discoveries in Mechanical Philosophy, in Chemical Philosophy, and even in Mathematics, have been made. But it is one thing to make progress in a certain track; another thing to be able to give a description, a clear, and correct, and complete, and easily apprehensible, description of the progress so made in that same track.

Thus it is, that in this as in so many other parts of the field of science, infancy, under the preposterous name of *antiquity*,—infancy continues to set the law to *maturity; inexperience* to *experience*.

In regard to this gap in the mass of requisite instruction, ask for the reason of its existence; if, by the word reason, be meant a productive cause, having its root in the essential nature of the subject, no such reason will be found. But if, by the word reason, be meant a cause having its root in the nature of the human mind, there is nothing in it but what, in every part of the field of thought and action, lies constantly under our eyes.

Authority and *habit*.—In these two words, in as far as sinister interest is out of the question, may be seen the cause of all deficiencies in the system of instruction which (time for the operation not having been wanting) continue unsupplied. *Authority*,—the authority of great names: *habit*,—the habit of continuing to travel without reflection, in the track in which, with or without reflection, men have begun, or continued to travel already.

In the use of *general* terms for giving expression to the correspondent *general* relations between the correspondent sorts of figures and parts of figures, *Euclid*, the father of Geometry, went not beyond the collection of words expressive of the purely enunciative part of the discourse called a proposition; for the *demonstrative* part and the *preparatory* part he left it to the learner to deduce the general ideas from the individual objects, presented by the individual diagram, in company with the words, of which, by the reference made to it, the import was in like manner individualized. Can there be any need of doing, or so much as use in doing, that which, in the eyes of the father of the science, was not fit, or at least not necessary, to be done?

The papers in question, in and by which application was, so long ago made, of the *purely-verbal-expression-maximizing principle* to a large portion of Euclid's Elements, not being immediately accessible, an exemplification of it applied to the first proposition of these Elements, has, by the writer of these pages, been hastily formed for the purpose, and will be found in the Appendix.* To save recurrence to books, along with it is given a reprint of the same proposition as exhibited in the customary form in Mr Professor *Playfair's* Elements of that science.

Whether in any, and if in any, in what degree, the conception of the subject is facilitated by the mode here proposed, is a question, to the answering of which, an understanding matured, and in other respects not ill furnished, but by which little or no attention has happened to have been bestowed upon this branch of science, will be in a particular degree well adapted.

Mode of making the experiment, to try the utility of the proposed mode, so far as concerns facility of conception.

1. Try whether the purely verbal mode of designation is intelligible without a diagram. For this purpose, the *diagram*, as given without the letters of reference, and the diagram, as given with the letters of reference, should both be covered.

2. If it be not perfectly or readily intelligible without a diagram, uncover that diagram which has not any letter of reference.

3. If it be not perfectly or readily intelligible even then, uncover now the diagram which has the letters of reference.

As to the giving facilities to conception, by this advantage, should it in any way be found included among the effects of the proposed mode, not only in the instance of each scholar would the labour be alleviated, and expenditure of time diminished, but in a greater degree than antecedently to experience would perhaps be expected, the number of the scholars

* This "exemplification" has not been discovered among the MSS.: but the method proposed by Mr Bentham was (perhaps is) in use, to some extent, in the University of Dublin, and there is in existence a small tract, containing the proposition of the first book of Euclid demonstrated in words alone, (published in Dublin.)—*Ed.*

reaping from this part of the instruction substantial benefit would be increased.

Even in the grammar school, under the old and still subsisting mode, large according to an eminent and most amply experienced master,* is the proportion of scholars by whom, at the end of a long series of years, no efficient learning is obtained. Larger, again, by far, among those by whom, after years spent in the endeavour, on one part, to infuse learning in this shape, on the other to imbibe it, [is the proportion by whom,] no efficient stock of it is obtained.

Under the name of the Ass's Bridge, the 5th proposition, in the very first book of Euclid, is the known stumbling-block, the *ne plus ultra* to many a labouring mind.† Why? Because, to the purpose of clear conception, to the purpose of efficient instruction, the method traced out by Euclid, and followed blindfold for so many ages, is lamentably incompetent. In the Chrestomathic School, it may be presumed with some confidence, there will be no Ass's Bridge.

The Ass's Bridge having thus presented itself to view, the temptation of exhibiting this additional test of the utility of the *purely verbal-expression-maximizing* principle was too strong to be resisted. To the labour of giving expression in this mode to Euclid's first proposition, has, accordingly, been added in the Appendix, the corresponding-like labour applied to the 5th proposition, called the Ass's Bridge.‡

To what length in the field of mathematics this substitution of ordinary and unabbreviated language, to scientific and abbreviated, is in the nature of the case capable of being carried with advantage, can scarcely be determined antecedently to experiment. What is certain is, that in the details, in the actual performance of algebraical operations, i. e. on any other occasion, or for any other purpose than that of explanation, practised in the way of instruction, it cannot be carried over the whole. For in as far as pursued in detail, the system of abbreviation is essentially necessary to the performance of the operations themselves, when taken in the aggregate. But for this assistance, a long life might be consumed before more than a small part of those which have actually been performed, could be perused and understood, after their being respectively invented, not to speak of the labour expended in the course of the invention.

But while the uses of ordinary language were confined to the giving expression to *principles*, i. e. to propositions of so general and extensive a nature, as that by each of them large bundles of details, bundles more or less large and copious [might be embraced,] whether a degree of progress, considerable enough to be productive of sensible advantage, might not thus be made, is a matter to which experiment may be looked to for a determinate answer; and in the meantime the conjectures, in anticipative views taken of the subject by the learned, for a provisional one.

In proportion as in the character of *principles*, a number of these propositions, all expressed in ordinary language, are brought to view,—and laid before the reader all of them in one view,—such point of conformity and disconformity will, it may be expected, be found to have place among them, as will enable the mind to bind a number of them together into bundles, capable of being each of them designated by a term of more extensive import, these bundles into still smaller bundles, and so on: at each step of this abstractive process, the number of the bundles thus diminishing, and the extent of each thus receiving increase. To what length the nature of the case would suffer this process to be carried on, the greatest adept would scarcely venture to predict. But, that the further it were carried on, the more clear and complete would be the view thus rendered obtainable, will hardly be regarded as matter of dispute.

That, for this purpose, changes would require to be made in the stock of expression afforded by ordinary language, seems scarcely to admit of doubt: some terms might require to be added, others substituted, to that part of the ordinary language which is applicable to the purpose. But it is in the way of definition that the whole of this business might be despatched. In these definitions, in as far as the word had been already employed in different senses, the object and effect of the operation would be to fix the import: in as far as it was new, to give to it, for the first time, an import applicable to the subject. In all these cases, in the first instance, the defined word alone would be the word which would be foreign to the stock of the ordinary language: to the ordinary language would belong all the words employed in the explanation of it. True it is that, when once a word in itself new, and thence foreign to the ordinary language, had thus received its explanation, viz. in ordinary language, it then, without inconvenience, might be employed, and of necessity would be employed, in the explanations given of other such new words.

But in comparison with the perplexity produced by the introduction of an extensive system of new characters, the utmost perplexity that would be produced by the introduction of new words, supposing them to be, in a moderate degree, expressive, and at the same time elucidated, by explanations expressed in ordinary language, would be inconsiderable indeed, especially if the number of them was so insignificant as to admit of their being, in the form of a synoptic table, spread under the eye all together at one time.

* See Mr Pillans' Letter, supra, p. 61.

† In practice, this is not found to be the case.—*Ed.*

‡ This, like the former exemplification, has not been found.—*Ed*

II. *Practical-use-indication maximizing, or practical-application maximizing principle.*

Signal would be the service rendered to mankind, if, by some competent hand, a line were to be drawn between those parts in the field of Mathematics, the contents of which *are*, and those the contents of which are *not*, susceptible of practically useful application.

1. In some instances the whole contents of the field are of this useful kind, and, in respect of right practice, absolutely necessary. Such is the case, for example, with the doctrine of probabilities, so far at least as the application of it is confined to such events as, besides being actually exemplified, or liable to be exemplified, are of a nature interesting to, that is, liable to be productive of pain or pleasure to, mankind. In these instances, figure has no place. To the field of Arithmetic, deloporic or adeloporic—simple, or algebraical,—(manifestly expressive or non-manifestly expressive) —this class of instances is confined. Such, again, is the quantity added to any mass of money, or money's worth, by allowance paid for it, whether in the shape of interest or discount.

2. Another class of instances there is, in which the whole contents of the field are of this useful, and, at the same, necessary kind. The field is the field of uranological geography or topography: the field of astronomy, in as far as the mass of art and science belonging to it is applicable to the ascertainment of the extent of portions, or the relative position of single places or spots, on the earth's surface.

In this class of instances not only number but figure is a necessary object of regard. The field to which they belong lies therefore within that portion of the field of mathematics, which is common to geometry and arithmetic.

3. In another class of instances the contents of the field are, beyond question, occasionally useful, but without being constantly and in every part of it necessary. This field is the field of *Mechanics*, taken in the largest sense in which that appellation is employed.

In this field, the most general and intelligible use consists in the saving of what may be called *fumbling:* viz. experiment—first experiments or observations employed to ascertain some general matter of fact, which, by calculation alone—calculation grounded on existing experiments and observations, might, without the aid of fresh ones made on purpose, have sufficed.

How great a quantity of labour, and thereby of the matter of *wealth*, and of time,—and thereby of the matter of *life*, which might have been saved by mathematical calculation, has been wasted in fumbling, may be more easily imagined than ascertained.

In this case too the field belongs to that portion of the field of mathematics, which is common to algebra and geometry.

Between what is susceptible of practically useful application, and what is not susceptible of practically useful application, why is it that this line ought to be drawn? What is it that calls upon professional men engaged in the teaching of this branch of art and science, to take this task upon themselves?

Answer;—That persons who either cannot afford, or on any other account are not willing to bestow, any part of their time upon any parts of the field, from which no practical use can be reaped, may not, by ignorance of this distinction, be drawn into any such misapplication of time and labour. A moral transgression, though unpunishable, an injury analogous to the crime called fraudulent obtainment, or obtainment of money on false pretences, would be the act of that teacher, who, knowing that the purpose of the pupil was not to go beyond the productive part of the field, should, for want of the land-mark or warning-post in question, here called for, lead him upon the irremediably barren part of the field.

Of a proposition which, in any shape, has, as above, a physical use, the use will be found exemplified either in some branch or branches of physical art and science, i. e. of *Natural Philosophy*, as it is so commonly, though unaptly, called, or in the doctrine of probabilities. Of these branches, see a list, though not exactly a complete one, in Table I.

Without having any immediate application to any branch of physics, as above, and therefore without having any immediate use, a proposition may still have a practical use. If it has, this use may, in this latter case, be termed a preparatory use.

A proposition belonging to geometry, suppose it to be itself not susceptible of application to any branch of physics, but suppose it, at the same time, necessary to the demonstration of another which is susceptible of such application. Immediate use it has none; but it has a preparatory use.

Such preparatory use may, by any number of degrees, be removed from the immediate use. A proposition is of no use but in respect of its being necessary to the demonstration of another; that other is of no use but in respect of its being necessary to the demonstration of a third: let a series of this sort be of any length, if at the end of it we come to a proposition which has an immediate use, every proposition in the series has its use, for every one of them has a preparatory use.

In the Chrestomathic school, time will not allow of the giving admission to more than a comparatively small part of these mathematical propositions, which are not only practically true, but practically useful: much less of the giving admission to any that possess not this essential requisite.

In so far as practicable, it will, therefore, be highly useful that selection should be made.

For making the selection a principle of distinction, has already just been pointed out; and for the making application of it a process, mainly mechanical, is altogether obvious.

In relation to each of the several branches of natural science, as above, look over some work or works the most correct, and upon the whole the most complete that can be found, in which, to any part of the physical subject in question, application has been made of mathematical, and, in particular, of geometrical propositions: in as far as this has been done, the work is a work of what is called mixed mathematics. In each of these works, note under the occasions in which, and the places in which, use has been made of any proposition, beginning at least, if not ending with, those, for example, of Euclid. From them make out a list or table, headed with the names of these several propositions.

This done, in any new edition published of that elementary work [Euclid,] under the head of each proposition, make reference, if not to the several instances, at any rate to some of the most eminently useful of the instances, in which application has thus been made of it; ranging them under the head of the branch of physical science, to which they respectively belong, and referring to the work in which they have been found. So in the case of those whose use is of the preparatory kind. For labour, whether of body or mind, there exists not any more effectual sweetener than the indication of use. That branch of useful art or science is scarcely to be found, in which, for the acquisition of the instruction it affords, labour of mind so intense, or in itself so irksome, is necessary as in Mathematics.

In the existing mode, the manner of administering the instruction is pregnant with perplexity to the learner, and no such indication as above, is employed to sweeten it. In the now proposed mode, the manner in which the instruction is administered will be found much less perplexing; and, in the addition of the practical use, the labour will find its natural edulceration, the indication of the reward naturally attached to it.

*By the humble and sincere desire of rendering himself useful to mankind, by contribution made to an association which has for its object the giving extent, in every sense of the word, to useful instruction, the writer of these pages finds, and that not without very serious and unfeigned regret, that he has fallen into a sort of system which, at Edinburgh, and probably in many other seats of learning, is deemed heretical; for true it is, that such is his fortune, and, in this respect, his misfortune, that he belongs to that school to which, in 1793, the late Dr Beddoes, in 1811, the present Mr Professor Leslie, not to speak of Mr Locke, have been found to belong. To this same school it was, moreover, his good or ill fortune to belong, as from what is above stated may be suspected, many years before the work of Dr Beddoes, on this subject, was published, and perhaps before that ingenious philosopher belonged, or had even been sent, to any school.

To him it is, not a matter of exultation but of regret, not a pleasureable reflection, but a painful one, that if this his view of the matter should be found correct and useful; if, by means of institutional books, composed upon the purely-verbal-expression-maximizing principle, geometry, for example, should be found to be learned at the same time, either more easily or more thoroughly than in the present mode, all the institutional books at present existing on this subject, would be found comparatively useless, and cease to be the subjects of purchase.

That without regret, or even without displeasure, such a state of things should be contemplated by persons interested, either in respect of pecuniary matters or in respect of reputation, in the existing stock of writers on this subject, is not consistent with human nature; and if, in this instance, that line of conduct should, on the part of persons so circumstanced, be pursued, which, in all other instances, has been pursued, the object of general research will be, by what means the reputation of the idea, and thence of him by whom it was advanced, may most effectually be depressed.

But if, by considerations of this sort, men, to whom it seemed that they had anything new and useful to offer, had been induced to suppress them, no improvement would ever have been made in any part of the field of art and science. And, in the present instance, a circumstance fortunate to the heretic is, that in no case could the resentment of orthodoxy fall lighter than in his.

Of this school, in as far as concerns Mathematics, the principle or principles may thus briefly be brought to view.

Otherwise than in so far as it is applicable to physics, Mathematics (except for amusement, as chess is useful) is neither useful nor so much as true. 1. That, except as excepted, it is not useful, is a proposition which, when clearly understood, will be seen to be identical: a proposition disaffirming it would be a self-contradictory one. 2. That it is not so much as true, will, it is believed, be found, upon calm and careful reflection, to be little if anything different from an identical, proposition; a proposition contradicting it, little if anything different from a self-contradictory one.

A proposition in Mathematics, [Geometry excepted] what is it? A proposition, in which physical existences, *i. e.* bodies and portions of space are considered in respect of their quantities, and nothing else.

A proposition in Geometry, what is it? A proposition in which physical existences, as

* The remarks which follow bear the title, "All true Mathematics is Physics; or, Beddoism defended against *Edinburgh Review* for July 1812." Dr Thomas Beddoes published, in 1793, "Observations on the nature of demonstrative Evidence," in which he maintained (but by no means to the same extent as the author) the physical origin of mathematical conceptions.—*Ed.*

above, are considered in respect of their figure, and thereby in respect of their quantity, but in no other respect.

A proposition, having for its subject the geometrical figure called a sphere, is a proposition having for its subject all such bodies as can with propriety be termed spherical bodies, as likewise all such individual portions of space, as can with propriety be termed spherical spaces; and so in the case of a cone, a cube, and so forth.

In as far as any such individual portions of matter and space are actually in existence, the proposition is actually true. In as far as any such portions of matter or space may be considered as likely to come into existence, or as capable of coming into existence, it may be considered as having a sort of potential truth, which, as soon as any such portions of matter or space come into existence, would be converted into actual truth.

