Chapter XII.

Of The Logic Of Practice, Or Art; Including Morality And Policy.

§ 1. In the preceding chapters we have endeavored to characterize the present state of those among the branches of knowledge called Moral, which are sciences in the only proper sense of the term, that is, inquiries into the course of nature. It is customary, however, to include under the term moral knowledge, and even (though improperly) under that of moral science, an inquiry the results of which do not express themselves in the indicative, but in the imperative mood, or in periphrases equivalent to it; what is called the knowledge of duties; practical ethics, or morality.

Now, the imperative mood is the characteristic of art, as distinguished from science. Whatever speaks in rules, or precepts, not in assertions respecting matters of fact, is art; and ethics, or morality, is properly a portion of the art corresponding to the sciences of human nature and society.(287)

The Method, therefore, of Ethics, can be no other than that of Art, or Practice, in general; and the portion yet uncompleted of the task which we proposed to ourselves in the concluding Book, is to characterize the general Method of Art, as distinguished from Science.

§ 2. In all branches of practical business there are cases in which individuals are bound to conform their practice to a pre-established rule, while there are others in which it is part of their task to find or construct the rule by which they are to govern their conduct. The first, for example, is the case of a judge, under a definite written code. The judge is not called upon to determine what course would be intrinsically the most advisable in the particular case in hand, but only within what rule of law it falls; what the legislature has ordained to be done in the kind of case, and must therefore be presumed to have intended in the individual case. The method must here be wholly and exclusively one of ratiocination, or syllogism; and the process is obviously, what in our analysis of the syllogism we showed that all ratiocination is, namely the interpretation of a formula.

In order that our illustration of the opposite case may be taken from the same class of subjects as the former, we will suppose, in contrast with the situation of the judge, the position of the legislator. As the judge has laws for his guidance, so the legislator has rules, and maxims of policy; but it would be a manifest error to suppose that the legislator is bound by these maxims in the same manner as the judge is bound by the laws, and that all he has to do is to argue down from them to the particular case, as the judge does from the laws. The legislator is bound to take into consideration the reasons or grounds of the maxim; the judge has nothing to do with those of the law, except so far as a consideration of them may throw light upon the intention of the law-maker, where his words have left it doubtful. To the judge, the rule, once positively ascertained, is final; but the legislator, or other practitioner, who goes by rules rather than by their reasons, like the old-fashioned German tacticians who were vanquished by Napoleon, or the physician who preferred that his patients should die by rule rather than recover contrary to it, is rightly judged to be a mere pedant, and the slave of his formulas.

Now, the reasons of a maxim of policy, or of any other rule of art, can be no other than the theorems of the corresponding science.

The relation in which rules of art stand to doctrines of science may be thus characterized. The art proposes to itself an end to be attained, defines the end, and hands it over to the science. The science receives it, considers it as a phenomenon or effect to be studied, and having investigated its causes and conditions, sends it back to art with a theorem of the combination of circumstances by which it could be produced. Art then examines these combinations of circumstances, and according as any of them are or are not in human power, pronounces the end attainable or not. The only one of the premises, therefore, which Art supplies, is the original major premise, which asserts that the attainment of the given end is desirable. Science then lends to Art the proposition (obtained by a series of inductions or of deductions) that the performance of certain

actions will attain the end. From these premises Art concludes that the performance of these actions is desirable, and finding it also practicable, converts the theorem into a rule or precept.

§ 3. It deserves particular notice, that the theorem or speculative truth is not ripe for being turned into a precept, until the whole, and not a part merely, of the operation which belongs to science, has been performed. Suppose that we have completed the scientific process only up to a certain point; have discovered that a particular cause will produce the desired effect, but have not ascertained all the negative conditions which are necessary, that is, all the circumstances which, if present, would prevent its production. If, in this imperfect state of the scientific theory, we attempt to frame a rule of art, we perform that operation prematurely. Whenever any counteracting cause, overlooked by the theorem, takes place, the rule will be at fault; we shall employ the means and the end will not follow. No arguing from or about the rule itself will then help us through the difficulty; there is nothing for it but to turn back and finish the scientific process which should have preceded the formation of the rule. We must re-open the investigation to inquire into the remainder of the conditions on which the effect depends; and only after we have ascertained the whole of these are we prepared to transform the completed law of the effect into a precept, in which those circumstances or combinations of circumstances which the science exhibits as conditions are prescribed as means.

It is true that, for the sake of convenience, rules must be formed from something less than this ideally perfect theory: in the first place, because the theory can seldom be made ideally perfect; and next, because, if all the counteracting contingencies, whether of frequent or of rare occurrence, were included, the rules would be too cumbrous to be apprehended and remembered by ordinary capacities, on the common occasions of life. The rules of art do not attempt to comprise more conditions than require to be attended to in ordinary cases; and are therefore always imperfect. In the manual arts, where the requisite conditions are not numerous, and where those which the rules do not specify are generally either plain to common observation or speedily learned from practice, rules may often be safely acted on by persons who know nothing more than the rule. But in the complicated affairs of life, and still more in those of states and societies, rules can not be relied on, without constantly referring back to the scientific laws on which they are founded. To know what are the practical contingencies which require a modification of the rule, or which are altogether exceptions to it, is to know what combinations of circumstances would interfere with, or entirely counteract, the consequences of those laws; and this can only be learned by a reference to the theoretic grounds of the rule.

By a wise practitioner, therefore, rules of conduct will only be considered as provisional. Being made for the most numerous cases, or for those of most ordinary occurrence, they point out the manner in which it will be least perilous to act, where time or means do not exist for analyzing the actual circumstances of the case, or where we can not trust our judgment in estimating them. But they do not at all supersede the propriety of going through, when circumstances permit, the scientific process requisite for framing a rule from the data of the particular case before us. At the same time, the common rule may very properly serve as an admonition that a certain mode of action has been found by ourselves and others to be well adapted to the cases of most common occurrence; so that if it be unsuitable to the case in hand, the reason of its being so will be likely to arise from some unusual circumstance.