In point of fact, no portion, either of matter or space, such as agrees exactly with the description given by Mathematicians of the sort of figure called a sphere, ever has come into existence, (there seems reason to believe.) But, by this circumstance, though in a strict sense,—that is, to the mere purpose of absolutely correct expression,—the truth of all propositions concerning the sort of figure called a sphere is destroyed; yet, in no degree is the utility of any of them either destroyed, or so much as lessened; in no degree is the truth of them destroyed or lessened with reference to any useful purpose, with reference to any purpose, or in any sense, other than a perfectly useless one.

A general proposition which has no individual object to which it is truly applicable, is not a true one. It is no more a true proposition than an army which has no soldier in it is a true army; a fagot which has no stick in it, a true fagot.

A Mathematical proposition which has no individual portion of matter or space to which it is truly applicable, is a general proposition which has no individual object to which it is truly applicable.

Among the sorts of things which are the subjects of mathematical propositions, there is not one which contains any individual objects which, with strict truth, can be said to belong to it.

There are, however, many which, without any error attended with any practical inconvenience, may be considered as belonging to it. These then may, without practical disadvantage, and, at the same time, with great practical advantage, be considered as having individuals belonging to them; be considered, in a word, as true.

Take any body—a billiard ball, for example—that is intended to be spherical, assuredly it is not exactly spherical. Of all the geometrical propositions which have the sphere for their subject, there is not one of them that is exactly true when applied to it; but it is so near to the being spherical, that all these propositions may, without any material error, be applied to it.

Among a number of billiard balls all perfectly capable of being applied to the use for which they were designed, some will come nearer to an exactly spherical figure than others. The nearer any one comes to this figure, the nearer, in that instance, will these several propositions come to the being exactly true.

From the list of the applications, and thereby of the uses made of the several propositions of pure mathematics, the order of invention will follow as a sort of corollary. Amongst other things it may, on that occasion, be seen how, in point of fact, mathematical ideas—how all mathematical ideas—have their root in physical ones—in physical observations. The actual applications thus made to practice,—the indications thus afforded, will be pregnant with immediate practical uses. The general observations deduced as above, in the way of inference, from those observations of detail, will be but matter of curiosity and theory. Curious as it may be it will not be very easy to find the class of persons to whom it will be acceptable. To the non-mathematician it will be neither very interesting nor comprehensible. To the mathematician it will not be very acceptable. That, before any such surface as a circular one had any existence, all its radii were equal, is, in his creed, as in Montesquieu's, a fundamental article. That fluxions and equations should have had their origin in so impure a source as matter, is, to an ardent-minded mathematician, an idea no more to be endured than, by certain religionists it is, that moral evil should have no other source than physical; or, by the sentimental poet, the sentimental orator, or the hypocritical politician, it is that sympathy (whether for the individual or the particular class of the community-political body he belongs to, the nation at large, or the human race) should have so unhonoured a parent, or so despicable an antagonist, as self-regard, either in his own pure bosom, or that of any of his friends.

In the construction of the sort of Genealogical Tables here brought to view, the difference between the order of invention and the order of demonstration, must not be out of view. It is by observation made of the practical applications of which the several propositions have been found susceptible, that the order of invention in as far as it is capable of being determined, will be determined; and, for the benefit of posterity, the secrets of inventive genius brought to light. The path of genius in the intellectual world has been like that of a comet in the physical world. To the eye of the ordinary observer few marks by which it can be discovered are visible. In the spreading of this veil, love of ease concurs with love of fame, or what, in dyslogistic language,—(language, with the addition of disapprobation

attached to the practice)—is the same thing, pride and vanity concur with indolence. In these circumstances may, perhaps, be found the causes of that obscurity in which, from Euclid, through Newton, down to the present time, the works of mathematicians have been so generally involved. To display to the wondering, and not unenvious, eyes of the adept, inventions and discoveries of a man's own, in all their freshness, is an operation, not only more pleasant, but less tedious than that of endeavouring to facilitate, to the vulgar mind, the conception of discoveries that, whether they were or were not his, are already become stale. As in the order of time, so in the order of dignity and reputation, communication is preceded by invention. But, to communicate in the promptest, easiest, and most effectual manner, what has already been invented and discovered, is itself the work of inventive genius and the matter of an art;—it is a branch of logic, that commanding art, of which invention, to whatever subject applied, constitutes one branch, and no more than one.

III. *Genealogical-Table employing, or Synoptic-Filiation indicating principle.*

Viz. Of the sort of relation of which the propositions in Geometry are susceptible, in respect of use.

Immediate or preparatory; to one or other, or both, of these denominations, will be referable the use of any proposition in mathematics that has any use.

In as far as in either way, it has a use, how to point out, and, in the most satisfactory, not to say the only satisfactory, way, afford a demonstration of that use, was shown under the last head.

In as far as the use is not only preparatory but mathematical,—and, between any two propositions, of the last of which the use is ultimate, while, of the first of them, the use is, with reference to the last, preparatory, others, connected with one another in a series or chain, are interposed, each being in like manner preparatory with reference to that which stands next to it,—a *chain* or *tree* of this sort (or whatever be the sensible image employed for elucidation) will bear some resemblance to the chains or trees of which a genealogical table is composed.

The business is nothing more than to propose for consideration the composition of a table, or set of tables, in and by which these several relations may all of them stand exhibited at one view.

Of this sort of matter, what quantity will be capable of being, in a commodious manner, brought together, so as to be presented in one view, remains to be determined by experiment.

Something will depend on the application which may be found capable of being made with advantage of the principle next mentioned.

For the giving connexion to these several elementary units, use—practical use, in its several modifications, as above explained, will show itself the strongest possible cementing principle. A rope of sand is the emblem of a cluster of propositions, for none of which, be it ever so copious, use in any shape is discernible.

How to construct a Geometrical Genealogical-Filiation Table.

Of this sort of Table, the one essential property is—that the more advanced the proposition is, and thence the greater the number by which it is expressed, the greater the number of the propositions on which the demonstration of it may depend.

Thus, in the case of proposition the first, no proposition on which it has any dependence can have existence. Definitions and axioms are the only materials of which the foundation of it can be composed. In the case of proposition second, there exists one proposition, but no more than one, on which, besides definitions and axioms, it is possible for it to have dependence. In the case of proposition third, there may be two such supports, and so on throughout.

The higher the proposition in question stands in the geometrical scale thus described, the more numerous the list or string is capable of being, the list or string of propositions on which it depends.

In any tabular or synoptic exhibition, the demonstrative part, or the corresponding diagram of the proposition in question, being included in a graphical compartment of correspondent bulk and convenient form, a circle, an oval, a square, or a long square, for example;—a circle, an oval, or a pear-shaped figure, may be considered as the body of the sort of plaything by means of which Franklin drew thunder from the sky, called a *kite;* of this kite, the string of numbers which, one below another, give indication of the several sources or foundation-stones of the proposition, as above, naturally may be so disposed as to represent the tail of this kite.

The higher the place of the proposition is in this scale of *filiation* (the word descent cannot, without a sort of verbal contradiction, be employed,) the longer will naturally be this tail. If, therefore, in this Table, the propositions are ranged in horizontal rows, one above another, according to their places in the scale, the higher the proposition or kite stands, the greater is the quantity of room which, in a vertical direction will naturally be requisite to give lodgment to its tail.

In a tail of this sort, over and above the series of propositions, the axioms and definitions will require to be designated. For the designation of the propositions, convenience will require the employing of the Arabic numerals. If then, for the designation of the axioms, Roman numerals in an upright form be employed, and, for the designation of the definitions, the same numerals in a leaning

form,—upon this plan the function of designation will be performed in the most simple, and, at the same time, on the most familiar plan.

An explanation of the purpose to which these numerals are respectively applied, might constitute part of the contents of a *border*, with which a Table of this sort might and should be garnished.

As to the postulates, being but three in number, and these of perpetual recurrence, it seems questionable whether, after the first use, any repetition need be made of them; and thence, whether any particular numerals, or other instruments of designation for them need be provided.

For the composition of the border other ingredients are—a list of the definitions and another of the axioms employed in the demonstration of the several propositions included in the Table.

In the case of the definitions and the axioms, what seems to render this concomitant exhibition necessary (but not to the exclusion of the propositions) is, that in the case of the definitions and the axioms, there exist no such means of elucidation as have place in the case of the propositions, viz. by means of the reciprocal exercises afforded by the purely verbal mode of designation, in the one case, and the purely diagrammatical in the other.

In some instances the same proposition will be susceptible of demonstration, from two or more different sources. Wheresoever this multiplicity has place, the kite will have the corresponding number of tails.

As to the border, the string of axioms will be comparatively a short one: a dozen, or some such matter. For the whole number of propositions contained in the geometrical scale, be it ever so ample, this small number will suffice.

Much longer will be the number of definitions. At every considerable step it will necessarily receive increase.

The same border might and should be inserted in both of the two corresponding Filiation Tables, viz. the *verbally expressed* and the *diagrammatically expressed* one.

The degree of closeness as between proposition and proposition in the several rows, consequently the number capable of being inserted with convenience in each row, and the inequalities, if any, in the distances between proposition and proposition in each row, *i. e.* between kite and kite, (tail or tails included,) will depend upon the room, if any, necessary to be left in each inferior row for the tails belonging to the several kites, ranged in the several superior rows. For the construction of such a Table, the most convenient course, it is believed, that could be taken, would be—having settled the scale of magnitude, as determined *i. e.* by the size of the type, form the several kites separately, and then having ready a sheet of paper of the proposed size and dimensions, attach them to it in order: the mark of attachment temporary till everything is finally settled.

In respect of its contents, a Table of this sort, shall it be confined to the propositions contained in Euclid's Elements?—to the propositions contained in Euclid's works at large?—to the propositions contained in the sum of the works of the Grecian geometers?—or shall it, as far as it goes, comprise all such geometrical propositions, as in any way present themselves as susceptible of practical use? To all these questions, surely the last suggests the only natural answer, viz. that which is implicitly contained in the last of them.

By a very simple expedient in the verbally expressed Table, a distinction might be made, by a particular type, between those of modern and those of ancient date. In the elementary branch, in which no curve but the circle is introduced, let Euclid's propositions, for example, as constituting the main part of the work, be in the ordinary Roman type: propositions found in the works of other ancients might be either in the same Roman type with Euclid's, or in another Roman type of different, suppose of inferior size: if the type could not conveniently be diminished, the black letter might answer the purpose.

Another part of the above-mentioned border might be composed of references to the original works, in which the several propositions, denoted by the number by which they are designated in the Table, have been found.

In this case, as in every other, the application made of the exercises, with the place-capturing principle for their support,* will be determined by the nature of the particular object to be accomplished. Having for his guides a corresponding pair of Tables, viz. one containing the propositions (the enunciative parts) verbally expressed; the other with the same diagrammatically expressed; both of them without any of the references by which the filiation is indicated, the exercise is performed either by the *extempore* pronunciation, or by the *extempore* writing, of the references. Briefly thus: given the *kites*, required the *tails*.

By a system of exercitation thus conducted, the object to the attainment of which the process of demonstration in form is directed, would, it is believed, be not only attained, but attained in a much more perfect degree. By the form of demonstration, what is brought to view is the connexion between that individual proposition, and those on which it depends more immediately—that and nothing more. But by this system of genealogy, what is brought to view is the connexion between each such proposition and every other. In the one case, you have first one part by itself, then another part by itself, and so on; in the other case, all the parts are knit together into one connected whole.

At the outset, at any rate, an enunciative

* *Vide supra*, p. 48.

part, the preparatory part, and the demonstrative part, being distinguished as above, in the demonstrative the forms of demonstration might and should be strictly observed; in the preparative as well as the demonstrative part, each distinguishable step being carefully distinguished from every other, and for that purpose formed into a distinct paragraph. But, the mode of reasoning being once thoroughly understood, sooner or later the former, by which so much room is occupied, might, it is supposed, without prejudice to intellection, be discarded.

Scarcely in the compass of a single Table thus constructed, could any very considerable part of the field of geometry be exhibited. A number of such Tables, standing in succession, would be found requisite, any two or more of which might, upon occasion, by so simple an operation as juxtaposition, be made into one.*

IV. *Special-visible-sign-employment-maximizing—Purely-diagrammatic-expression occasionally-employing—Verbal-expression occasionally-discarding principle.*

Special sign, *special* in contradistinction to *ordinary:* special in contradistinction to the ordinary signs of which language is composed.

Arbitrary, in contradistinction to *imitative*, are, moreover, the signs to be understood to be in both cases.

By any of these special and arbitrary signs, imitation being out of the question, nothing can be intended to be expressed, which is not capable of being expressed by the ordinary signs; to the expression of which the signs of which ordinary language is composed, are not capable of being applied.

But in this case, as in every other, the labour necessary to the faculty of making use of the ordinary signs of which language is composed, has already been undergone, and the faculty acquired.

Whatsoever may be the special signs in question, in the acquisition of the faculty of making use of them, whatsoever labour requires to be employed, is so much extra labour added to that which has been expended in the acquisition of the faculty of employing the ordinary signs.

In as far as any use is made of special signs, here there is an account of profit and loss: or say rather of loss and profit: cost, the labour necessarily expended in acquiring the faculty of making use of these signs: profit, the advantage, whatever it be, derived from the application made of these signs, in lieu of, or in addition to, the ordinary signs, to the purpose in question. First in order of consideration comes the article of profit, that being the final cause, but for which the expenditure would not be made.

Profit derivable from the employing of special signs: or uses of special signs in Mathematics.

I. Exemplification, viz. employing individual signs, or assemblages of signs, to serve as examples of the general propositions which compose the matter of mathematical language, and, by that means, the more clearly and promptly to convey the general ideas of which they are intended to be the expression.

In as far, however, as it is to this use, and no other, that the assemblage of special signs in question is applied, the epithet of *unanalogous* does not belong to them. On the contrary, they are imitative. Thus, geometrical diagrams are a species of drawing: and as, in the case of a square table, the draught of the whole table, in proportion or otherwise, is an imitation of the whole table, so the diagram of a square is an imitation of the principal part of it.

II. To the head of *Abbreviation*, or say *Condensation*, will be found referable whatsoever useful effect is producible by this means.

Ordinary language is the sort of vehicle, and the only sort of vehicle, which is in possession of the employment of conveying ideas to the mind. In as far as any other sign, or set of signs, shares in this employment,—in as far as this function is performed by any special set of signs,—it is only through the medium of those ordinary signs: those ordinary signs, not the ideas themselves which they are employed to denote, are the objects immediately presented to the mind by any fresh special signs.

Unless they present spoken words, *i. e.* the sounds in question in a shorter compass than the shortest in which they can, with an equal degree of conspicuousness, be presented by the ordinary signs or characters of which written language is composed, the effect, if any, of special signs, must necessarily be to retard, not to accelerate, conception; for, first, they have to bring to view the ordinary signs, and, when they have so done, then it is

* In the six first Books of Euclid's Elements, being all that relate to plane figures to the exclusion of solids, the sum of the propositions is 231. This number might, perhaps, not be too great to be conveniently included in one Table.

In one of the latest, and it is supposed, upon the whole, most instructive of the books professing to exhibit the elements of Geometry, one book has for its title, "The Comparison of Solids." In this book, the number of propositions is twenty-one. Besides their respective mathematical and preparatory uses, many of these have their physical and immediate uses. Witness cylinders and spheres, and thereby and therein milk measures, ale measures, and oranges. Of these twenty-one, no one is to be found in the elementary work[a] of Euclid: every one, perhaps, is in some way or other, descended from its contents. Might not here be another occasion for marking the filiation of the branches contained in this useful supplement, and thereby affording indication and demonstration of the utility of the venerable original?

[a] The first six Books.—*Ed.*

that they are, in respect of promptitude, upon a par, and no more than upon a par, with those ordinary signs.

As to the first named of these uses, what is certain is, that, for a length of time, more or less considerable, it cannot take place, or so much as begin to take place. Every new sign of this kind is part and parcel of a new language: and of no new language can any part or parcel be ever learned, without a proportionable expense in the article of time. All this is so much loss. When once the portion in question of the new language has been learned, *i. e.* when between the thing meant to be signified and the new sign an association has been sufficiently formed, then, and not till then, if there be a profit, comes the profit.*

In the instance of each such sign, taken by itself, if between the thing signified and the sign there be any analogy, the closer the analogy the less will be the *cost*: the more frequently the occasion occurs for putting the sign to use, the greater will be the *profit*.

Thence, taking the whole number of the signs together, the aggregate number of the occasions in which they can be employed being given, the profit will be the greater the less the number of the signs.

In algebra, in contradistinction to, and almost to the exclusion of, geometry, has the employment thus given to this principle been most copious. Of the signs of which this language is composed, the number even absolutely taken is very small. The number of the occasions on which they are employed, being, even in a work of a very moderate scope, immense, relatively taken, its smallness is still more conspicuous.

It is, however, to the second head, to speak shortly in the way of abridgment, that, in algebra, any part of the advantages derived, from the use therein made of peculiar signs, can be referred. The effect produced by them is neither more nor less than the presenting, in a smaller compass, the same ideas as those which are produced by the corresponding portion of ordinary language. By the cross employed to signify addition, the effect is neither more nor less than that which would be produced by the word, addition, together with such other words as may be necessary to complete the sentence—the grammatical or logical proposition, for which this one simple sign is capable of being employed, and is commonly made to serve as a substitute.

Of this sort of calculation, the importance, as well as the nature, may be not uninstructively illustrated by an instance in which, by a scientific person of no mean note, ingenuity, labour, time, and expense, (typographic expense,) in no small quantity, were actually thrown away. On the publication of the then new system of chemistry, which bears the name of Lavoisier, the business was divided among three hands. The contrivance of a new set of characters, termed *chemical characters*, adapted to the new theory, being at that time regarded as constituting the subject of a necessary part of that business, was announced as having fallen exclusively to the lot of one of these three hands. Since that time, so different in many parts, as well as so much more extensive is the culture received by the field of chemistry, that even had the principle of the contrivance been good, the application given to it could no longer have continued useful, without having undergone, in every shape, such alteration as would have rendered it hardly recognisable. But it was bad in principle. The new signs were characters or signs to which every imaginable exertion was made to give what analogy could be given to them to the things signified. But had these exertions been even much more successful than they were, these special and newly published characters would never have presented to the mind, especially to the mind of a learner, the ideas of the respective chemical substances, with the same perfection, much less with the like certainty, as that with which they come presented by the corresponding set of names, as expressed by those already and commonly adopted general characters, of which ordinary written language is composed.

In the way of facility afforded to conception, whatsoever effect they were productive of was wholly on the side of disadvantage.

In respect of abbreviation or condensation, it was not productive of any advantage. For giving lodgment to each one of these signs, a receptacle of the same form for each was, as in the case of a Genealogical Table, it is believed, or, at any rate, for illustration, may be conceived to have been, provided. But within every such receptacle, the name of the substance in question, expressed in ordinary letter-press, might have been included, and in such form and size as to be altogether as conspicuous, as readily apprehensible, as the new sign, for the giving lodgment to which it was employed.

Of the notion of this mode of expression, what was the source? Imitation: imitation, without sufficient thought.

In the infancy of chemistry, when as yet she was little better than a slave to the impostor alchemy, a set of special signs were employed, for the designation of such of the metals as were then known; together with some others of the simple, or supposed simple, substances then known, or supposed to be known. But the design, in pursuance of which these characters were framed, was of a mixed character, made up of the opposite ingredients divulgation and concealment; and entertained by minds in which, in sharers of power, perpetually varying and perpetually unascertainable, credulity and imposture maintained a

* Except by means of the abbreviative and concentrative, it cannot facilitate conception more than ordinary language, of which it is the sign, does.

conjunct sway. By an effort of economy, as whimsical as it was elaborate, the same set of seven signs served for a set of chemical substances, namely, metals, and the same number of heavenly bodies at the same time; that the use might be the more profound, and the adepts, including or not including the inventor himself, the more effectually deluded.

At the same time that, by the pair of self-teaching learners, application, as above,* was made of the purely verbal expression maximizing principle, by the same persons was application made of the principle which there corresponds to and contrasts with it, viz. this same verbal expression occasionally discarding principle, or purely diagrammatical expression employing principle.

What the signs had for their immediate purpose, was to convey to the mind, by these means alone, without the use of words, a conception, in the first place, of the enunciative part of the proposition; in the next place, of the several operations which, in the preparatory part, were required to be performed; and, lastly, of the several assertions contained in so many distinct steps of the demonstrative part.

What, in relation to this head, is recollected of them, is as follows:—1. The signs employed were, or at least were endeavoured to be, made *analogous*, i. e. naturally expressive. If, for example, on the occasion of the first step in the preparatory part—on the occasion of the first operation required by it to be performed,—a line of a certain description was, at a certain part of the figure, exhibited in conformity to the enunciative part, or representation of the subject of it, required to be drawn,—in this case, immediately after this original figure or diagram, came another, in which it was copied, with the addition of the thus prescribed line, and so on for every fresh step a fresh figure.

So, again, when, on the occasion of the demonstrative part, expression came to be given to the first step, a set of marks, of which a small number was found sufficient, were employed for distinguishing those parts, whether lines or angles, which were the subjects of that part of the demonstration, from the succeeding ones; and so on, as above.

Another condition necessary to usefulness is that, taken together, the collection of signs employed should not be too bulky for use,—should not occupy so great a quantity of space as not to be capable, in a number sufficient for instruction, of being brought together into one table.

Neither was this condition, it is believed, altogether unfulfilled. In the ordinary mode of designation, a circumstance which necessitates the allotting to each figure a larger space than would otherwise be necessary, is the affording room enough for the letters of reference: these letters large enough to be clearly distinguishable, and so placed as that no doubt should exist in regard to the part which, in each instance, they were employed to designate. But in the proposed plan, these arbitrary and naturally inexpressive marks would have no place.

In some such way would the matter stand in regard to the several propositions separately taken.

In regard to the Genealogical Tables abovementioned. On this occasion, each proposition, taken by itself, being supposed to be already understood, having, by the means already mentioned, been rendered intelligible, in a Table of this sort, all that could require to be exhibited, would be the diagrams or figures representative of the *enunciative* parts of the several propositions. For showing, in relation to each subsequent proposition, what were the preceding propositions on which it is grounded, and which in the demonstrative part were accordingly referred to, nothing more would be necessary than a cypher, or cyphers, expressive of the numbers by which, in the same Table, those propositions stand respectively designated. The diagrams expressive of the several propositions being included in similar compartments, circular suppose or quadrangular, and those compartments ranged in lines descending from the top to the bottom of the Table, an equal number on each line, the eye would thus be conducted to them with instantaneous rapidity. For this purpose, the order of the numbers should, from first to last, in the whole series of the propositions, be the order of the names upon the Table. Whether in each proposition (the order of the propositions being the same as in Euclid,) to the number expressive of its place in the series, should or should not be added the two sets of numbers expressive of the book to which it belonged in Euclid, and the place of it in that book, experiment would soon determine.

In the case when the same proposition is capable of being demonstrated from any one of several sets of antecedent propositions, sets of cyphers, expressive of them, might be inserted: each set being distinguished from every other by the word *or*, or by a simple line of separation.

In respect of promptitude of conception, could any additional facility be afforded by a set of lines drawn issuing from the succeeding proposition, to the several antecedent ones, by means of which it has been or might be demonstrated? The negative seems most probable: *confusion* rather than *elucidation* presenting itself as the most probable result of a tissue or piece of network, thus irregular and thus complicated.

To the propositions that are in Euclid, shall not all such others be added, by which equally useful instruction, relative to the same class of figures, promises to be afforded, and this, too, in the same Table? Yes, unless propa-

* Vide p. 156.

gation of superstitious and delusive errors be preferred to propagation of useful knowledge. But in the character of a certificate of acknowledged truth, the authority of Euclid being naturally more extensively received than any other, propositions derived from other sources might be distinguished from those of Euclid by some mark common to them all, and immediately discernible ; suppose, for example, by different colours, (or what would be much less expensive,) by being included in somewhat smaller compartments.

That, in the instance of the pair of self-teachers above-mentioned, after a few general hints received from their distantly situated adviser, the carrying into effect these little devices was a matter of no small instruction as well as amusement, is perfectly remembered.

That, in the instance of other learners, by whom no part in the pleasure of invention would be shared, any real profit, either in the way of amusement or of instruction, would be reaped, does not absolutely follow.

One consideration, however, does present itself as promising to turn the scale in favour of the affirmative side. This is the applicability of the two correspondent and opposite modes of expression to the purpose of affording a test of intellection, and such a test as admits of the application of the place-capturing principle.—(Table II., No. 10.) The correspondent exercises will consist of two correspondent and opposite translations : one the recitative, the other the organic exercise.

In the case of a proposition taken by itself, the scholar having before him the process expressed in the purely diagrammatic mode, repeats, by the help of it, the same process in its several steps, as expressed in the purely verbal mode. In this way is performed one of the two (the simple *recitative*) exercises. At another time, having before him the process expressed in the purely verbal mode, he delineates on the spot the same process as expressed in the purely diagrammatic mode. In this way is performed the Organic Exercise.

In a similar manner might the corresponding pair of reciprocal translation exercises be grounded on a pair of *Genealogical* Geometrical Tables.

Suppose one of these Tables expressed in the purely verbal, the other in the purely diagrammatic, mode. In this case the same correspondent exercises might be performed, as have been just described.

Another exercise might have either of these Tables for its ground. The figures of reference (arithmetical numbers) by which the genealogy of the proposition is, in each instance, expressed, being suppressed or concealed for the occasion, the exercise consists in the giving an indication of that analogy, viz. either by the mere naming or writing of the numbers, by the pronouncing or writing the lines or purport of the proposition as expressed in the purely verbal mode, or by delineating it as expressed in the purely diagrammatic mode.

V. *Key-presenting, or special contrivance-indicating principle.*

Key, viz. to the expedient by which the demonstration is effected, and by which, accordingly, in many instances, the entire proposition, whether theorem or problem was first suggested.

This principle will be found applicable as well to Algebra as to Geometry.

Of the sort of intellectual instrument here in view, as applied to Geometry, the Appendix presents two specimens ; one applied to Euclid's first proposition, which is a problem, the other to his fifth proposition, which is a theorem. In both instances, this part, termed the key, forms the second of the four points exemplified in these two propositions, as expressed upon the purely verbal expression-maximizing principle.*

Of the use of this sort of instrument, the effect, it is believed, will be found to be the letting the learner into the secret, as it were, of the invention ; by showing him what, on the occasion of the invention passed in the inventor's mind.

In these two instances each individual proposition has its own key ; the key which belongs to the one, will not be found to apply exactly to the other.

But should all the propositions delivered by Euclid, together with such others as it might be found practicable and useful to add to them, come to have been exhibited upon this same proposed principle, some circumstances common to a number of them, will probably be brought to view, by means of which they will be found distinguishable, with advantage, into so many classes : and, in that case, what will probably be found is, that in addition to, or in lieu of, the keys belonging to the individual propositions, a key will be found applicable to the whole class. Out of these classes may, perhaps, be found compoundable other more extensive classes—say, perhaps, of the second order ;—each such class with its key, as before.

Of the sort of instrument of elucidation, for the designation of which the word *key* is here ventured to be employed, happily for the science and the learners, examples, even now, are not altogether wanting in the works of Mathematicians ; and, as far as concerns the purpose of instruction at least, howsoever it may be in regard to further discovery and advancement, it will scarcely be denied that the greater the number of these keys, supposing them equally well constructed, that the work affords, the better adapted it is to the purpose.

One example which, of itself, is worth a multitude, is afforded by Montucla, in his Histoire des Mathématiques, tom i., lib. iii., note B., pp. 197–201.

* This, like the other exemplifications already alluded to, has not been found among the MSS.—*Ed.*

In it the several peculiar figures, three in number, capable of being produced by the cutting of a cone, (or rather a pair of cones,) are brought together, are confronted with each other, and their principal characteristic properties, viz. those in which they agree with, and those in which they differ from, each other, are placed together in one view,—all in the compass of no more than *four*, though it must be acknowledged, closely printed quarto pages.

A circumstance which renders this example the better adapted to the present purpose is, that, on this occasion, nothing more is given than the enunciative parts of the several propositions, preceded by such definitions, no more than six in number, as were judged necessary. Total number of propositions, according to the numerical figures, no more than 21 ; though, if it be considered that, in most of them, the three species of conic sections in question are comprised, that number may, in that respect, be required to be nearly tripled.

In this explanation, use, it is true, as could not but be expected, is made of *diagrams*, for reference to which alphabetical letters are in the usual way employed : consequently, neither the purely diagrammatic mode in any part, nor the purely verbal mode of expression, except here or there are or can be employed. But to no inconsiderable extent upon the whole, sometimes for five or six lines together, the purely verbal mode is employed.

Taken together, therefore, in the hands of a liberal minded and unprejudiced institutionalist, out of these four pages, upon the plan here proposed, might be made an admirable and most instructive set of exercises, for the geometrical section of the proposed Chrestomathic School.

Few, perhaps, if any institutional books are in use, in which keys of this sort, in greater or less abundance, may not be found. In particular, wherever anything is seen in form of a note, search may be made for an implement of this kind, with considerable probability of success.

To the natural aridity of the subject, more or less of humectation may be expected to be afforded from the springs of criticism.

Neither in the case of Algebra (as above announced will this same principle, it is believed, be found inapplicable.

In the branch of mathematics called Algebra,—viz. in such problems and such only as have no direct relation to figure—in which figure is not as such taken into the account ; two sorts of operations, in themselves perfectly distinct, may be distinguished : viz. the mode of designation or expression, and the contrivance or species of investigation employed in the resolution of problems : the system of abbreviation, and the system of contrivance for the purpose of performing the several particular operations, for the facilitation of which the same system of abbreviation is throughout employed. Between these two the relation is that between the means and the end : the mode of expression the means ; the resolution of problems the end.

As to the mode of designation, the object which it has in view, the advantage which in comparison with common arithmetic it affords, may be expressed in a word, *abbreviation ;* room, labour, and time, all these precious objects are saved by it. It is a particular species of *short-hand*, differing only from the sort commonly designated by that name in two particulars. 1. In its application it is confined to that sort of discourse which has quantity for its subject. 2. Within its field of action the degree of power which it exercises is much greater than any that is exercised by ordinary short-hand. All that short-hand does, is the employing, for the giving expression to each word, strokes in less number, or more easily and quickly described, than those which are employed in ordinary hand. The mode pursued in writing before the invention of printing, and in printing itself for some time afterwards,—in a word, the system of contractions was a species of short-hand.

Multifarious as well as great are the savings made by the mode of notation employed in algebra. As far as it goes, the following may serve as a specimen.

1. In the room of a number of single words, being those of most frequent occurrence, such as those of addition, subtraction, &c., it employs so many marks in a great degree more simple.

2. Of an assemblage of figures, *i. e.* the common Arabic characters expressive of the names of numbers,—characters which of themselves constitute a species of short-hand,—of an assemblage of this sort, however long and complicated, it performs the office, by a single letter of the alphabet.

3. Where the assemblage of these abridgments of abridgments present themselves as susceptible of ulterior abridgment, of a line of any length composed of letters, with or without figures, it performs the office, it expresses the import, by means of a single letter ; and so *totics quoties*.

From this function of algebra, the other, the *efficient* it may be termed, which consists in the solution of problems, in the performance of tasks proposed, in the rendering of services requested or demanded, is, as has been shown above, altogether different. To the last mentioned the former bears the relation of a means to an end.

By means of the relation which it bears to some quantity or quantities already known, to make known some quantity which as yet is unknown,—to this one problem may be referred all problems whatsoever, to which the name of algebraical can be applied.

For the accomplishment of this purpose on different occasions, different contrivances, over and above those which consist in nothing more than an abbreviated mode of expression, have suggested themselves to persons conversant

with this art. In no instance, perhaps, certainly not in every instance, to the giving expression to these contrivances, are the modes of abridgment employed in algebra considered as a species of short-hand indispensably necessary.

As yet not even in algebraical, that abbreviated and technical language, has any mathematician, it is believed, unfolded, or so much as endeavoured to unfold, for the *boy*, what may accordingly still be called the secrets of his art.

Not even in abbreviated and technical language do we possess any such key constructed out of unabbreviated and ordinary language.

As to the abbreviative principle, algebra is not the only branch of the mathematics in which the abbreviative system or method is applicable with advantage. Though not in its whole extent, nor to anything near its whole extent, it is to a part of that extent applicable, and with like, if not altogether equal advantage to geometry. In Payne's Geometry, not to look for others, application is accordingly made of it, and with very considerable advantage.

If *abbreviation* were the only use of the function here distinguished by the appellation of abbreviative, it would follow that in the performance of the essential function everything which at present is not only customarily but exclusively expressed by the exercise of the abbreviative function is capable of being expressed without it,—may be expressed in a word in ordinary language. To any such purpose as the practice of the art, what is plain enough is, that by no such substitution could any advantage be gained; on the contrary, it would by the amount of the whole of its effect be disadvantageous. Instruction is the only purpose to which it could be made serviceable; but that to this purpose it might be rendered eminently, in a very high degree, serviceable, seems sufficiently evident.