§ 4. The error is therefore apparent of those who would deduce the line of conduct proper to particular cases from supposed universal practical maxims, overlooking the necessity of constantly referring back to the principles of the speculative science, in order to be sure of attaining even the specific end which the rules have in view. How much greater still, then, must the error be, of setting up such unbending principles, not merely as universal rules for attaining a given end, but as rules of conduct generally, without regard to the possibility, not only that some modifying cause may prevent the attainment of the given end by the means which the rule prescribes, but that success itself may conflict with some other end, which may possibly chance to be more desirable.

This is the habitual error of many of the political speculators whom I have characterized as the geometrical school; especially in France, where ratiocination from rules of practice forms the staple commodity of

journalism and political oratory--a misapprehension of the functions of Deduction which has brought much discredit, in the estimation of other countries, upon the spirit of generalization so honorably characteristic of the French mind. The commonplaces of politics in France are large and sweeping practical maxims, from which, as ultimate premises, men reason downward to particular applications; and this they call being logical and consistent. For instance, they are perpetually arguing that such and such a measure ought to be adopted, because it is a consequence of the principle on which the form of government is founded; of the principle of legitimacy, or the principle of the sovereignty of the people. To which it may be answered, that if these be really practical principles, they must rest on speculative grounds; the sovereignty of the people, for example, must be a right foundation for government, because a government thus constituted tends to produce certain beneficial effects. Inasmuch, however, as no government produces all possible beneficial effects, but all are attended with more or fewer inconveniences, and since these can not usually be combated by means drawn from the very causes which produce them, it would be often a much stronger recommendation of some practical arrangement, that it does not follow from what is called the general principle of the government, than that it does. Under a government of legitimacy, the presumption is far rather in favor of institutions of popular origin; and in a democracy, in favor of arrangements tending to check the impetus of popular will. The line of augmentation so commonly mistaken in France for political philosophy, tends to the practical conclusion that we should exert our utmost efforts to aggravate, instead of alleviating, whatever are the characteristic imperfections of the system of institutions which we prefer, or under which we happen to live.

§ 5. The grounds, then, of every rule of art, are to be found in the theorems of science. An art, or a body of art, consists of the rules, together with as much of the speculative propositions as comprises the justification of those rules. The complete art of any matter includes a selection of such a portion from the science as is necessary to show on what conditions the effects, which the art aims at producing, depend. And Art in general, consists of the truths of Science, arranged in the most convenient order for practice, instead of the order which is the most convenient for thought. Science groups and arranges its truths, so as to enable us to take in at one view as much as possible of the general order of the universe. Art, though it must assume the same general laws, follows them only into such of their detailed consequences as have led to the formation of rules of conduct; and brings together from parts of the field of science most remote from one another, the truths relating to the production of the different and heterogeneous conditions necessary to each effect which the exigencies of practical life require to be produced.(288)

Science, therefore, following one cause to its various effects, while art traces one effect to its multiplied and diversified causes and conditions, there is need of a set of intermediate scientific truths, derived from the higher generalities of science, and destined to serve as the generalia or first principles of the various arts. The scientific operation of framing these intermediate principles, M. Comte characterizes as one of those results of philosophy which are reserved for futurity. The only complete example which he points out as actually realized, and which can be held up as a type to be imitated in more important matters, is the general theory of the art of Descriptive Geometry, as conceived by M. Monge. It is not, however, difficult to understand what the nature of these intermediate principles must generally be. After framing the most comprehensive possible conception of the end to be aimed at, that is, of the effect to be produced, and determining in the same comprehensive manner the set of conditions on which that effect depends, there remains to be taken, a general survey of the resources which can be commanded for realizing this set of conditions; and when the result of this survey has been embodied in the fewest and most extensive propositions possible, those propositions will express the general relation between the available means and the end, and will constitute the general scientific theory of the art, from which its practical methods will follow as corollaries.

§ 6. But though the reasonings which connect the end or purpose of every art with its means belong to the domain of Science, the definition of the end itself belongs exclusively to Art, and forms its peculiar province. Every art has one first principle, or general major premise, not borrowed from science; that which enunciates the object aimed at, and affirms it to be a desirable object. The builder's art assumes that it is desirable to have buildings; architecture, as one of the fine arts, that it is desirable to have them beautiful or imposing. The hygienic and medical arts assume, the one that the preservation of health, the other that the cure of disease, are

fitting and desirable ends. These are not propositions of science. Propositions of science assert a matter of fact: an existence, a co-existence, a succession, or a resemblance. The propositions now spoken of do not assert that any thing is, but enjoin or recommend that something should be. They are a class by themselves. A proposition of which the predicate is expressed by the words *ought* or *should be*, is generically different from one which is expressed by *is*, or *will be*. It is true, that in the largest sense of the words, even these propositions assert something as a matter of fact. The fact affirmed in them is, that the conduct recommended excites in the speaker's mind the feeling of approbation. This, however, does not go to the bottom of the matter; for the speaker's approbation is no sufficient reason why other people should approve; nor ought it to be a conclusive reason even with himself. For the purposes of practice, every one must be required to justify his approbation; and for this there is need of general premises, determining what are the proper objects of approbation, and what the proper order of precedence among those objects.