In this case the same substitution of signs immediately expressive of general ideas, to signs immediately expressive of none but individual ones, would be the result, as has been already shown to be the result in the case of geometry; and in respect of intellection, and command of the subject, that result would be attended with the same advantages.

In this case the whole method of the art might be explained and taught,—the whole secrets of the art laid open, to an intelligent mind, without its being subjected to any part of that hard labour which must so unavoidably be bestowed upon the subject, before the signs and modes of proceeding, by means of which the abbreviation is performed, have been learned.

But supposing this done, the number of persons more or less acquainted with the principles of this art might be increased,—increased by the whole number of those who at present are repelled from it, by the formidable apparatus of magical characters now employed, by means of which the abbreviative function of it is performed. And when the principle of each distinguishable contrivance was held up to view in ordinary language, each principle characterized and fixed by an appropriate name, with a definition annexed, even the adepts themselves might, in the clearness and expressive generality of the language, find facilities according to the nature of the case, either for the invention of new contrivances, or for showing if such were the case, and as soon as it came to be the case, that the nature of the case admitted not of any others.

An observation which, it is believed, will be found general among mathematicians, is, that by the use of different inventions, contrivances, and expedients, from the number of years which even in the case of an amateur of this branch of art and science, would be necessary to carry him over the whole field of it, several years have been struck off, principally by the ingenuity of the French mathematicians. These applications of inventive genius, what then are they? To this question—and the whole field of the science cannot present a more important one—an answer might, if what is said above be correct, be given in ordinary language.

In the case of Algebra, (Fluxions included,) elucidation, if so it may be termed, though the same in respect of its end, will, in respect of the description of the means requisite to be taken for the accomplishment of that end, be somewhat different from what it has been seen to be in the case of Geometry.

In the case of Geometry, the enunciative parts of the proposition excepted, nor even they throughout the whole of the field—the language is particular, being, by the want of general terms, confined, in respect of the subject, to the individual figures and parts of figures exhibited by the individual diagrams, and designated—not by any indication given of their intrinsic and permanent relations one to another, but—by the arbitrary and unexplanatory denomination given to them by means of so many combinations of the letters of the alphabet. In this case, one great instrument of elucidation, therefore, consists in the substitution of terms expressive of general ideas, being those of so many sorts of relation, to denominations thus individual and unexpressive. But in the case of Algebra, the terms employed, abbreviated, and, to those to whom the use of them is not familiar, obscure and perplexing, are as general as it would be in the power of words—of words at length and unabbreviated, to make them. For generalizing designation, in the character of a new and as yet unknown instrument of elucidation, no room is left in Algebra.

But though of the application of the purely verbal expression employing principle the effect is not in Algebra, to add in any respect to the generality of the language, that, even in Algebra, it is capable of being made to act, and with very considerable effect, in the char-

acter of an instrument of elucidation, seems scarcely to admit of doubt.*

It consists in simply forbearing to employ the algebraic formulæ or forms, while those explanations are going on, by which the rationale of the art and science is brought to view.

In the algebraic branch of mathematics, in idea at least, two sorts of operations, as above pointed out, may be distinguished—the abbreviative or condensative, and the effective or efficient. The abbreviative are but a species of short-hand: they perform, on the occasion of discourse applied to this particular subject, though with a degree of efficiency incomparably superior, the sort of function which the characters of which short-hand is composed, in relation to discourse at large, perform. In as far as this is the case, it follows that, in the exercise of this art, every particular contrivance, which does not consist in the mere employment of this general system of abbreviation, may as effectually and intelligibly be expressed in ordinary characters, and without this particular species of short-hand, as any other subject of discourse may be expressed in these same ordinary characters, and without the use of that species of *short-hand* commonly called short-hand, the use of which is applicable to every subject of discourse.

In regard to these abbreviative contrivances, what may very well happen is, that some apply principally or exclusively to this or that subject; to the solution of this or that particular problem or group of problems; and in so far the invention of the mode of abbreviation is the invention of the mode of solving the problem, and thus the abbreviative part and the efficient part are in a manner confounded. But, at any rate, it is not in every instance that this sort of confusion has place; and, on the other hand, a number there are of these contrivances for condensation, which are employed on all occasions alike.

True it is that, on the explanation given of the several substitutions by which the condensation is performed, the characters, the instruments themselves by which it is performed, cannot but be brought to view. But, for this particular purpose, no one of them need be brought to view more than once, or some other small and limited number of times; and between this use of them for the mere purpose of explanation, and the constant use of them through the whole of every page, how great the difference cannot but be to the mind of a young scholar, is sufficiently obvious.

By one passage, or some other small number of passages, consisting of the abbreviative forms or characters, every contrivance that belongs to the head of abbreviation may be explained; and even without so much as one such assemblage of uncouth forms, every contrivance, which does not operate as an instrument of abbreviation, or in so far as it operates otherwise than as an instrument of abbreviation, may be explained.

Prodigious would be the relief thus afforded to the uninitiated juvenile learner's mind, made by the indulgence thus afforded to his love of ease.

Under the head of Language-learning, the dark spot produced by every hard word, by every word which, being derived from a foreign language, has no relative belonging to it in the vernacular language, has already been brought to view. To an uninitiated eye, a page of algebra is a surface covered almost wholly with the like dark spots.

True it is that, for the explanation of the different contrivances, words in no small number that to the learner will be new, some of them already in use, others which it may be necessary to coin for the particular purpose here proposed, would be found requisite: and these new words will be so many hard words, so many dark spots.

But no sooner would one of these new words present itself, than a definition or explanation, composed either purely of common words, or partly of common words and partly of such peculiar words as had already, in this same way, received their explanation, would be subjoined. No sooner has the dark spot made its appearance, than the requisite light will have been thrown upon it: and how much more thickly darkened a portion of discourse is by unknown characters, than even by hard words expressed in familiar characters, few but must have experienced.

In the case of Geometry, the word *key* was confined in its application to such explanations as were annexed to particular propositions, or groups of propositions, over and above such explanations as, in the case of the demonstrative and preparatory parts of the several propositions, could not but result from the translation of the individualizing modes of designation employed, in so far as diagrams are employed with letters of reference, into the general expressions of which purely verbal discourse is composed.

In the case of Algebra, every paragraph in which the use of forms and characters were abstained from, would, in so far as it were instructive, operate as a key. For it would have as its object, either the explanation of the several contrivances of *abbreviation*, or of the several contrivances whereby these instruments of condensation were applied to practice and endeavoured to be put to use. Of no other sort of matter could it be composed; for, to the solution of the several problems, unless it be, in a few instances, as above, for illustration, the use of these forms would, of course, be necessary.

* There is here a frequent incidental repetition of views already discussed in, and properly belonging to, other departments of this Essay. It was written at considerable intervals of time, and the author sometimes overlooked the fact that he had already gone over the same ground.—*Ed.*

In this case, as in that of Geometry, an additional instrument of elucidation would be afforded by the application of the use indication-prescribing principle, by the indication of the use, the practical use, derivable from the solution of the several sorts of problems, for the solution of which the Algebraic language is wont to be employed.

On this occasion it is not by any application which may be, or that has been, made of them that, in the sense here in view, they could with propriety be said to be put to *use*. Only in so far as it had been, or was capable of being made, subservient, either to some security or comfort in the business of ordinary life, whether immediately, or through the medium of this or that spot in the field of art and science, is it that the application made could with propriety be termed a *useful* one.

Take, for instance, the collection of articles intituled *Praxes*, or *Questions for Praxis*, subjoined to the English translation of Euler's Algebra. The number of them is 213. Of this number, a part more or less considerable, consist of a sort of jokes, named paradoxes, having the excitation of wonder manifestly for their effect, and perhaps for their only effect. In every one of them application is made of the Algebraic form, to the solution of some problem. But of these 213 problems, it is not from every one that, by any person, benefit in any shape, over and above the pleasure derivable from playing at this kind of game, seems capable of being received. The additional praxis, therefore, would be from this miscellaneous list to point out such as are in their nature applicable to beneficial use, and by indication of the occasion to show in what shape they are respectively capable of being put to use.

To answer the purpose of elucidation in the completest manner—understand always, with reference to the uninitiated—a key should not only have the effect of letting the reader into the heart (so to speak) of the contrivance, by which the proposed object is effected, the proposed advantage gained, but in the production of this effect the purely verbal mode of expression alone, unless it be with the sort of exception above hinted at, should be employed: the *purely verbal* mode; viz. in *Geometry*, to the exclusion of the *diagrammatic*, in Algebra to the exclusion of the *Algebraic*, characters and forms.

To what precise length it may be possible, with any degree of net advantage, to carry this principle of elucidation, which consists in the temporary exclusion of peculiar signs, is a question on which, antecedently to experience, it can never be within the reach of the most expert mathematician to pronounce. Thus much, however, may be asserted: viz. that the further the institutionalist can find means to carry on his system of instruction in this track, the greater will be the number of the learners whom he will carry with him.

To Geometry,—as it seems pretty well agreed among the learned,—to *Geometry* to the exclusion of, and in contradistinction to, *Algebra*, (including Fluxions,) is confined what may be called the *tonic* or *invigorative* use of Mathematics: the service done to mental health and strength by a sort of exercise by which the process of close reasoning is carried on, and to the performance of which close and unremitted attention is indispensable. It is in consideration of this use, that by some the Algebraic form is held in a sort of contempt, and that, in the immense class of occasions in that vast portion of the mathematical field which belongs to Geometry and Algebra in common, and on which the same conclusion may be arrived at by either track, the same problem effected in the algebraic mode is considered as done in the way of makeshift, and not productive of use or advantage in any shape, over and above what may happen to be attached to the solution of the particular problem for the solution of which it is employed.

This being admitted, although by the solution of a single problem in the algebraic mode, no such service could be rendered to the mental frame, as in manner above mentioned, may be rendered to it by the solution of the same single problem in the geometrical mode, yet by the indication of this or that particular contrivance, by means of which this or that class of problems may be solved in the algebraic mode, there seems little reason to doubt that, to the mental frame, a service might be rendered, though not exactly of the same sort, yet of a sort not to be absolutely neglected. In the Geometrical case, it is to the judgment and the attention, that the service would be rendered; in the algebraical case, it is to the conceptive and inventive faculty that the most immediate part of the service would be rendered.

The case of the uninitiated is here all along the only principal case in view. But, neither to the adepts does it seem that the mode of elucidation thus here proposed, would be altogether without its use. By the survey that would thus be made of the ground, in a point of view so new, it could scarcely happen but that in one way or other an increase of command would be acquired with reference to it, and new discoveries made in it such as otherwise, for a long time, if ever, might not have been made.

The sort of intellectual instrument, the key thus proposed, or rather the apparatus or collection of keys, would be very far from being complete, if in its purpose it did not include all the several fictions, which, in the framing of this branch of art and science, have been invented and employed.

For illustration, without looking any further, two may here be mentioned: viz., the conversion of the algebraical method into geometrical, and the contrivance, called by its

first inventor *Newton*, and from him by British mathematicians the method of *fluxions*, and by its second but not less original inventor Leibnitz, and from him by the mathematicians of all other countries, the *differential and integral calculus*.

For the explanation of these fictions, and, indeed, for the justification of the use so copiously made of them, two operations would, it should seem, require to be performed. One is, the indication of the really exemplified state of things, to which the fiction is now wont to be applied, or is considered as applicable, the other is the indication of the advantage derived from the use of this the fictitious language, in contradistinction to the language by which the state of things in question would be expressed plainly and clearly without having recourse to fiction.

1. As to the conversion of the forms of Algebra into those of Geometry, or of the algebraic mode of expression into the geometrical. If in a case in which figure has no place,—as in a case where the quantity of money to be paid or received, or given under the name of interest for the use of money during a certain time, is the subject of investigation,—the geometrical forms should be employed, or the subject of investigation, thereby represented in the character of a portion of matter or space, exhibiting a certain figure, here a fiction, is employed: figure is said to have place in a case where it really has no place.

2. In cases where the geometrical form is the form in which the subject presents itself in the first instance, and the translation which is made is a translation from this geometrical form into the algebraical, here in this case no fiction has place: here what is done may be done, and is done, without any recourse to fiction; and as to the advantage looked for from this translation, an obvious one that presents itself is the abbreviation which constitutes an essential character of the algebraic form. In the opposite species of translation: viz. that from the algebraic form into the geometrical, fiction is inseparable. Why?—because when by the supposition figure does not form part of the case, figure is stated as forming part of the case. But when the translation is from the geometrical form into the algebraical, neither in this, nor in any other shape, has fiction any place. Why?—because, though in the case as first stated, figure has place, yet if reference to the figure be not necessary to the finding the answer which is sought, to the doing what is required or proposed to be done, the particular nature of the figure, is a circumstance which, without fiction, may be neglected, and left out of the account.

So in the case of the method of fluxions, which is but a particular species of algebra distinguished by that name.

Take some question for the solution of which this new method is wont to be employed. This question, could it be solved by ordinary algebra, or could it not? If it could, then why is it that this new method is employed? i. e. what is the advantage resulting from the employment of it? if it could not, then what is the expedient which is supplied by fluxions, and which could not be supplied by algebra?

In this method a fiction is employed: a point, or a line, or a surface, is said to have kept flowing where in truth there has been no flowing in the case. With this falsehood, how is it that mathematical truth, spoken of as truth by excellence, is compatible?

What is here meant is, not that no such fictions ought to be employed, but that to the purpose and on the occasion of instruction, whenever they are employed, the necessity or the use of them should be made known.

To say that, in discourse, fictitious language ought never, on any occasion, to be employed, would be as much as to say that no discourse in the subject of which the operations, or affections, or other phenomena of the mind are included, ought ever to be held: for no ideas being ever to be found in it which have not their origin in sense, matter is the only direct subject of any portion of verbal discourse; on the occasion and for the purpose of the discourse, the mind is all along considered and spoken of as if it were a mass of matter: and it is only in the way of fiction that when applied to any operation, or affection of the mind, anything that is said is either true or false.

Yet in as far as any such fictions are employed, the necessity of them, if, as in the case just mentioned, necessary, or the use of them, if simply useful, should be made known. Why? In the first place, to prevent that perplexity which has place in the mind, in as far as truth and falsehood being confounded, that which is not true is supposed to be true; in the next place, by putting it as far as possible in the power of the learner to perceive and understand the use and value, as well as the nature of the instruction communicated to him, to lighten the burthen of the labour necessary to be employed in the acquisition of it.

When for purposes such as the above, a survey comes to be taken of the field of mathematics, another object or subject of inquiry may be, whether in mathematics in general, but more particularly in algebra, fluxions included, the language is, in every instance, as expressive as it ought to be. Antecedently to association, with a very few exceptions for the designation of anything which is to be signified, any one sign is as proper as another. But when associations have once been formed, this original indifference is at an end: for the designation of any object, some word or phrase should be looked out, which, in virtue of some meaning with which they have already been invested, serve in some measure to lead the mind to the conception of the thing meant to be designated, and in that respect are better adapted to the purpose than any words taken

at random: than any words, in short, between which and the object which is to be designated, no such relation has place.

Thence it is, that, for the idea, be the object what it may, the choice of the words employed for the designation of it, is never a matter of indifference; nor will there perhaps ever exist the case in which a number of words or phrases may not be found, all of them possessing, in respect of the designation of the object in question, so many different degrees in the scale of aptitude.

In the practice of Mathematicians, propositions of the geometrical cast, and propositions of the algebraical cast, are, to an extent which seems not to have been as yet determined, considered as interconvertible: employed indifferently, the one or the other, and upon occasion translated into each other. When, in the particular subject to which they are respectively applied, figure, although it have place, may, without inconvenience in the shape of error, or any other shape, be laid out of consideration;—in this case, instead of geometry, which, in this case, seems the more apposite and natural form, Algebra, if employed, is employed without fiction, and may, therefore, be employed without production of obscurity, without inconvenience in that shape; and, in proportion as the sought for result is arrived at with less labour and more promptitude, with clear, and peculiar, and net advantage.

But if, in a case in which figure cannot have place, as in the case of calculation concerning degrees of probability, as expressed by numbers, if any proposition be clothed in the geometrical form, so far will fiction have been employed, and with it, its never-failing accompaniment—obscurity, have been induced.

In the mind of him by whom they are employed, when the natural and individual ideas in which they have their source, and the individual or other particular objects, from which those ideas were drawn, are once lost sight of, all extensive general expressions soon become empty sounds.

In the use made of Algebra, at any rate, on the occasion of instruction given in this art to learners, the particular application which, either at the time in question, was made, or at any future time, was proposed to be made of it, should never be out of sight.

It is for want of this test of intellection—it is for want of this check, that, in books on Algebra, so many propositions, that are self-contradictory, and thereby void of all real and intelligible import, are to be found. Quantities that are *negative*, which, being interpreted, means less than nothing: and by the multiplying one of these quantities by another, that is, by adding together a certain number of these quantities,—a number of quantities equal to the product, and each of them greater than nothing, generated.

Algebraical language, even where, in the use made of it no fiction is involved, is a sort of abbreviated or short-hand language. So far, and so far only, as the abbreviated expressions which it employs, are, by him who employs them, capable of being, upon occasion, translated into propositions delivered at length, and in the form of ordinary language; so far, and so far only, as in the room of every such fiction as it employs, expressions by which nothing but the plain truth is asserted,—expressions significative, in a direct way, of those ideas for the giving expression to which the fictitious language here employed—were capable of being substituted, and accordingly are substituted; so far, and so far only, are they in the mouth or pen of him by whom they are employed, of him by whom, or of him to whom, they are addressed, anything better than empty sounds.

It is for want of all regular recurrence to these sorts of intellection, it is for want of this undiscontinued reference to unabbreviated and unsophisticated language, that algebra is in so many minds a collection of signs, unaccompanied by the things signified, of words without import, and therefore without use.

Employed on a number of different occasions, in so many different senses, and without any clear indication of the difference, or enumeration attempted to be made of these different occasions, the tissue of fictions involved in the use made of the negative sign, fills with obscurity the *field of quantity*, as the fiction of a debt where there is no debt covers with obscurity the field of commercial arrangement and commercial intercourse. See Tab I., Stage V., Book-keeping (p. 39.)

It was by an abstract consideration of the nature of the case (*i. e.* by a metaphysical view of the subject, as some mathematicians would incline to say, or a logical, as it might be more correct to say,) that this notion of the natural distinctness between the contrivances for abbreviation on the one hand, and the contrivances for the actual solution of problems, though with the assistance afforded by those abbreviative contrivances on the other, were suggested to the writer of these pages. It was with no small satisfaction that, for this same idea, he found afterwards a confirmation, and a sort of sanction, in the writings of two first-rate mathematicians, viz. a passage in Euler, adopted and quoted with applause by Carnot.—Euler, Mémoires de l'Academie de Berlin, Année 1754; Reflexions sur la Metaphysique du Calcul infinitesimal. Paris, 1813, p. 202.

Persons there are, says he, in whose view of this matter, Geometry and Algebra (la géomètrie et l'analyse) do not require many reasonings (raisonnemens); in their view, the *rules* (les regles) which these sciences prescribe to us, include already the points of knowledge (les connoissances) necessary to conduct us to the solution, so that all that we have to do is to perform the operations in

conformity to those rules, without troubling ourselves with the reasonings on which those rules are grounded. This opinion, if it were well-grounded, would be strongly in opposition to that almost general opinion, according to which Geometry and Algebra are regarded as the most appropriate instruments for cultivating the mental powers (l'esprit,) and giving exercise to the faculty of ratiocination (la faculté de raisonner.) Although the persons in question are not without a tincture of mathematical learning, yet surely they can have been but little habituated to the solution of problems in which any considerable degree of difficulty is involved; for, soon would they have perceived that the mere habit of making application of those prescribed rules, goes but a very little way towards enabling a man to resolve problems of this description; and that, before application is actually made of them, it is necessary to bestow a very serious examination upon the several particular circumstances of the problem, and on this ground to carry on reasonings of this sort in abundance (faire la-dessus quantité de raisonnemens,) before he is in a condition to apply to it those general rules, in which are comprised that class of reasonings, of which, even during the time that, occupied in the calculation, we are reaping the benefit of them, scarce any distinct perception has place in our minds. This preparation, necessary as it is that it should be before the operation of calculation is so much as begun, —this preparation it is, that requires very often a train of reasonings, longer, perhaps, than is ever requisite in any other branch of science: a train, in the carrying on of which a man has this great advantage, that he may all along make sure of their correctness, while in every other branch of science he finds himself under the frequent necessity of taking up with such reasonings as are very far from being conclusive. Moreover, the very process of calculation itself, notwithstanding that, by Algebra, the rules of it are ready made to his hands (quoique l'analyse en préserve les règles,) requires throughout to have for its support a solid body of reasoning (un raisonnement solide,) without which he is, at every turn, liable to fall into some mistakes. The algebraist, therefore, (le géomètre is the word, but it is in his algebraic, and not in his geometrical, capacity, that, on the present occasion, the mathematician is evidently meant to be brought to view); the algebraist, then, (concludes this Grand Master of the Order,) finds, on every part of the field, occasion to keep his mind in exercise by the formation of those reasonings by which alone, if the problem be a difficult one, he can be conducted to the solution of it.

Thus far this illustrious pair of mathematicians. Now these reasonings (raisonnemens) so often mentioned, and always as so many works or operations perfectly distinct from those which consist in the mere application of the algebraic formulæ, what are they? Plainly the very things for the designation of which the words, contrivances for the coming at the solution of the problem, or some such words, have all along been employed. Thus much, then, is directly asserted, viz. that the operations, which consist in the as it were mechanical application of this set of rules, which for all cases is the same, on the one hand; and, on the other hand, those which consist in the other more particular contrivances for solving the particular problem, or set of problems, in question, by the application of these same general rules, are two classes of operations perfectly distinct from each other. But, moreover, another thing which, if not directly asserted, seems all along to be implied, is, that, to one or other of these two heads, everything that is or can be done in the way of algebra is referable.

Of the descriptions given of these different contrivances and sets of contrivances, of this sort of materials it is, that, in as far as they apply to the algebraic (not to speak here of the geometric) method, all these *keys* and sets of *keys*, as employed by the hand of the mathematician, will have to be composed. But, these contrivances being in themselves thus distinct from the general formulæ, it follows that, for the explanation of them, language other than that in which these formulæ are delivered, may consequently be employed: other language, viz. (—for there is no other) that language which is in common use. And thus it is that not only to Geometry, but to Algebra, may the purely verbal mode of designation be applied, to give to the several quantities which have place in the problem, such a mode of expression, as by indicating the several relations they bear to each other, shall prepare them for being taken for the subjects of that sort of operation, which consists in the putting them in that point of view in which, by means of those relations, those quantities which at first were not known, but which it is desired to know, become known accordingly. This, when expressed in the most general terms of which it is susceptible, will, it is believed, be found to be a tolerably correct account of the sort of operation which, on each particular occasion, must proceed. No direct, and, as it were, mechanical application of the set of general rules. Of what, then, is it, that a sort of algebraic *key*, or *set of keys*, of the kind in question, must be composed? Of a system of abbreviations or directions by which it shall be shown in what manner, in the several cases to which it is applicable, this sort of preliminary tactical operation may be performed, and to the best advantage.

As these two intimately connected yet distinguishable operations, viz. the application of the use-indicating (No. II.) and that of the key-presenting principle, went on together—

the order of *invention*, i. e. the order in which the several propositions, or groups of propositions, come to be invented, would, in conjunction with the order of *demonstration*, i. e. the order in which, for the purpose of demonstration, it is either necessary or most convenient that they should be presented, be brought to light.

But in proportion as the order of invention came thus to be detected and displayed, in that same proportion would it be rendered manifest that theory was formed, and in what manner it was so formed, by abstraction, out of positive ideas; more and more general out of particulars; and, in a word, originally out of individual ones.

Supposing the whole field of Geometry, or, in a word, of Mathematics, measured and delineated upon this plan, what would, in that case, be signified by the word *understanding*, in such phrases as these, viz. he understands plain elementary geometry, he understands conic sections, or, in general, he understands the subject, would be a state of mind considerably different from that which at present is indicated by these same phrases, and accordingly, in the signification of the words learning and teaching, as applied to the same subject, the correspondent changes would be undergone.

VI. Field of Mathematics—need of a general revision of it, for the purpose of Chrestomathic instruction.

Should there be any person, in whose eyes any of the observations above hazarded afford a prospect of their being conducive, in any degree, to the wished for purpose, to that same person a general revision or survey of the whole field of the science, with a view to the same purpose, may, perhaps, present itself as a task neither altogether needless nor unpromising.

In this, as in every other track of art and science, invention and teaching what has already been invented, are very different operations; and, for the performance of them to the best advantage, talents, in some respects different, and, at any rate, different situations, will, in general, be found necessary.

To the removal of the difficulties by which, in the minds of the generality of learners, progress is most apt to be impeded, a strong and clear sense of them is at least useful, if not indispensably necessary: and the larger the possession a man has of that sort and strength of talent by which he is qualified for invention, the less strong will be the impression left by any such difficulties on his mind.

Placed on the threshold of the science, upon crossing the track of it, a little verbal inaccuracy, which, to the eyes and feet of an adept standing in the higher regions, will, like a thread of gossamer, be an object altogether imperceptible, will, in the eyes of many a learner, be, if not an insurmountable bar, a troublesome, and, for a long time, a disheartening, stumbling-block.

In this part, as in so many others of the field of art and science, dazzled, not to say blinded, by the splendour which encircles a great name, professors have scarce suffered their eyes to be opened to see anything like an imperfection in the object of their admiration; and hence it is that so long as it affects not the substance—the very vital part, of the art and science, inaccuracies by which, though imperceptible to proficients, learners are put to torture, might, if searched for by eyes wholly unprejudiced, be found, it is believed, in greater numbers than is commonly so much as suspected.

For illustration, and as far as they go, even for demonstration, the following examples, taken from each of the three great divisions of Mathematics, viz. Geometry, Algebra, and Fluxions, no one of them requiring, for the conception of it, any the smallest degree of proficiency in the science to which it belongs will, it is believed, be considered as neither irrelevant nor unsatisfactory.

Euclid, Euler, and Newton,—men of no less account than these, will each of them be seen to afford an example of the sort of relation, and hitherto imperceptible, but not less operative sort of imperfection here in view: Euclid in Geometry, Euler in Algebra, Newton in the world of his own creation, Fluxions. If in the greater number, or in all these instances, the seat of imperfection should appear to belong rather to Logic or Grammar, than to Mathematics, neither the inconvenience to the learner, nor, consequently, the demand for indication, will by this circumstance be at all diminished.

In regard to Geometry, on the occasion of the exemplifications, which have already been mentioned, and for which reference has been made to the Appendix,* three have already been brought to view.

But those which are seen are but three out of a much greater number of imperfections, real or supposed, which, in the course of the inquiry already mentioned, the pair of self-teaching learners detected or supposed themselves to have detected. Without an adequate motive no labour at all, much less any course of labour so persevering as that which was here necessary, was ever undertaken; and on this occasion, in the character of an adequate motive and efficient cause, none presented itself as being so analogous, or in all respects so promising, as the sort of triumph which, in every instance, would follow upon the supposition of success. Many of these supposed triumphs the then adviser remembers to have been occasionally reported by these two pupils, if, on the ground of a few general hints, furnished at the outset, pupils they could be called: and sometimes it was the Grecian sage, sometimes his disciple, Simpson; some-

* Vide supra, p. 159. note.

times both the one and the other, that were thus dragged, in imagination, at the tail of the audacious stripling's car. For one most lengthy and perplext proposition, viz., the enunciative part of it on the subject of proportions, Simpson, who, in his quality of modern, could be treated with the less ceremony, Simpson, it is perfectly remembered, was not only drawn and quartered, but gibbeted.

Next, as to Algebra.

A seeming paradox, not to say absurdity, in which many a mind, it is believed, contrives even now to be entangled, is the rule, according to which, the product of two negative quantities, multiplied by each other, each of them less than nothing, (for in that mystery this other is but included in part,) produce a positive quantity; yea, verily, and that altogether as great as if they had both been positive.

In the third chapter and thirty-third Article of his Algebra, Euler, when he has observed that, by the multiplication of a positive by a negative, or of a negative by a positive, quantity, the product is still negative; and therefore, if the product of two negative quantities were not positive, it would be the same with these, thinks he has made the matter sufficiently clear. That the conception remaining in the mind of this adept, after the utterance of these words, was abundantly clear, need not be doubted; and no less clear would it have been whatever other words it had on this same occasion happened to him to employ. But, as to a learner, taught by such a demonstration, the chances seem many to one that his tongue would be silenced; yet, the chances seem, at least, as many that his mind would be rather darkened than enlightened.

Fortunate it is, on this occasion, for the learner in Algebra, if, being an Englishman, it is through the medium of the translations that have been made into his own language, that he betakes himself for instruction to that celebrated work. At the end of the first volume are inserted a number of notes, some by a former translator of the work from German or Latin into French—some by the translator into English. In the second of these notes, should perseverance have carried him thus far, or fortune set him down at the place, the learner will find what light the subject admits of, thrown upon this the original darkness. Without employing the gloom of Algebraic characters to throw again their darkness upon this first light, a short passage or two, extracted from two pages, may suffice to afford to the intelligent though uninitiated, unmathematical reader, a clue which, if not immediately, will, it is believed, with the help of a little reflection, lead to a solution of the paradox.

"The taking of a negative quantity negatively destroys" (says the intelligent annotator) "the very property of negation, and is the conversion of negative into positive numbers." Of the non-conception or misconception, so apt to have place on this subject, he thus points out the cause. "Multiplication," (says he,) "has been erroneously called a compendious method of performing addition:" (which it might without impropriety be called when the quantities are both positive,) "whereas," (continues he,) "it is the taking or repeating of one given number as many times as the number by which it is to be multiplied contains units. Thus (any number multiplied by one-half) 9, for instance, multiplied by $\frac{1}{2}$, means that it is to be taken half a time;" (*i. e.* that of that same number the half is to be taken instead of the whole.) "Hence," (continues he, a little further on,) "it appears that numbers may be diminished by multiplication, as well as increased, in any given ratio, which is wholly inconsistent with the nature of addition."

Happy as the young Algebraist may have reason to think himself, if perseverance has thus carried him to the end of the first and longest of the two stages into which the road is divided, it will have been still more fortunate for him, if at the very place at which, by the obscure exposition, he has at the very threshold of the science been, as above, tormented, it has by any means happened to him to be conducted to that other spot, at which light is let into the subject, and satisfaction substituted to perplexity. True it is that, drowned in a flood of Algebra, a figure of two, being the same which is prefixt to the note, may, after the flood has been dragged, upon a close inspection be found. But, in point of fact, how stands the matter of reference? It is by the note itself that the eye was conducted to the reference in the text. By that reference it was not, nor probably ever would, have been conducted to the note.

Here belongs a practice, begun, it is believed, as well as continued, in Scotland, and but too much copied in England,—the throwing the matter of elucidation to a distance from the matter to be elucidated. The consequence is, that many, at the suggestion of indolence, refuse from first to last to go a-hunting, time after time, in quest of the light thus proffered, but, at the same time, hidden under a bushel; while others, groaning under a toil thus causelessly imposed upon them, purchase or leave unpurchased, at the humour of the moment, the light with which, without any additional expense to the writer, they might have been accommodated, without being thus made to pay for it.

Lastly, as to *fluxions:* a modification of the algebraic form,—a mode of calculating invented under that name by Newton,—under the name of the differential and integral calculus, by Leibnitz, whose denomination is employed in every language but the English.

The original work of Newton is not at present within reach. But the word employed on this occasion in English, being in all English books the same, no such suspicion can arise, as

that in the use of so elementary and radical an expression, any departure from the language of the great master can have had place.

In a logical and grammatical point of view, this word is not exactly the word which the object intended to be denoted required for the expression of it: instead of the clear idea meant to be conveyed, to an unpractised mind the idea presented is very apt to be a confused one: a confusion by which the very first steps taken on this ground are but too apt to be involved.

By a word or two of explanation, this confusion might have been effectually dispelled; but nowhere is any such explanation to be found.

The agent or operating instrument of action, and the product or result of it, in as far as the operation is effective; on every occasion both these entities are as necessary as they are distinct and distinguishable from each other. But owing to the poverty of the language, or to the want of clear discernment on the part of the generality of those who begun and of those who continue to use it, the two last of these objects are apt to be confounded under one name.

To the above examples, though in this case on particular great name, no individual mathematician can be brought to view, that no branch of mathematics may want its exemplification, may be added a source of confused conception, observable in the lowest field of mathematics, viz. arithmetic.

Square root, *cube* root: of the objects which these expressions are employed to signify, that in the head of many a student the ideas obtained remain from first to last in a state of confusion, is a proposition, the truth of which would, it is believed be, upon inquiry, but too abundantly exemplified.