These general premises, together with the principal conclusions which may be deduced from them, form (or rather might form) a body of doctrine, which is properly the Art of Life, in its three departments, Morality, Prudence or Policy, and Æsthetics; the Right, the Expedient, and the Beautiful or Noble, in human conduct and works. To this art (which, in the main, is unfortunately still to be created), all other arts are subordinate; since its principles are those which must determine whether the special aim of any particular art is worthy and desirable, and what is its place in the scale of desirable things. Every art is thus a joint result of laws of nature disclosed by science, and of the general principles of what has been called Teleology, or the Doctrine of Ends;(289) which, borrowing the language of the German metaphysicians, may also be termed, not improperly, the principles of Practical Reason.

A scientific observer or reasoner, merely as such, is not an adviser for practice. His part is only to show that certain consequences follow from certain causes, and that to obtain certain ends, certain means are the most effectual. Whether the ends themselves are such as ought to be pursued, and if so, in what cases and to how great a length, it is no part of his business as a cultivator of science to decide, and science alone will never qualify him for the decision. In purely physical science, there is not much temptation to assume this ulterior office; but those who treat of human nature and society invariably claim it: they always undertake to say, not merely what is, but what ought to be. To entitle them to do this, a complete doctrine of Teleology is indispensable. A scientific theory, however perfect, of the subject-matter, considered merely as part of the order of nature, can in no degree serve as a substitute. In this respect the various subordinate arts afford a misleading analogy. In them there is seldom any visible necessity for justifying the end, since in general its desirableness is denied by nobody, and it is only when the question of precedence is to be decided between that end and some other, that the general principles of Teleology have to be called in; but a writer on Morals and Politics requires those principles at every step. The most elaborate and well-digested exposition of the laws of succession and co-existence among mental or social phenomena, and of their relation to one another as causes and effects, will be of no avail toward the art of Life or of Society, if the ends to be aimed at by that art are left to the vague suggestions of the *intellectus sibi permissus*, or are taken for granted without analysis or questioning.

§ 7. There is, then, a *philosophia prima* peculiar to Art, as there is one which belongs to Science. There are not only first principles of Knowledge, but first principles of Conduct. There must be some standard by which to determine the goodness or badness, absolute and comparative, of ends, or objects of desire. And whatever that standard is, there can be but one; for if there were several ultimate principles of conduct, the same conduct might be approved by one of those principles and condemned by another; and there would be needed some more general principle, as umpire between them.

Accordingly, writers on Moral Philosophy have mostly felt the necessity not only of referring all rules of conduct, and all judgments of praise and blame, to principles, but of referring them to some one principle; some rule, or standard, with which all other rules of conduct were required to be consistent, and from which by ultimate consequence they could all be deduced. Those who have dispensed with the assumption of such a universal standard, have only been enabled to do so by supposing that a moral sense, or instinct, inherent in

our constitution, informs us, both what principles of conduct we are bound to observe, and also in what order these should be subordinated to one another.

The theory of the foundations of morality is a subject which it would be out of place, in a work like this, to discuss at large, and which could not to any useful purpose be treated incidentally. I shall content myself, therefore, with saying, that the doctrine of intuitive moral principles, even if true, would provide only for that portion of the field of conduct which is properly called moral. For the remainder of the practice of life some general principle, or standard, must still be sought; and if that principle be rightly chosen, it will be found, I apprehend, to serve quite as well for the ultimate principle of Morality, as for that of Prudence, Policy, or Taste.

Without attempting in this place to justify my opinion, or even to define the kind of justification which it admits of, I merely declare my conviction, that the general principle to which all rules of practice ought to conform, and the test by which they should be tried, is that of conduciveness to the happiness of mankind, or rather, of all sentient beings; in other words, that the promotion of happiness is the ultimate principle of Teleology.(290)

I do not mean to assert that the promotion of happiness should be itself the end of all actions, or even of all rules of action. It is the justification, and ought to be the controller, of all ends, but it is not itself the sole end. There are many virtuous actions, and even virtuous modes of action (though the cases are, I think, less frequent than is often supposed), by which happiness in the particular instance is sacrificed, more pain being produced than pleasure. But conduct of which this can be truly asserted, admits of justification only because it can be shown that, on the whole, more happiness will exist in the world, if feelings are cultivated which will make people, in certain cases, regardless of happiness. I fully admit that this is true; that the cultivation of an ideal nobleness of will and conduct should be to individual human beings an end, to which the specific pursuit either of their own happiness or of that of others (except so far as included in that idea) should, in any case of conflict, give way. But I hold that the very question, what constitutes this elevation of character, is itself to be decided by a reference to happiness as the standard. The character itself should be, to the individual, a paramount end, simply because the existence of this ideal nobleness of character, or of a near approach to it, in any abundance, would go farther than all things else toward making human life happy, both in the comparatively humble sense of pleasure and freedom from pain, and in the higher meaning, of rendering life, not what it now is almost universally, puerile and insignificant, but such as human beings with highly developed faculties can care to have.

§ 8. With these remarks we must close this summary view of the application of the general logic of scientific inquiry to the moral and social departments of science. Notwithstanding the extreme generality of the principles of method which I have laid down (a generality which, I trust, is not, in this instance, synonymous with vagueness), I have indulged the hope that to some of those on whom the task will devolve of bringing those most important of all sciences into a more satisfactory state, these observations may be useful, both in removing erroneous, and in clearing up the true, conceptions of the means by which, on subjects of so high a degree of complication, truth can be attained. Should this hope be realized, what is probably destined to be the great intellectual achievement of the next two or three generations of European thinkers will have been in some degree forwarded.

THE END.

FOOTNOTES

1 In the later editions of Archbishop Whately's "Logic," he states his meaning to be, not that "rules" for the ascertainment of truths by inductive investigation can not be laid down, or that they may not be "of eminent service," but that they "must always be comparatively vague and general, and incapable of being built up into a regular demonstrative theory like that of the Syllogism." (Book iv., ch. iv., § 3.) And he observes, that to

devise a system for this purpose, capable of being "brought into a scientific form," would be an achievement which "he must be more sanguine than scientific who expects." (Book iv., ch. ii., § 4.) To effect this, however, being the express object of the portion of the present work which treats of Induction, the words in the text are no overstatement of the difference of opinion between Archbishop Whately and me on the subject.