Square-root, *i. e.* root of the square: just as we say, fountain-head, house-top. In a book of instruction, suppose an explanation to this effect were subjoined upon the first mention of this compound appellative, many a scholar's mind, it is believed, would be saved from a load of perplexity and confusion under which at present it has to struggle.

Or without the explanation, short and simple as it is, suppose the hyphen and no more inserted, as above, between the two elements of this compounded appellative, this, if it had not of itself afforded a complete solution of the enigma, would, in many instances, have afforded a clue to it. Accordingly sometimes, though not constantly, this simple though of itself inadequate instrument of explanation is inserted.

For want of such an explanation of the two adjuncts, viz. square and cube, thus applied, what in many a mind is at present the effect?

Square root and cube root, two different roots belonging to the same imaginary plant. Square root, as being that one of the two which is of the most frequent occurrence, a root, such as that of the common radish, which runs out into length, made square, viz. as it might be by four strokes of a knife made in proper situations and directions.

Cube root, a root of another shape, such as that for instance of a turnip radish brought into the shape of a cube or die by four such strokes as the above, with the addition of two others, viz. at the top and bottom of the radish.

Matter is infinitely divisible, matter is not infinitely divisible—both these propositions cannot be true, one of them must be true: which of them is true it is scarce possible to prove. For the present purpose, let the latter be supposed to be true; true or not true, it is rather more distinctly conceivable than the other; and for the present purpose the only one that can serve. For the present purpose, then, let it be supposed true.

On this supposition, all matter is composed of *atoms*, and all of them of the same size.

These smallest existing atoms, suppose them, all or some of them, *cubes*—so many perfect *dice*. These dice may be conceived to be composed each of them of a determinate number of particles of the same form, which though never in fact separated, may as easily be conceived to be separable and separated as if they really were so. These component particles, call them *points*: and let the number of them be exactly 512. Ranged in a column regular, eight of these points make a line; the lines being all of them *straight* and ranged in appropriate order, one above another, eight of them, each containing eight *points*, make a *surface*—a surface of a square form, such as that exhibited by a chess-board; and ranged again in a correspondent order, eight of these chess-board surfaces compose the atomic *cube* or die.

The sixty-four points first mentioned, points which thus placed in the due and correspondent order—in the order adapted to the purpose, exhibit the superficial *figure* called a square; the square composed of these sixty-four stands upon, and placed in any direction, has for each of its sides, (of which the square placed in a certain position, may be called the base,) the line composed of eight of these points. The whole atom is composed of eight of these squares, piled one upon another, constituting a *cube*, having for its base the *square* first mentioned.* The number contained in the cube is then with relation to each of the lines of each of these squares, a cube, containing eight times as many of these points as any one of the squares contains; each such square, containing eight times as many points as any one of its component lines contains.

Eight, the number of the points in each of

* Of these conceivable ultimate particles, eight ranged in proper order exhibit the figure of a line; eight such lines, containing sixty-four such particles, the figure of a square; eight such squares, containing sixty-four such lines, and 512 such particles, the figure of a cube or die.

these lines, is the cube root of 512, the whole solid composed of 512 such points, the whole number of the points contained in the solid *atom*, the form of which is, by the supposition, that of a cube or die: eight, this same number, eight, is at the same time the square root of sixty-four, which is the number of the points contained in each of the surfaces by which that *atom* is bounded; the form of each of which is by the supposition the form of a *square*.

As often as in any institutional work in mathematics an explanation of these terms square root and cube root is undertaken to be given, the figure of a square at least is, it is believed, exhibited; and for the representation of it a number of points or lines are employed.

But nowhere, it is believed, is the explanation so full as above; nor in the giving it are the points put together in such a manner as to present the idea of a cube. Yet this cube being, of all the entities in question the only one which, in a separate state has, in the nature of things, its exemplification, the ideas of a surface, a line, and a point, having, respectively, been deduced from the idea of this solid in the way of abstraction, the consequence seems to be, that when images come to be exhibited, the image of a cube ought no more to have been omitted than the image of a square.

Neither is it very distinctly explained why or how one of the surfaces by which a cube or die is bounded, comes to be considered as constituting the root of it; nor why or how one of the lines by which one of these surfaces is bounded, comes to be considered as constituting the root of that surface.

Supposing these matters to admit of explanation, the explanation it is believed will be to some such effect as this: Take a die and set it down upon a table resting on any one of its faces or surfaces—suppose that which is marked with *one* spot—then suppose the die to be a plant, that surface may naturally enough be considered as representing the root of the plant. Of any figure approaching to that of a die, true it is that no plant has ever yet been found. But of a figure approaching very nearly to that of a hemisphere, such as that which might on all sides be contained exactly within the compass of a die, of correspondent dimensions, plants have actually been found, witness a species of the genus *cactus*.

In like manner, in a vertical position, at right angles to the table, set up a *chess board*, composed, as above, of the rows of squares of which it (this square figure) is composed; the lowest, *i. e.* that which is in contact with the table, represents that boundary which in geometrical language is frequently called the base of the square; and which in the language of arithmetic, as above, may be termed the root of it, bearing, as it does, the same relation to the number of lines contained in the whole surface, as the number of lines contained in the whole surface bears to the number of lines contained in the whole solid, termed, as above, a *cube* or *die*.

Simple as the above explanation is, and useful at least as it seems to be for the obviating confused conceptions and misconceptions, such as those of which the above exemplifications may serve as a sample, no such explanation will, it is believed, be as yet to be found in any institutional book.

Unfortunately, coupled as it is with the expressions used for the designating of the other objects that are so closely related to, and inseparably connected with it, the word *root*, considering the material image which it cannot fail to present, and which if it did not present, it would be altogether insignificant and inexpressive, seems not very happily suited to the purpose.

In correspondency with the word *root*, is employed the word *power; root* being, in a certain proposition, indicative of *decrease; power*, in the same proportion of *increase*. Here, with no other difference than that between *decrease* and *increase*, the objects themselves match exactly. But the symbols that are thus employed for the designation of those same objects, very badly do they match with each other.

1. No image correspondent in any way to that which is exhibited by the word *root*, is exhibited by the word power. With the correspondent idea, for the expression of which the word *root* is employed, it has no analogy; it does not match with it: of itself neither of them has any tendency to call up to mind the other.

2. On the other hand, power has the advantage, and an indispensable one it is, of carrying the increase to any number of degrees, and consequently the length, say also the height, to any extent that can be desired.

On the other hand, when for expressing *decrease*, and thus, in the scale of magnitude, *descent*, you employ the word *root*, at the first step in the line of descent you have the *square* root; at the next, the *cube* root; but there your stock of roots, of different species of roots, each less, and running down lower than the preceding one, is at an end.

In one point of view, and *that* the main one, *power*, it is true, is not ill adapted to present the ideas that belong to the subject. The idea of power includes in it the idea of the effect produced or producible by the operation or action of that power; and the greater the quantity of power, the greater will be expected to be the quantity of the effect. Whatsoever be the number in question, by the quantity expressed by the term the *third power*, of that same number, the effect producible, be it of what nature it will, will be greater than the effect producible by the quantity expressed by the term the *second power* of that same number; taken in this point of view, of two numbers employed for giving expression to two powers of different magnitude, the greater will therefore be expressive of the greater power.

But taken in another sense,—as resulting from another of the sorts of occasions on which it is wont to be employed,—another sense, and that to many minds a more familiar one, of any increase of the number attached to the word *power*, the result will be the idea not of increase but of decrease. Apply it, for example, to statistics. What is meant by the first power in Europe? Is it not that which is capable of producing the greatest effects? What is meant by the second power in Europe? Is it not that which is not capable of producing any effects but such as will be less than those producible by the first power? and so on, the greater the number the less the power indicated by it.

Though, as above, in itself and of itself, were no correspondent and apposite idea required to be expressed along with it, *power* might, have been not altogether ill adapted to the purpose; yet this incapacity of finding its match in any other word, is such an objection to it as seems insuperable and conclusive.

Retaining the word root for giving expression to *decrease in quantity and descent in altitude*, suppose that for giving expression to *increase* and *ascent* in the same proposition, the word branch were employed. *Branches* ascending in the sky, we might have as many as powers; descending, *roots* we might have as many as *branches; roots*,—not *square* roots and *cube* roots indeed,—after which our stock of roots would be exhausted; but first roots, and second roots, and third roots, and so on, down to the centre of the earth; exactly as many as branches; for every *branch* a root, wherever a root were wanted; for every *root* a *branch*, wherever a *branch* were wanted.

The plain and standard number, neither multiplied by itself nor divided, neither increased nor diminished, shall it be root or branch, or both, or neither? Keeping still to the same figure, shall it not be trunk? Second root will then be to *trunk*, what trunk will be to second branch. In this case, as in the case of logarithms, there are points which would require to be settled.

To the use of the word *branch* an objection not unanalogous to that which, as above applied to the word power, does, it must be confessed, present itself. In the ascending series of branches, the greater the number employed in giving expression to any term in the series—in a word, to any branch,—the greater should be the effect of any portion of matter taken in that number, repeated the number of times indicated by that numerical *denomination*: the effect producible by the third branch of the number should be greater than the effect producible by the second branch of the same number and so on. But, in the case of the class of material beings, from the sensible properties of which the image is deduced; in the case of a tree, (for example,) the higher the branch is, it is not the *stronger* the more powerful, but the *weaker* the less powerful; and it is by the *greater* number that the higher branch will be presented to view; and, in particular, no branch can fail to present itself as being in a greater or less degree weaker, instead of stronger than the trunk.

Here, then, applying to the word *branch* is an objection analogous to that which we have seen applying to the word *power:* analogous to it, and perhaps equal to it.

But, when the one objection is set against the other, there remains in favour of the word *branch*, the circumstance of its being analogous, to the word *root*—the word already in use to designate in corresponding propositions the correspondent and opposite effect.

What must be confessed is, that supposing the superior aptitude of the proposed new terms, when compared with the old established terms, were ever so unquestionable, the utility of any such undertaking as that of substituting in any institutional work, or scheme of oral instruction, the new to the old, would still be very questionable. It is in the terms now in use for the designating of the ideas in question, that all the existing works on the subject stand expressed: these works could, therefore, no further be understood, than in as far as the terms here in question are understood.

But how conclusive soever this consideration may be, in the character of an objection to any such attempt as that of substituting these new terms to the old established ones, it applies not in the character of an objection, to the adding, in a scheme of instruction, to an explanation of the old, an explanation of the new. If, therefore, the ideas presented by the proposed new terms should, in any instance, be found clearer than the ideas presented by the old, here will so much new light be thrown upon the subject, without any of the inconveniences so frequently, if not constantly, attached to change.

Nor would the preferable use of the new language be altogether incompatible with the reaping the instruction contained in the books in which the old terms are employed. All along, since the days of Newton and Leibnitz, while, in the English school, the terms *fluent* and *fluxion*, with their appendages, have been employed,—by the German and French schools, for the conveyance of the same ideas, the terms integral and differential, with their appendages, have been employed.

A principle of nomenclature so inadequate—a principle by which neither multiplication nor division could be carried on more than two stages, how came it to be adopted? To what cause shall it be ascribed? Obviously enough to this, viz. the continual conversion of the algebraical and the geometrical forms into each other. In geometry, when from your point you laid down a line, when from your line you had erected your square, and on your square you had erected your solid in the form of a cube, then you found yourself at a stand,

no other ulterior dimensions did the nature of things afford. So much as to the scale of increase. So, on the other hand, in regard to roots. In the *square* you possessed a figure, of which the metaphorical root represented by any of its boundaries, might be found; in the cube you possessed another figure, for which a still deeper root, viz. the same by which the root of the square had been represented, might be found. But, the nature of things not affording anything more solid or substantial than a cube, there ended also the corresponding line of roots. So much as to the scale of decrease, for in the number called a *square* number, in other words, in the second power of that (the correspondent) number, or in the first branch of that same number, considered in the character of a *branch*, Geometry affords an image capable, in some sort, of representing it; so likewise in the number called a cube number. But, at that point the representation, and, consequently, the interconvertibility ends; at that next point you come to the third power, or the second branch of the number in question, and to *that* the stores of Geometry afford not any correspondent image.

Here, then, may perhaps be seen the cause of this obscure and imperfect portion of nomenclature. But, by the indication thus given of the cause of the imperfection, the inconvenience resulting from it is not by any means diminished; nor, therefore, the demand for the application of such remedy as the nature of the case admits of.

In the case of this science, as in the case of so many other branches of art and science, the knowledge which the artist, or man of science possesses, in relation to the subject, is derived from the several particulars of detail which belong to the subject, from the acquaintance which continual practice has given him with these several particulars. The ideas which, from these several particulars it has happened to him to derive and store his mind with, are perhaps, without exception, clear ones. On the several occasions on which these particulars have been brought to view and spoken of, spoken of in language which, in the mind of him by whom it has been employed, has all along had clear ideas for its accompaniment—the language attached to the subject by usage has, of course, been all along employed. In the mind of this artist, or man of science, by whom this current language is employed, it is all along conjoined with clear ideas. The conclusion which very naturally, however erroneously he forms in his own mind,—forms all along, as a matter of course, and in such a manner as he would move his legs in walking, almost without thinking of it—is, that in the minds of other persons, in the minds of learners, ideas similarly, if not altogether equally, clear, will be attached to this same language.

But in the minds of persons in general, and of young scholars in particular, the phrases in question have no such accompaniment; with the particulars belonging to the science they have no such already formed acquaintance. When, therefore, without sufficient warning, perhaps without any warning at all, of the impropriety of the application thus made of them, the phrases in question are by the teachers in question (through which soever of the two modes of conveying his instruction, viz. discourse scriptitiously or discourse orally delivered,) employed in the delivery of instruction in relation to the art or science, the consequence is, that, instead of ascribing to them the latent and multifarious meaning which, by long practice and acquaintance with particulars, the teacher has learned to attach to them, the meaning which he, the learner, attaches to them, is no other than that which has been attached to them by the usage of ordinary language. When, with the assurance so naturally attached to the possessor of acknowledged and undisputed infallibility, he is told that every number which is brought to view, to which the sign called the negative sign is prefixed, is expressive of a quantity which is, and exactly by so much as the figure indicates, less than nothing, the belief of the existence of an infinite number of quantities, each of them less than nothing, is thus added to his creed.

When, again, after having been required to take one of these quantities that are by so much less than nothing, and multiply it by another of these quantities that are less than nothing,—two, for example, by three—the product is composed of a number of quantities, all of them greater than nothing, viz. six in number (being exactly the same number of quantities, all greater than nothing, that would have been the result, if, instead of quantities all of them less than nothing, an equal number of quantities, all of them greater than nothing, is employed;) what is the consequence? We remain astonished and confounded. But the more astonishing the matter of science thus imbibed, the greater the glory attached in the acquisition of it; and to comfort the learner under his confusion, is the use and benefit of this glory, the glory of having, by dint of hard labour, succeeded in treasuring up in his mind, under the name of science, this mass of palpable nonsense.

A determination (suppose) is taken to substitute, on this ground, the language of simple truth for the language of scientific falsehood, and thereby to substitute light for darkness. For the production of this effect what is the course that a man will have to take? On the occasion of every sort of transaction, operation, event, or state of things, in which this sort of fictitious language is in use to be employed, he will have to bring to view the nature of the transaction, operation, event, or state of things, and, at the same time, to bring to view the effect which the supposed existence of some supposed negative quantity is productive of. Of this transaction, operation, event,

or state of things having given an indicative description, employing, in so far as susceptible of application to the subject, the terms of ordinary language, he will thereupon, in the like language, give an indication of the effect so produced by the negative quantity, as above. So far as this mode of explanation shall have been made to extend, so far, and no farther, will the science have been brought and put into that state in which it ought to be put for the instruction of the young beginner; into which it must be put before it can have been fitted for rendering more than a very small part of that quantity of service which, in its own nature, it is capable of rendering to mankind.

In what circumstances shall we look for the cause of so apparently extraordinary a phenomenon; such flagrant impropriety, inapositeness, falsity, and thence so thick a veil of factitious obscurity in the language of science? Of inappositeness, impropriety, falsity, in that science, of all others, which reckons infallibility in the number of its pretensions; of which infallibility is commonly regarded as the unquestionable and exclusive attribute?

In as far as language which, on ordinary occasions, is used in one sense, is, on the occasion of scientific instruction, used in another, an effect similar to that which, by the species of secret discourse called *cypher*, is produced in any mind which is not in possession of the *key*, is produced in the mind to which instruction in the science has lately begun to be communicated.