2 Now forming a chapter in his volume on "The Philosophy of Discovery."

3 Archbishop Whately.

4 I use these terms indiscriminately, because, for the purpose in view, there is no need for making any distinction between them. But metaphysicians usually restrict the name Intuition to the direct knowledge we are supposed to have of things external to our minds, and Consciousness to our knowledge of our own mental phenomena.

5 This important theory has of late been called in question by a writer of deserved reputation, Mr. Samuel Bailey; but I do not conceive that the grounds on which it has been admitted as an established doctrine for a century past, have been at all shaken by that gentleman's objections. I have elsewhere said what appeared to me necessary in reply to his arguments. (*Westminster Review* for October, 1842; reprinted in "Dissertations and Discussions," vol. ii.)

6 The view taken in the text, of the definition and purpose of Logic, stands in marked opposition to that of the school of philosophy which, in this country, is represented by the writings of Sir William Hamilton and of his numerous pupils. Logic, as this school conceives it, is "the Science of the Formal Laws of Thought;" a definition framed for the express purpose of excluding, as irrelevant to Logic, whatever relates to Belief and Disbelief, or to the pursuit of truth as such, and restricting the science to that very limited portion of its total province, which has reference to the conditions, not of Truth, but of Consistency. What I have thought it useful to say in opposition to this limitation of the field of Logic, has been said at some length in a separate work, first published in 1865, and entitled "An Examination of Sir William Hamilton's Philosophy, and of the Principal Philosophical Questions discussed in his Writings." For the purposes of the present Treatise, I am content that the justification of the larger extension which I give to the domain of the science, should rest on the sequel of the Treatise itself. Some remarks on the relation which the Logic of Consistency bears to the Logic of Truth, and on the place which that particular part occupies in the whole to which it belongs, will be found in the present volume (Book II., chap. iii., § 9).

7 Computation or Logic, chap. ii.

8 In the original "had, *or had not*." These last words, as involving a subtlety foreign to our present purpose, I have forborne to quote.

9 Vide infra, note at the end of § 3, book ii., chap. ii.

10 Notare, to mark; *con*notare, to mark *along with*; to mark one thing *with* or *in addition to* another.

11 Archbishop Whately, who, in the later editions of his *Elements of Logic*, aided in reviving the important distinction treated of in the text, proposes the term "Attributive" as a substitute for "Connotative" (p. 22, 9th edit.). The expression is, in itself, appropriate; but as it has not the advantage of being connected with any verb, of so markedly distinctive a character as "to connote," it is not, I think, fitted to supply the place of the word Connotative in scientific use.

12 A writer who entitles his book *Philosophy; or, the Science of Truth*, charges me in his very first page (referring at the foot of it to this passage) with asserting that *general* names have properly no signification. And he repeats this statement many times in the course of his volume, with comments, not at all flattering,

thereon. It is well to be now and then reminded to how great a length perverse misquotation (for, strange as it appears, I do not believe that the writer is dishonest) can sometimes go. It is a warning to readers when they see an author accused, with volume and page referred to, and the apparent guarantee of inverted commas, of maintaining something more than commonly absurd, not to give implicit credence to the assertion without verifying the reference.

13 "Take the familiar term Stone. It is applied to mineral and rocky materials, to the kernels of fruit, to the accumulations in the gall-bladder and in the kidney; while it is refused to polished minerals (called gems), to rocks that have the cleavage suited for roofing (slates), and to baked clay (bricks). It occurs in the designation of the magnetic oxide of iron (loadstone), and not in speaking of other metallic ores. Such a term is wholly unfit for accurate reasoning, unless hedged round on every occasion by other phrases; as building stone, precious stone, gall-stone, etc. Moreover, the methods of definition are baffled for want of sufficient community to ground upon. There is no quality uniformly present in the cases where it is applied, and uniformly absent where it is not applied; hence the definer would have to employ largely the license of striking off existing applications, and taking in new ones."--BAIN, *Logic*, ii., 172.

14 Before quitting the subject of connotative names, it is proper to observe, that the first writer who, in our times, has adopted from the schoolmen the word *to connote*, Mr. James Mill, in his *Analysis of the Phenomena of the Human Mind*, employs it in a signification different from that in which it is here used. He uses the word in a sense co-extensive with its etymology, applying it to every case in which a name, while pointing directly to one thing (which is consequently termed its signification), includes also a tacit reference to some other thing. In the case considered in the text, that of concrete general names, his language and mine are the converse of one another. Considering (very justly) the signification of the name to lie in the attribute, he speaks of the word as *noting* the attribute, and *connoting* the things possessing the attribute. And he describes abstract names as being properly concrete names with their connotation dropped; whereas, in my view, it is the *de*notation which would be said to be dropped, what was previously connoted becoming the whole signification.

In adopting a phraseology at variance with that which so high an authority, and one which I am less likely than any other person to undervalue, has deliberately sanctioned, I have been influenced by the urgent necessity for a term exclusively appropriated to express the manner in which a concrete general name serves to mark the attributes which are involved in its signification. This necessity can scarcely be felt in its full force by any one who has not found by experience how vain is the attempt to communicate clear ideas on the philosophy of language without such a word. It is hardly an exaggeration to say, that some of the most prevalent of the errors with which logic has been infected, and a large part of the cloudiness and confusion of ideas which have enveloped it, would, in all probability, have been avoided, if a term had been in common use to express exactly what I have signified by the term to connote. And the schoolmen, to whom we are indebted for the greater part of our logical language, gave us this also, and in this very sense. For though some of their general expressions countenance the use of the word in the more extensive and vague acceptation in which it is taken by Mr. Mill, yet when they had to define it specifically as a technical term, and to fix its meaning as such, with that admirable precision which always characterizes their definitions, they clearly explained that nothing was said to be connoted except *forms*, which word may generally, in their writings, be understood as synonymous with *attributes*.