To him who is in possession of the key, the language of the cypher, obscure, mysterious, and perhaps nonsensical, (as to the conception of this very person it would be otherwise,) is clear, correct, and instructive. But does it ever happen to him to entertain any such expectation, that to any person who is not a possessor of that necessary instrument, it should present itself in that more satisfactory character? So soon as any such persuasion to any such effect were entertained by him, so soon would an assurance equally strong be possessed by him that the purpose for which alone the language had with so much pains been devised, was already defeated.

To the experienced instructor, the particulars which he has been accustomed to have in view on the occasion of which the technical and inapposite language in question, which, and which alone, in speaking of the subject, it has been usual to him to employ, and have employed, is the cypher: to this cypher the particulars which, on these same occasions, it has been usual for him to have in view, compose the *key*. What wonder if, among those to whom, while not yet in possession of the key, the cypher comes to be pored over, the number of those to whose minds the words of the cypher have imparted clear ideas, is comparatively so inconsiderable.

By a comparatively small number of privileged minds, to the constitution of which the subject happens to be in a peculiar degree adapted, at the end of a certain number of years thus employed, an acquaintance with the science—an acquaintance more or less clear, correct, and extensive—comes to have been attained. Attained! but how? by means of the cypher? by means of the inapposite, the ill-constructed, the fictitious language? No: but in spite of it. Instead of being left to be drawn by abstraction, like Truth out of her well, from the bottom of an ocean of perturbers, had the key been conveyed, in the first instance, and terms of compact texture constructed out of apposite, familiar, and unfictitious language, a small part of the time so unprofitably employed would have sufficed for extracting from the subject a set of conceptions much more clear, correct, and extensive, than those obtained by a process so full of perplexity and inquietude.

To no man can any truth, or set of truths, the effect of which is to prove and expose the vanity of any part of that treasure of science, real or pretended, in which he has been accustomed to place any part of his title to the expectation of distinction and respect, be naturally expected to be otherwise than unacceptable. In no better light than that of an enemy can the author of so unwelcome an importation be regarded. By the feeling of the uneasiness thus produced, the passion of anger directing itself toward the immediate author of the uneasiness, will be produced; and with it the appetite for vengeance. To the gratification of this appetite, the readiest instrument which the nature of the case will, generally speaking, be found to present, will be the imputation of ignorance: matter by which an imputation of this sort may be fixed will of course be looked out for, and never does it fail to be looked out for with a diligence correspondent to the provocation given, and the temper of the individual to whom it has been given. Ingenuity is set to work to devise by what means the dart cast at the mind may be rendered most sharp; the wound deepest and most afflictive.

But by no such artifices will the mind of a judicious reader be led astray from the view of the proffered benefit. By the means indicated, or by any other means, is the art of teaching, as applied to the branch of art and science in question, susceptible of being improved? If so, whether on the part of him by whom any useful and practically applicable means of improvement have been suggested, the marks of ignorance be more or less palpable, or more or less numerous, are questions not worth a thought.

To the man of science, in whose breast the predominant affection is not the self-regarding love of reputation and desire of intellectual fame, but the social affection of philanthropy, observations which have for their tendency, as well as their object, to put him on his guard against those different propensities which, with

more or less power and effect, operate in every human breast, will be regarded, not as an injury but as a service ; will be received, not with anger, at least not with any durable emotion of that kind, but rather with complacency and thankfulness. He will find himself thus put upon his guard against an intestine, against a latent and insidious, enemy.

On the occasion of propounding any extensive plan of useful instruction—in this, as in every other walk of useful art and science, the lover of mankind will propose to himself two main objects : the one to maximize the quantity of use capable of being derived from it, the other to maximize the facility, and thence the promptitude with which each given portion or degree of it may be rendered obtainable. *Usefulness* and *facility*, by these two words, may be expressed the main objects of his regard.

Long after these, the advancement, in as far as that is distinct from usefulness ; long after these, though still not as an object to be neglected, will the mere extension of science, that science being but a speculative one, rank in his estimation and endeavours.

VII. *Interconversion of Geometry and Algebra.*

In speaking of Geometry and Algebra—of Geometry in the first place, of Algebra in the next place—thus far it has been necessary to speak of these two objects, as if they were so many distinct branches of mathematical art and science ; one of them, and that alone, applicable to one sort of subject or occasion ; another, and that alone, to another. But, to his surprise not improbably, and to his no small annoyance certainly, the learner will sooner or later have occasion to observe, that, in point of practice, no such separation has place ; and that, for the obtaining of one and the same result, for the solution of one and the same problem, for the finding an answer to one and the same question, for the demonstrating the truth of one and the same assertion, for instance, in the way the problem in question* has been solved, both these branches of mathematical art and science have been employed at once ; and that, for the arriving at no more than one conclusion, he will have to feel his way through the two distinct sorts of labyrinths, the labyrinth constructed out of the capitals of the letterpress alphabet, or the field of geometry ; and the labyrinth constructed out of the small letters of the same alphabet, in the field of Algebra, with dots put over some of them, in the upper quarter of it, if in the part occupied by the Newtonians ; and d's put before as many of them, if in the part occupied by the Leibnitzian corps. Accordingly when, after leaving out a swarm of other lines, he has learned that, for the designation of the line which, in the first place, he is in search of, two of these capital letters have been appointed, a supposition which he will naturally be led to make is, that now he has formed with it that sort of acquaintance which will be sufficient for the purpose. Not he, indeed ; for too soon, whenever it is, for his peace, will he find it snatched out of his hands, and thrown into the algebraic mill, out of which it will not come without having stamped upon it a new name, made out of a *single* letter of the alphabet, and that a small one ; and so with regard to all the other Geometric personages, for giving names to some of which, nothing less than three, or even more than three, of these letters a-piece, will suffice.

Of so troublesome a repetition of labour, especially on a branch of the field of art and science, of which, by means of the abbreviative and condensative forms, saving of labour is acknowledged to be the grand instrument, wherein consists the use ? To what cause is the usage that has taken place in this matter to be ascribed ? To find any answer to this question, the new search that has been made in the works of mathematicians has not been attended with success.

One effect seems inseparably to follow, of course, from the very nature of the two modes; and that is, that the mode of expression which, in the geometrical mode is, by the references to the individual diagram, confined to that individual diagram, and thus reduced down (narrowed, to the minimum or maximum shall we call it of narrowness) is, in the algebraic mode, and for the opposite reason, *generalized*, or, to use an expression more conformable to the language of logicians, *universalized;* and, to this circumstance, without our being always if ever fully aware of it, may frequently, perhaps, be found the cause, not less real, how imperfectly soever perceived, of the trouble taken to translate the preparatory and demonstrative part of the proposition out of the geometrical form into the algebraic.

Then why not translate it at once into the ordinary unabbreviated language ? In answer to this question several reasons may be given, none of them unapt.

1. Of one of the most obvious of them, intimation is already conveyed by the word unabbreviated. Abbreviation is the main characteristic of the algebraic mode of notation, as distinguished from the simply arithmetical.

Applied in so many cases where it was in a prodigious degree, beneficent, habit would suffice to cause it to be applied to other cases in which the employment of it would not be attended with any such advantages.

2. Be it of what kind it may, an instrument which, after much trouble, a man has at length succeeded in rendering himself expert in the use of, he is naturally fond of playing with ; love of power and love of admiration,—both these appetites find their gratification in it.

3. By this symbolical, in contradistinction

* This seems to have been meant to follow some exemplification which has not been found among the MSS.—*Ed.*

to the *purely verbal*, mode of designation, much embarrassment and difficulty is saved; and, in lieu of a variable, an invariable mode of expression is employed. For framing the expression in the purely verbal mode, how much more effectually soever if framed by a masterly hand, instructive to the scholar at first entrance, a much fuller and clearer comprehension of the subject will commonly be necessary than every one is able to attain, as well as much more labour than every one is willing to bestow.

For the giving expression to the same matter in the purely verbal mode, it is impossible to say how many forms, all more or less different from one another, some more apt, some less apt, whether in respect of choice of words or arrangement, might be capable of being employed. Expressed in the symbolical mode, all these variants are reduced to one. To the reader, great, whatsoever be the subject, is the advantage derived in the shape of clearness of conception, from this unity and simplicity in the mode of expression; to the writer it, moreover, affords, though a different, a correspondent advantage. Reducing all styles to one, it places the most inexpert grammarian upon a level with the most expert.

APPENDIX No. IX.

Hints towards the Composition of an Elementary Treatise on Universal Grammar, on a New Principle, on which that branch of Art and Science may, it is supposed, be capable of being taught and learned with advantage and facility, towards the close of a Chrestomathic Course.

Introduction.

The purposes for which Grammar, as applied to languages other than the vernacular one, is proposed to be included in the Chrestomathic Course, have already been brought to view.*

With a view to these same purposes it is supposed, that now in the present state of the field of Art and Science, to the leading principles of what is called Universal Grammar, admission might in this same seminary be given, and that with sufficient facility and adequate practical advantage.

Of a plan of the kind in question, the general principles of Mathematics will, it is taken for granted, be universally recognised as forming a proper part. But, it is confidently anticipated, that, with the rules of particular grammar to afford explanation to them, the general principles of universal grammar will not, on the part of the student, require either more labour or a greater maturity of intellect than the general principles of Mathematics; while, on the other hand, by the more extensive command which will thus be given to him over the powers of his mind, the use derived from a given quantity of labour will, in this case, be at least equal to any that can reasonably be expected to have place in that other case.

A consideration from which this expectation has received additional strength is, that upon the plan in question, to the exposition of the leading principles of the art and science of universal grammar upon the plan in question, the exposition of a correspondent part of the principles of Logic would be necessary. Considerations of the logical cast, forming all along the basis of such considerations of the grammatical cast as would be brought to view. If, by this connexion, the access to an acquaintance with so much of the connected matter as belongs to the head of Grammar, would be clogged with difficulty and the progress retarded, here would *pro tanto* be an objection. But the notion is, that from the two branches of art and science in question, mutual light would by each other be reflected, and that by means of the conjunction, a given degree of acquaintance with both would be attained with less labour than, supposing separation practicable, would be necessary to the attainment of an equal degree of acquaintance with no more than one.

The circumstance by which, at the present time in particular, the prospect of being able in relation to this at present abstruse branch of art and science, to administer instruction on terms of hitherto unprecedented advantage, is the discovery made by Horne Tooke:—that discovery by which the relation which has place between certain till then incomprehensible parts of speech on the one part and certain of the better understood parts of speech on the other part, has been brought to view;—by which the import of certain till then incomprehensible parts of speech was made known, by showing their identity with other parts of speech, the import of which was not thus abstruse.

The explanation of this discovery of his, having been left by him in an unfinished state, may, perhaps, in some measure, have been the cause, why no new system of universal Grammar, constructed with the lights thrown on the subject by that discovery, hath as yet been given to the world. But to the purpose here in question, to any one who will be at the pains of availing himself of them, the light afforded by that discovery will, it is believed, be found quite sufficient.

Should the expectations here spoken of be sanctioned by the event, two results, one theoretical, the other practical, both of them in a more particular degree gratifying to an English heart will, it is believed, be found deducible from the branch of instruction here proposed.

The theoretical one is, that to all the purposes of discourse taken together, Latin and

* Vide supra, pp. 33, 34.

Greek not excepted, the English language is better adapted than any other language.

The practical result is, that in the seminary which, so much to the honour of this country, is at work for the training up of young persons to be sent abroad in the character of missionaries, in the hope of that glory which is to be reaped from the propagation of Christianity and civilisation among barbarous nations, by whom, when taken in the aggregate, a prodigiously diversified multitude of languages afford respectively the only medium they have through which instruction can be transmitted to them by the generosity of their intended benefactors,—an institutional treatise on the principles of universal Grammar would, if grounded on the foundation here in question, be found a useful assistant, substracting, at the same time, from the quantity of the correspondent part of such their literary labour, and at the same time in respect of strength of mind and mastery of the subject, making addition to their capacity for it.

Section I.

Of Language.

A communication made by language is either simple or complex.

It is *simple* when the matter of thought communicated by it is no more than what is contained in one proposition—one logical proposition.* *Complex*, if any more.

For the making of any communication,—in other words, for the framing a proposition, if every necessary part of it be expressed—no part of it *understood*, as the phrase is, *i. e.* left to be supplied by the person *addressed*—several parts, called words or terms, are necessary; or, at any rate, if no more than a single word be employed, and the import of an entire proposition be expressed by it, it is because, by means of a certain letter or letters, forming part of that word, an import is given to it the same as that, for the expression of which more words than one are in other cases employed,* viz. without making any addition to the sense of it.

Every complex communication is resolvable into two or more simple ones. Every complex proposition is resolvable into two or more simple ones.

Every simple proposition, if the expression given to it be complete, contains in it the import of at least three different sorts of words, the import of each of them bearing a particular relation to that of the rest.

To the import, for the expression of which three words are necessary and sufficient, if the import of any other word, having a separate import of its own, be added, the import of this additional word is expressible by, and when fully expressed, equivalent to, that of an entire proposition.

For the giving expression to the different propositions of which discourse is, or is capable of being composed, different sets of words, different sets of *sounds*, together with correspondently different sets of visible signs, employed for presenting to the sense of sight, or that of touch, the import of those sounds, with or without the sounds themselves, are employed by different portions of the human population of this earth, each set of sounds forming a separate language.

But for giving expression to all the different sorts of relations,† which, for the composition of *discourse*, i. e. of every possible assemblage of propositions, simple and complex, the sorts of words necessary and sufficient are the same in every language. These different sorts of words are what are called the *parts of speech*.

Into the import of a simple proposition of the most simple *sort* of proposition, three different sorts of words as already stated must enter. These are—

1. The name of the subject of the discourse, of the communication made by it.—

2. The name of some attribute, attributed or ascribed to the same subject.

3. The name of the copula,—the attributive copula by which the attribution is performed.

Of Language, the primary use is by means of expression to make communication of thought. By the necessity of making this communication it was, that the original demand for language was created.

Of the nature of language no clear, correct, and instructive account can be given but with reference to thought.

But the arrangement which, on this occasion, and for this purpose, is given to the materials, may have all along a view to, and be such as is prescribed by the arrangement that seems requisite to be given to the materials of language.

The origin of language being the demand created for it by the need men found themselves under of making communication of their thoughts, the next consideration is that of the modifications of which that demand is susceptible.

Here comes the inquiry, in what ways, by language in general, and by the different known languages in particular, or rather, by particular languages, and thence by language

* Example: in Latin, *sto*, and so *stes*, *stet*, &c. Of *sto*, the equivalent, in which every member of the communication has a word for the designation of it, is, *Ego sum stans*—I am standing, or in a standing posture.

† It belongs to the abstract or unapplied part of universal Grammar, to present to view the import of these several relations considered in themselves.

It belongs to the Grammar of each particular language to present to view the different forms of words, by which these relations are respectively expressed in that same language.

It belongs to the concrete, or applied part of universal Grammar, to present comparative views of the different modes in which expression is given to these same relations in different languages.

in general, satisfaction has been given to that demand.

All along it will be matter not less of instruction than of curiosity and amusement, to go back, and, in the remaining fragments, as in exuviæ of lost species of plants and animals, to observe the features of language and languages in their earliest state.

Throughout the whole field of language, two languages, as it were, run all along in a state of parallelism to each other,—the one *material*, the other *immaterial*;—the material all along the basis of the immaterial.

The same stock of words serves for each,—each word serving, or being capable of serving, in both senses;—at any rate, every word originally employed in a material sense, is capable of being employed in an immaterial sense.

Saving the class of real entities distinguished by the appellation of inferential, the entities of which the words of the immaterial language are designative, are all fictitious entities.

Fictitious entities may be distributed according to the branch of Art and Science for the purpose of which the names of them require to be employed.

Thus we have, 1. Somatic, or Somatological fictitious entities: 2. Noological fictitious entities: 3. Ethical fictitious entities.*

All language is employed in announcing the existence, absolute or conditional, past, present, or future of some event or state of things, or say of some state of things quiescent or moving, real or imaginary, *i. e.* meant to be represented as real, or meant to be represented as imaginary.

In this case, the distinction between reality and imaginariness may apply as well to the things themselves as to the state, whether of motion or rest, in which they are represented as existing.

No state of things can have been in existence but in some place and some time,—in some portion of the field of space, and in some portion of the field of time.

Place and time are, accordingly, both of them adjuncts to all existence. Existence is a field or ocean which spreads itself at once over both these subjacent fields, the field of space and the field of time.

But though, in fact, neither space nor time can, in any instance, fail to be the actual accompaniments of existence, yet, by language, expression may, on any occasion, be given to existence without being given either to place or to time, or at any rate, without being given to both.

The ideas, in the designation of which language is employed, are reducible to two heads:—1. Ideas of subjects, *i. e.* of entities, real or fictitious, considered as subjects; and, 2. Ideas of relations—of relations between subject and subject.

For the designation of ideas of relations, adjuncts, and modifications attached to the principal idea—the idea of the subject—two modes are employed in language, viz.—1. Separate accessory words; 2. Modifications of the signs of the principal idea or subject—the principal word.

For the giving an account of these different modifications of ideas, the most commodious of all languages will be that in which the greatest use is made of separate words. Why? Because, in this case, for the separate designation of each such modification, there is a separate and apposite word already provided by the language.†

The more of these separate words a language possesses, the less the demand it has for, and naturally the less the number it will have of the above-mentioned verbal modifications.

These modifications have, by Grammarians, been termed *inflections*.

In proportion as the number which it furnishes of these modifications or inflections is small, the language may be said to be a *sparingly inflected*—in the opposite case, a *copiously inflected*, language.

Section II.

Systematical Sketch of the Parts of Speech.

Under the universally applying appellation of Parts of Speech, are included the whole number of the words of which the language in question is composed, classed and denominated according to the several relations which they bear, or are capable of bearing, one to another, in the composition of a grammatical sentence.

A sentence, in the language of grammar, is not the same thing with a proposition in the language of Logic. A sentence, when all the words belonging to it are inserted, cannot contain less than an entire proposition, but it may contain any number of propositions.

The different species of relations which, for the purposes of discourse, have need of so many different classes of words for giving expression to them, are the same in all languages. The parts of speech are, therefore, the same in all languages, the scantiest and most inconveniently constructed as well as the richest and most cultivated,—the Hottentot and Chinese as well as the Greek and English.

Universal grammar is that sort of grammar which treats of those relations in so far as they are common to all languages.

When, upon a correct foundation, an all-comprehensive institute of universal grammar has once been formed, supposing it framed with that degree of skill which has been exemplified in so many particular grammars, it will serve as a common standard of comparison, and as a source of explanation for all

* See this subject at length in the immediately following tract.

† Of all languages, the language in which, for this purpose, the greatest use is made of separate words is, it is believed, the English.

languages, and as a foundation-model for the several particular grammars, which take for their respective subjects these same languages.

Without, and therefore, before, the discoveries made by Horne Tooke, no such universal grammar, it will be seen, could have been formed. By him the way has been prepared for a work of this sort; but, for the framing of it, one of the requisites has been a clear view of that logic in which, when taken in its most extended sense, grammar, even universal grammar, has its foundation; and so it has happened that no professed Grammarian seems, as yet, to have given himself this qualification.

An acquaintance with universal grammar, as above-described, will naturally be among the acquisitions to be made in a Chrestomathic school. So far from adding to, it will substract from, the quantity of labour necessary to the acquisition of a given degree of acquaintance with the particular languages therein proposed to be taught.

Words are the signs of thoughts,—proportioned only to the degree of correctness and completeness with which thoughts themselves have been conceived and arranged, can be the degree of correctness and completeness given to their respective signs.

Of speech, though the correction, extension, and improvement of thought be, and that to a prodigious degree a consequence, yet the more immediate and only universally regarded object, is but the communication of thought.

But by anything less than an entire proposition, *i. e.* the import of an entire proposition, no communication can have place. In language, therefore, the *integer* to be looked for is an entire proposition,—that which Logicians mean by the term logical proposition. Of this integer, no one part of speech, not even that which is most significant, is anything more than a fragment; and, in this respect, in the many-worded appellative, part of speech, the word *part* is instructive. By it, an intimation to look out for the integer, of which it is a part, may be considered as conveyed. A word is to a *proposition* what a *letter* is to a word.

A sentence,—in that which, by Grammarians, is meant by the word sentence,—the matter either of no more than a single proposition, or that of any number of propositions, may be contained.

Not unfrequently, by no more than a single word, the import of an entire proposition is expressed. But the case in which this happens is that in which, as to all that is not supplied by modification, as above, that omission of words, of which, at the same time, it is necessary that the import should be present to the mind, that omission which, by Grammarians, is called *ellipsis*, has place.

Of the existence of an ellipsis, or any omission, the test is this:—Look out for the words, the import of which, though the terms themselves are not inserted, is supposed to be intended to be conveyed. In so far as this is the case, then, so it is that, by the insertion of these words, no addition will appear to have been made to the sense.

Without a gap in the sense, an ellipsis can no otherwise be left than in so far as, by the nature of the subject, or of the context, *i. e.* the words of which the circumjacent proposition are composed, the import of the words omitted is suggested.

Arranged in the order of simplicity and conceptibility, and denominated by their usual names, the several parts of speech that are essentially different from one another, and not included any one of them under any other, will stand as follows:

1. Substantive. Noun-substantive.
2. Adjective. Noun-adjective.
3. Verb. Verb-substantive, called also the copula.
4. Preposition.
5. Conjunction.

If considered as distinct from all the above, and not including in itself the import of several of them, the interjection does not form a part of organized language. It is no more than part and parcel of that unorganized language which is common to man and the inferior animals.

In the above list, the word substantive must be considered as unfurnished with those several additaments and other modifications by which the relations designated by the words gender, number, and case, are expressed.

So likewise the noun-adjective.

So likewise the verb, as distinct from those by which the relations designated by the words person, number, moods, and tense, are expressed.

The pronoun-substantive will be found to coincide in its import and properties with the noun-substantive, and that as perfectly as any one noun-substantive with another common substantive, that is, the sort of relation it bears to the several other parts of speech is the same.

The pronoun-adjective will, in like manner, be found to coincide in its import and properties with the noun-adjective.

The article, whether definite or indefinite, will be found in like manner to be but a species of noun-adjective.

A part of speech is either, 1. Aplonoctic,—Simple in its import. Or, 2. Syncraticonoctic,—composite in its import.

A part of speech, simple in its import, is either, 1. Significant by itself. Or, 2. Not significant by itself.

The only part of speech which is perfectly simple in its import, and at the same time integrally significant, is the noun-substantive. The noun-substantive, not as it exists in Greek and Latin, complicated with literal modifications indicative of logical relations, such as gender, number, and case, but such as it exists in English, as in the words *man, woman, horse.*

A noun-substantive is a *name*, as in the Latin the word noun truly imports.

The entity of which it is the name, belongs either to the class of *real* entities, or to the class of fictitious entities.

Incorporeal as well as corporeal substances being included, real entities are those alone which belong to that universal class designated by the logicians by the name of substances.

Substances are divided by them into corporeal and incorporeal. Under the name of corporeal, are included all masses of matter, howsoever circumstanced in respect of form, bulk, and place.

Of corporeal substances, the existence is made known to us by sense. Of incorporeal, no otherwise than by ratiocination,—they may on that account be termed inferential.*

To the class of inferential entities belong, 1. The soul of man in a state of separation from the body. 2. God. 3. All other and inferior spiritual entities.

Substantives are either proper names or common names. A proper name is a sign by which some individual object is alone signified. A common name is a name by which some class of objects is signified.

In the order of time, the use of proper names cannot but have preceded the use of common names.

Common names cannot have been formed without a course of experience, whereby the identity or resemblance of properties or qualities, as between individual and individual, among all such individuals as belong to the class so constituted and designated, has been made known.

The import of a proper name is intelligible to the inferior animals, to all animals, for example, who for the purpose of their being fed are accustomed to be called. If it be never addressed on any other occasion, or for any other purpose, the sound by which it is called becomes, in the animal's mind, the animal's name. To the animal it is but a proper name, howsoever, to the man who on that occasion uses it, it may be a common name. To the man who, intending to give food to a cat, cries puss, puss may be a common name, and be accordingly applied to the purpose of feeding several cats at once. But to each respective cat it is but a proper name,—what each cat understands is that itself is named by it. What no cat understands is that any other cat is named by it.

Among names of fictitious entities, the foremost, and those the designation of which is of most immediate necessity to mind-expressing converse, are qualities.†

Taking the word *proposition* in its simplest acceptation, by every proposition the existence of some quality in some subject is asserted. A proposition is any portion of discourse by which the existence of some quality in some subject is asserted. The name of the substance is the noun-substantive. The name of the quality is the noun-adjective. The word by which the relation between the quality and the substance is indicated, viz. the existence of the one in the other, is by logicians called the copula.

By grammarians, on some of the occasions on which by logicians the term copula is employed, the term *verb* is employed. But it would not by any means be true to say that the word *copula*, and the word verb are synonymous,—interconvertible—indicative of precisely the same object, and nothing more. By the word *copula* no more than one single class of words is indicated, viz. the class of words by which intimation is conveyed that in the opinion of the speaker the quality named by him exists in the subject, the name of which is pronounced by him at the same time. By the word verb is indicated the cluster of objects the names of which are by grammarians put together, and spoken of as constituting all of them together but one *verb*.

The import of the word copula is the same in all languages. The import of the word verb is different in different languages. In the copiously inflected languages, it includes a much greater number of words than in the sparingly inflected languages.

In the import of the copula is included nothing more than the one idea just brought to view.

In the language of grammarians one verb is by the name of the verb-substantive distinguished from all others,—it may be termed the verb in which are contained indications of simple existence. In Latin, the verb *sum*; in English, the verb *to be*; for in Latin one of the many species of conjugates included under that complex denomination, in English another of those species of conjugates, is employed as the name of the whole aggregate.

In every other verb throughout all its modifications, to the import of the copula is added the import of some name of a quality. In the verb-substantive no such additament has place unless the objects designated by the words person, number, mood, tense, be regarded as

* According to those who agree with Bishop Berkeley, matter belongs to the class of those entities of which the existence is inferential; impressions and ideas being, in that case, the only perceptible entities. But, in the case of matter, the justness of the inference is determinable, at all times determinable by experimental proof: if of the wall opposite me, I infer the non-existence, and run that way as if there were no wall, the erroneousness of the inference will be but too plainly perceptible on my forehead; which is not the case in any one of these other instances.

† *Quality* being taken in the largest sense of which the word is susceptible, is that which, in its import, is co-extensive with the applicability of the word so much used in the Aristotelian Logic school, *predication*.

capable of being included under, and designated by, the word *quality*.*

The following are the accessory ideas of which the principal ones expressed by the several parts of speech in question must be divested. Why? *Answer.*—Because of these several accessory ideas, the several signs will be found to be equivalent to the import of so many entire propositions.

I. Noun-substantive; accessory ideas attached to it in some languages.

The ideas designated by the words, 1. Gender. 2. Number. 3. Case.†

II Noun-adjective; the same.

III. Verb. Accessory ideas attached to it, as above, in some languages.‡

1. Person, (relation had to the speaker, and the being spoken to.)

2. Number.

3. Mood or mode, which is either, 1. Absolute; or, 2. Conditional.

4. Tense, *i. e.*, the sign of time.

I. Gender. Proposition involved in the import of the termination by which gender, *i. e.* sex, is designated.

1. The *person* in question; viz. the person in the designation of whom the noun-substantive, to which the termination is attached, is employed, is of the sex thus designated,—either male or female; applied to human, and most other animated beings, the proposition thus expressed may always be true.

2. The *thing* in question is of the sex so designated. Applied to unorganized beings, this is never true; and so among organized beings, with few exceptions, if applied to vegetables. By this absurd falsehood, useless complication to a vast amount, and conception not only erroneous but pernicious to a considerable amount, are infused into the composition of the languages in which this excrescence is contained, and in particular the Latin, the Greek, and the modern languages, of which these ancient languages form respectively the main roots.

II. Number. Proposition involved in the import of the termination by which number is designated.

Objects of the same kind, more than one are meant to be indicated by the noun-substantive, to which with or without the addition of the noun-adjective, the termination in question is attached.

In the same way may be brought to view the propositions respectively indicated by the terminations or other modifications expressive of case, mood or mode, and tense.

Two cases there are, in and by the import of which no such adscititious and accessory idea is necessarily involved. There are, 1. The nominative. 2. The accusative In these cases there is not any proposition of the import of which the designation is added to that of the import of the noun, to which the termination, or other modification, is attached.

Those in the instances of which there is always some proposition, of the import of which the designation is always involved in that of the termination in question, are, 1. The genitive. 2. The dative. 3. The ablative.

In certain sparingly inflected languages, the import of the genitive is indeed expressed by a termination. But in those same languages it is in every instance expressed also by a proposition.

In every language in which it has place, the substitution made of terminations or other inseparable modifications to separate words, such, for example, as prepositions, is, on several accounts, a great blemish. 1. It is a source of prodigious complication,—the whole of it useless. 2. It is a most copious source of ambiguity; one such modification being in these copiously inflected languages applied of necessity to convey indiscriminately a multitude of different imports, which being essentially different, present a correspondently urgent demand for these instruments of distinction, of which so correct and complete a stock is afforded by the sparingly inflected languages.

3. From the multitude of these separate adjuncts which in the sparingly inflected languages are capable of being conjoined with the same principal part of speech, and the multitude of the changes capable of being rung upon them, by arranging them in different orders, may be seen a copious source of energy, variety, and thence of beauty, of which the copiously inflected languages are not susceptible.

Section III.

Properties Desirable in Language.

The properties desirable in the case of any particular language will be correspondent to, and dependent on, the properties desirable in all language or discourse taken in the aggregate.

Different properties are in different degrees desirable in a human discourse on different

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* A sign designative of present time, is it to be considered as designative of a relation? Is not the present the standard of all relations of time? The copula, it should seem, must be considered as including the designation of present time, unless in so far as intimation is given of the contrary.

† In the copiously inflected languages, (*ex. gr.* Greek, Latin, Sclavonian, and their derivatives,) all these three accessory ideas are all of them distinguished by terminations, letters, or combinations of letters, added or substituted to those expressive of the principal object In the sparingly inflected, for example: Gender, not; number, yes; case, the Genitive, and no other.

‡ In the Russian, a dialect of the Sclavonian, instances are not wanting in which, not only the noun, but the verb also, is encumbered with variations of termination indicative of sex.

occasions; the properties desirable in a mass of discourse will, in some degree, as to some of them, depend on the nature of the discourse, that is, on the sort of end which it has in view, and the occasion on which,—the state of things, —the conjuncture in which it is uttered.

The properties desirable in language in general will then be the sum of all the properties which can be desirable in it, on the sum of all the different occasions that are capable of having place.

One all-comprehensive property may, therefore, be stated as desirable in any particular language, viz. the capacity of being, according to the nature of each occasion, endowed with all the several properties which on that particular occasion are desirable in language,—would be desired by, would be serviceable to, any and every person who on that occasion should have need to employ the faculty of discourse.

Properties of the first order, or primary properties,—properties of the second order, or secondary properties; under these different heads may be ranked all the several properties desirable in language or discourse taken at large.

By properties of the first order, understand all such properties as in a direct way are respectively conducive to one or other of all the several sorts of ends, to the accomplishment of which language is in any part of it, on any occasion capable of being employed and directed; and which, supposing them possessed, need not for that purpose the intervention or addition of any other properties.

By properties of the second order, understand such properties as are indeed conducive to the same ends, but no farther, nor any otherwise than as being respectively contributory to the endowing of the language with one or more of the properties above designated and distinguished by the appellation of properties of the first order.

The several properties of the first order which, with reference to all ends, and on all occasions taken together, are desirable in language, may be thus enumerated :—

1. Clearness. 2. Correctness. 3. Copiousness. 4. Completeness. 5. Non-redundance. 6. Conciseness. 7. Pronounciability. 8. Melodiousness. 9. Discibility. 10. Docibility. 11. Meliorability. 12 Impressiveness. 13. Dignity. 14. Patheticalness.

The several properties of the second order, which in respect of their conduciveness to the same ends, but through the medium each of them of one or more of the particulars standing in the above list of primary properties, are desirable in language, may be thus enumerated.

1. The relations expressed by it, expressed as much as may be by distinct words in contradistinction to modifications of other words.

In proportion as it is endowed with this property, a language may be termed, a sparingly inflected language.

A word being assumed as the basis or root of these several modifications, they will consist either of additions to, substractions from, or changes of some one or more of the letters of the fundamental or radical word.

These may be made, 1. At the beginning. 2 At the end. 3 At any intermediate part.

All such modifications may be termed *inflections*, in proportion to the multitude of these modifications, it may be called a copiously inflected language §

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* Here the MS. terminates with this notandum. —"Another secondary property,—Affording facility to the construction of composite words. State the use of composite words."