Now, if the word *to connote*, so well suited to the purpose to which they applied it, be diverted from that purpose by being taken to fulfill another, for which it does not seem to me to be at all required; I am unable to find any expression to replace it, but such as are commonly employed in a sense so much more general, that it would be useless attempting to associate them peculiarly with this precise idea. Such are the words, to involve, to imply, etc. By employing these, I should fail of attaining the object for which alone the name is needed, namely, to distinguish this particular kind of involving and implying from all other kinds, and to assure to it the degree of habitual attention which its importance demands.

15 Professor Bain (*Logic*, i., 56) thinks that negative names are not names of all things whatever except those denoted by the correlative positive name, but only for all things of some particular class: *not-white*, for instance, he deems not to be a name for every thing in nature except white things, but only for every *colored* thing other than white. In this case, however, as in all others, the test of what a name denotes is what it can be predicated of: and we can certainly predicate of a sound, or a smell, that it is not white. The affirmation and the negation of the same attribute can not but divide the whole field of predication between them.

16 Or rather, all objects except itself and the percipient mind; for, as we shall see hereafter, to ascribe any attribute to an object, necessarily implies a mind to perceive it.

The simple and clear explanation given in the text, of relation and relative names, a subject so long the opprobrium of metaphysics, was given (as far as I know) for the first time, by Mr. James Mill, in his Analysis of the Phenomena of the Human Mind.

17 On the preceding passage Professor Bain remarks (Logic, i., 265): "The Categories do not seem to have been intended as a classification of Namable Things, in the sense of 'an enumeration of all kinds of Things which are capable of being made predicates, or of having any thing predicated of them.' They seem to have been rather intended as a generalization of predicates; an analysis of the final import of predication. Viewed in this light, they are not open to the objections offered by Mr. Mill. The proper question to ask is not--In what Category are we to place sensations or other feelings or states of mind? but, Under what Categories can we predicate regarding states of mind? Take, for example, Hope. When we say that it is a state of mind, we predicate Substance: we may also describe how great it is (Quantity), what is the quality of it, pleasurable or painful (Quality), what it has reference to (Relation). Aristotle seems to have framed the Categories on the plan--Here is an individual; what is the final analysis of all that we can predicate about him?"

This is doubtless a true statement of the leading idea in the classification. The Category {~GREEK CAPITAL LETTER OMICRON~}{~GREEK SMALL LETTER UPSILON WITH PSILI~}{~GREEK SMALL LETTER SIGMA~}{~GREEK SMALL LETTER IOTA WITH OXIA~}{~GREEK SMALL LETTER ALPHA~} was certainly understood by Aristotle to be a general name for all possible answers to the question Quid sit? when asked respecting a concrete individual; as the other Categories are names comprehending all possible answers to the questions Quantum sit? Quale sit? etc. In Aristotle's conception, therefore, the Categories may not have been a classification of Things; but they were soon converted into one by his Scholastic followers, who certainly regarded and treated them as a classification of Things, and carried them out as such, dividing down the Category Substance as a naturalist might do, into the different classes of physical or metaphysical objects as distinguished from attributes, and the other Categories into the principal varieties of quantity, quality, relation, etc. It is, therefore, a just subject of complaint against them, that they had no Category of Feeling. Feeling is assuredly predicable as a summum genus, of every particular kind of feeling, for instance, as in Mr. Bain's example, of Hope: but it can not be brought within any of the Categories as interpreted either by Aristotle or by his followers.

18 Philosophy of the Inductive Sciences, vol. i., p. 40.

19 Discussions on Philosophy, etc. Appendix I., pp. 643, 644.

20 It is to be regretted that Sir William Hamilton, though he often strenuously insists on this doctrine, and though, in the passage quoted, he states it with a comprehensiveness and force which leave nothing to be desired, did not consistently adhere to his own doctrine, but maintained along with it opinions with which it is utterly irreconcilable. See the third and other chapters of *An Examination of Sir William Hamilton's Philosophy*.

21 "Nous savons qu'il existe quelque chose hors de nous, parceque nous ne pouvons expliquer nos perceptions sans les rattacher à des causes distinctes de nous mêmes; nous savons de plus que ces causes, dont nous ne

connaissons pas d'ailleurs l'essence, produisent les effets les plus variables, les plus divers, et même les plus contraires, selon qu'elles rencontrent telle nature ou telle disposition du sujet. Mais savons-nous quelque chose de plus? et même, vu le caractère indéterminé des causes que nous concevons dans les corps, y a-t-il quelque chose de plus à savoir? Y a-t-il lieu de nous enquérir si nous percevons les choses telles qu'elles sont? Non évidemment.... Je ne dis pas que le problème est insoluble, *je dis qu'il est absurde et enferme une contradiction*. Nous *ne savons pas ce que ces causes sont en elles-mêmes*, et la raison nous défend de chercher à le connaître: mais il est bien évident *à priori*, qu'*elles ne sont pas en elles-mêmes ce qu'elles sont par rapport à nous*, puisque la présence du sujet modifie nécessairement leur action. Supprimez tout sujet sentant, il est certain que ces causes agiraient encore puisqu'elles continueraient d'exister; mais elles agiraient autrement; elles seraient encore des qualités et des propriétés, mais qui ne ressembleraient à rien de ce que nous connaissons. Le feu ne manifesterait plus aucune des propriétés que nous lui connaissons: que serait-il? C'est ce que nous ne saurons jamais. *C'est d'ailleurs peut-être un problème qui ne répugne pas seulement à la nature de notre esprit, mais à l'essence même des choses.* Quand même en effet on supprimerait par le pensée tous les sujets sentants, il faudrait encore admettre que nul corps ne manifesterait ses propriétés autrement qu'en relation avec un sujet quelconque, et dans ce cas *ses propriétés ne seraient encore que relatives*: en sorte qu'il me paraît fort raisonnable d'admettre que les propriétés déterminées des corps n'existent pas indépendamment d'un sujet quelconque, et que quand on demande si les propriétés de la matiere sont telles que nous les percevons, il faudrait voir auparavant si elles sont en tant que déterminées, et dans quel sens il est vrai de dire qu'elles sont."--*Cours d'Histoire de la Philosophie Morale au 18me siècle*, 8me leçon.

22 An attempt, indeed, has been made by Reid and others, to establish that although some of the properties we ascribe to objects exist only in our sensations, others exist in the things themselves, being such as can not possibly be copies of any impression upon the senses; and they ask, from what sensations our notions of extension and figure have been derived? The gauntlet thrown down by Reid was taken up by Brown, who, applying greater powers of analysis than had previously been applied to the notions of extension and figure, pointed out that the sensations from which those notions are derived, are sensations of touch, combined with sensations of a class previously too little adverted to by metaphysicians, those which have their seat in our muscular frame. His analysis, which was adopted and followed up by James Mill, has been further and greatly improved upon in Professor Bain's profound work, *The Senses and the Intellect*, and in the chapters on "Perception" of a work of eminent analytic power, Mr. Herbert Spencer's *Principles of Psychology*.

On this point M. Cousin may again be cited in favor of the better doctrine. M. Cousin recognizes, in opposition to Reid, the essential subjectivity of our conceptions of what are called the primary qualities of matter, as extension, solidity, etc., equally with those of color, heat, and the remainder of the so-called secondary qualities.--*Cours*, ut supra, 9me leçon.

23 This doctrine, which is the most complete form of the philosophical theory known as the Relativity of Human Knowledge, has, since the recent revival in this country of an active interest in metaphysical speculation, been the subject of a greatly increased amount of discussion and controversy; and dissentients have manifested themselves in considerably greater number than I had any knowledge of when the passage in the text was written. The doctrine has been attacked from two sides. Some thinkers, among whom are the late Professor Ferrier, in his *Institutes of Metaphysic*, and Professor John Grote, in his *Exploratio Philosophica*, appear to deny altogether the reality of Noumena, or Things in themselves--of an unknowable substratum or support for the sensations which we experience, and which, according to the theory, constitute all our knowledge of an external world. It seems to me, however, that in Professor Grote's case at least, the denial of Noumena is only apparent, and that he does not essentially differ from the other class of objectors, including Mr. Bailey in his valuable *Letters on the Philosophy of the Human Mind*, and (in spite of the striking passage quoted in the text) also Sir William Hamilton, who contend for a direct knowledge by the human mind of more than the sensations--of certain attributes or properties as they exist not in us, but in the Things themselves.

With the first of these opinions, that which denies Noumena, I have, as a metaphysician, no quarrel; but,

whether it be true or false, it is irrelevant to Logic. And since all the forms of language are in contradiction to it, nothing but confusion could result from its unnecessary introduction into a treatise, every essential doctrine of which could stand equally well with the opposite and accredited opinion. The other and rival doctrine, that of a direct perception or intuitive knowledge of the outward object as it is in itself, considered as distinct from the sensations we receive from it, is of far greater practical moment. But even this question, depending on the nature and laws of Intuitive Knowledge, is not within the province of Logic. For the grounds of my own opinion concerning it, I must content myself with referring to a work already mentioned--*An Examination of Sir William Hamilton's Philosophy*; several chapters of which are devoted to a full discussion of the questions and theories relating to the supposed direct perception of external objects.

24 Professor Bain (*Logic*, i., 49) defines attributes as "points of community among classes." This definition expresses well one point of view, but is liable to the objection that it applies only to the attributes of classes; though an object, unique in its kind, may be said to have attributes. Moreover, the definition is not ultimate, since the points of community themselves admit of, and require, further analysis; and Mr. Bain does analyze them into resemblances in the sensations, or other states of consciousness excited by the object.

25 Analysis of the Human Mind, i., 126 et seq.

26 Logic, i., 85.

27 Instead of Universal and Particular as applied to propositions, Professor Bain proposes (*Logic*, i., 81) the terms Total and Partial; reserving the former pair of terms for their inductive meaning, "the contrast between a general proposition and the particulars or individuals that we derive it from." This change in nomenclature would be attended with the further advantage, that Singular propositions, which in the Syllogism follow the same rules as Universal, would be included along with them in the same class, that of Total predications. It is not the Subject's denoting many things or only one, that is of importance in reasoning, it is that the assertion is made of the whole or a part only of what the Subject denotes. The words Universal and Particular, however, are so familiar and so well understood in both the senses mentioned by Mr. Bain, that the double meaning does not produce any material inconvenience.

28 It may, however, be considered as equivalent to a universal proposition with a different predicate, viz.: "All wine is good *quâ* wine," or "is good in respect of the qualities which constitute it wine."

29 Logic, i., 82.

30 Dr. Whewell (*Philosophy of Discovery*, p. 242) questions this statement, and asks, "Are we to say that a mole can not dig the ground, except he has an idea of the ground, and of the snout and paws with which he digs it?" I do not know what passes in a mole's mind, nor what amount of mental apprehension may or may not accompany his instinctive actions. But a human being does not use a spade by instinct; and he certainly could not use it unless he had knowledge of a spade, and of the earth which he uses it upon.

31 Professor Bain remarks, in qualification of the statement in the text (*Logic*, i., 50), that the word Class has two meanings; "the class definite, and the class indefinite. The class definite is an enumeration of actual individuals, as the Peers of the Realm, the oceans of the globe, the known planets.... The class indefinite is unenumerated. Such classes are stars, planets, gold-bearing rocks, men, poets, virtuous.... In this last acceptation of the word, class name and general name are identical. The class name denotes an indefinite number of individuals, and connotes the points of community or likeness."

The theory controverted in the text, tacitly supposes all classes to be *definite*. I have assumed them to be indefinite; because, for the purposes of Logic, definite classes, as such, are almost useless; though often serviceable as means of abridged expression. (Vide infra, book iii., chap. ii.)

32 "From hence also this may be deduced, that the first truths were arbitrarily made by those that first of all imposed names upon things, or received them from the imposition of others. For it is true (for example) that *man is a living creature*, but it is for this reason, that it pleased men to impose both these names on the same thing."--*Computation or Logic*, chap. iii., sect. 8.

33 "Men are subject to err not only in affirming and denying, but also in perception, and in silent cogitation.... Tacit errors, or the errors of sense and cogitation, are made by passing from one imagination to the imagination of another different thing; or by feigning that to be past, or future, which never was, nor ever shall be; as when by seeing the image of the sun in water, we imagine the sun itself to be there; or by seeing swords, that there has been, or shall be, fighting, because it used to be so for the most part; or when from promises we feign the mind of the promiser to be such and such; or, lastly, when from any sign we vainly imagine something to be signified which is not. And errors of this sort are common to all things that have sense."--*Computation or Logic*, chap. v., sect. 1.

34 Chap. iii., sect 3.

35 To the preceding statement it has been objected, that "we naturally construe the subject of a proposition in its extension, and the predicate (which therefore may be an adjective) in its intension (connotation): and that consequently co-existence of attributes does not, any more than the opposite theory of equation of groups, correspond with the living processes of thought and language." I acknowledge the distinction here drawn, which, indeed, I had myself laid down and exemplified a few pages back (p. 77). But though it is true that we naturally "construe the subject of a proposition in its extension," this extension, or in other words, the extent of the class denoted by the name, is not apprehended or indicated directly. It is both apprehended and indicated solely through the attributes. In the "living processes of thought and language" the extension, though in this case really thought of (which in the case of the predicate it is not), is thought of only through the medium of what my acute and courteous critic terms the "intension."

For further illustrations of this subject, see *Examination of Sir William Hamilton's Philosophy*, chap. xxii.

36 Professor Bain, in his *Logic* (i., 256), excludes Existence from the list, considering it as a mere name. All propositions, he says, which predicate mere existence "are more or less abbreviated, or elliptical: when fully expressed they fall under either co-existence or succession. When we say there *exists* a conspiracy for a particular purpose, we mean that at the present time a body of men have formed themselves into a society for a particular object; which is a complex affirmation, resolvable into propositions of co-existence and succession (as causation). The assertion that the dodo does not exist, points to the fact that this animal, once known in a certain place, has disappeared or become extinct; is no longer associated with the locality: all which may be better stated without the use of the verb 'exist.' There is a debated question--Does an ether exist? but the concrete form would be this--'Are heat and light and other radiant influences propagated by an ethereal medium diffused in space;' which is a proposition of causation. In like manner the question of the Existence of a Deity can not be discussed in that form. It is properly a question as to the First *Cause* of the Universe, and as to the continued exertion of that Cause in providential superintendence." (i., 407.)

Mr. Bain thinks it "fictitious and unmeaning language" to carry up the classification of Nature to one *summum genus*, Being, or that which Exists; since nothing can be perceived or apprehended but by way of contrast with something else (of which important truth, under the name of Law of Relativity, he has been in our time the principal expounder and champion), and we have no other class to oppose to Being, or fact to contrast with Existence.

I accept fully Mr. Bain's Law of Relativity, but I do not understand by it that to enable us to apprehend or be conscious of any fact, it is necessary that we should contrast it with some other positive fact. The antithesis necessary to consciousness need not, I conceive, be an antithesis between two positives; it may be between one positive and its negative. Hobbes was undoubtedly right when he said that a single sensation indefinitely

prolonged would cease to be felt at all; but simple intermission, without other change, would restore it to consciousness. In order to be conscious of heat, it is not necessary that we should pass to it from cold; it suffices that we should pass to it from a state of no sensation, or from a sensation of some other kind. The relative opposite of Being, considered as a summum genus, is Nonentity, or Nothing; and we have, now and then, occasion to consider and discuss things merely in contrast with Nonentity.

I grant that the *decision* of questions of Existence usually if not always depends on a previous question of either Causation or Co-existence. But Existence is nevertheless a different thing from Causation or Co-existence, and can be predicated apart from them. The meaning of the abstract name Existence, and the connotation of the concrete name Being, consist, like the meaning of all other names, in sensations or states of consciousness: their peculiarity is that to exist, is to excite, or be capable of exciting, *any* sensations or states of consciousness: no matter what, but it is indispensable that there should be some. It was from overlooking this that Hegel, finding that Being is an abstraction reached by thinking away all particular attributes, arrived at the self-contradictory proposition on which he founded all his philosophy, that Being is the same as Nothing. It is really the name of Something, taken in the most comprehensive sense of the word.

37 Book iv., chap. vii.

38 Logic, i., 103-105.

39 The doctrines which prevented the real meaning of Essences from being understood, had not assumed so settled a shape in the time of Aristotle and his immediate followers, as was afterward given to them by the Realists of the Middle Ages. Aristotle himself (in his Treatise on the Categories) expressly denies that the {~GREEK SMALL LETTER DELTA~}{~GREEK SMALL LETTER EPSILON~}{~GREEK SMALL LETTER UPSILON WITH OXIA~}{~GREEK SMALL LETTER TAU~}{~GREEK SMALL LETTER EPSILON~}{~GREEK SMALL LETTER RHO~}{~GREEK SMALL LETTER ALPHA~}{~GREEK SMALL LETTER IOTA~} {~GREEK SMALL LETTER OMICRON~}{~GREEK SMALL LETTER UPSILON WITH PSILI AND OXIA~}{~GREEK SMALL LETTER SIGMA~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER ALPHA~}{~GREEK SMALL LETTER IOTA~}, or Substantiæ Secundæ, inhere in a subject. They are only, he says, predicated of it.

40 The always acute and often profound author of *An Outline of Sematology* (Mr. B. H. Smart) justly says, "Locke will be much more intelligible, if, in the majority of places, we substitute 'the knowledge of' for what he calls 'the Idea of' " (p. 10). Among the many criticisms on Locke's use of the word Idea, this is the one which, as it appears to me, most nearly hits the mark; and I quote it for the additional reason that it precisely expresses the point of difference respecting the import of Propositions, between my view and what I have spoken of as the Conceptualist view of them. Where a Conceptualist says that a name or a proposition expresses our Idea of a thing, I should generally say (instead of our Idea) our Knowledge, or Belief, concerning the thing itself.

41 This distinction corresponds to that which is drawn by Kant and other metaphysicians between what they term *analytic* and *synthetic*, judgments; the former being those which can be evolved from the meaning of the terms used.

42 If we allow a differentia to what is not really a species. For the distinction of Kinds, in the sense explained by us, not being in any way applicable to attributes, it of course follows that although attributes may be put into classes, those classes can be admitted to be genera or species only by courtesy.

43 Professor Bain, in his Logic, takes a peculiar view of Definition. He holds (i., 71) with the present work, that "the definition in its full import, is the sum of all the properties connoted by the name; it exhausts the meaning of a word." But he regards the meaning of a general name as including, not indeed all the common properties of the class named, but all of them that are ultimate properties, not resolvable into one another.

"The enumeration of the attributes of oxygen, of gold, of man, should be an enumeration of the final (so far as can be made out), the underivable, powers or functions of each," and nothing less than this is a complete Definition (i., 75). An independent property, not derivable from other properties, even if previously unknown, yet as soon as discovered becomes, according to him, part of the meaning of the term, and should be included in the definition. "When we are told that diamond, which we know to be a transparent, glittering, hard, and high-priced substance, is composed of carbon, and is combustible, we must put these additional properties on the same level as the rest; to us they are henceforth connoted by the name" (i., 73). Consequently the propositions that diamond is composed of carbon, and that it is combustible, are regarded by Mr. Bain as merely verbal propositions. He carries this doctrine so far as to say that unless mortality can be shown to be a consequence of the ultimate laws of animal organization, mortality is connoted by man, and "Man is Mortal" is a merely verbal proposition. And one of the peculiarities (I think a disadvantageous peculiarity) of his able and valuable treatise, is the large number of propositions requiring proof, and learned by experience, which, in conformity with this doctrine, he considers as not real, but verbal, propositions.

The objection I have to this language is that it confounds, or at least confuses, a much more important distinction than that which it draws. The only reason for dividing Propositions into real and verbal, is in order to discriminate propositions which convey information about facts, from those which do not. A proposition which affirms that an object has a given attribute, while designating the object by a name which already signifies the attribute, adds no information to that which was already possessed by all who understood the name. But when this is said, it is implied that, by the signification of a name, is meant the signification attached to it in the common usage of life. I can not think we ought to say that the meaning of a word includes matters of fact which are unknown to every person who uses the word unless he has learned them by special study of a particular department of Nature; or that because a few persons are aware of these matters of fact, the affirmation of them is a proposition conveying no information. I hold that (special scientific connotation apart) a name means, or connotes, only the properties which it is a mark of in the general mind; and that in the case of any additional properties, however uniformly found to accompany these, it remains possible that a thing which did not possess the properties might still be thought entitled to the name. Ruminant, according to Mr. Bain's use of language, connotes cloven-hoofed, since the two properties are always found together, and no connection has ever been discovered between them: but ruminant does not mean cloven-hoofed; and were an animal to be discovered which chews the cud, but has its feet undivided, I venture to say that it would still be called ruminant.

44 In the fuller discussion which Archbishop Whately has given to this subject in his later editions, he almost ceases to regard the definitions of names and those of things as, in any important sense, distinct. He seems (9th ed., p. 145) to limit the notion of a Real Definition to one which "explains any thing *more* of the nature of the thing than is implied in the name;" (including under the word "implied," not only what the name connotes, but every thing which can be deduced by reasoning from the attributes connoted). Even this, as he adds, is usually called not a Definition, but a Description; and (as it seems to me) rightly so called. A Description, I conceive, can only be ranked among Definitions, when taken (as in the case of the zoological definition of man) to fulfill the true office of a Definition, by declaring the connotation given to a word in some special use, as a term of science or art: which special connotation of course would not be expressed by the proper definition of the word in its ordinary employment.

Mr. De Morgan, exactly reversing the doctrine of Archbishop Whately, understands by a Real Definition one which contains *less* than the Nominal Definition, provided only that what it contains is sufficient for distinction. "By *real* definition I mean such an explanation of the word, be it the whole of the meaning or only part, as will be sufficient to separate the things contained under that word from all others. Thus the following, I believe, is a complete definition of an elephant: An animal which naturally drinks by drawing the water into its nose, and then spurting it into its mouth."--*Formal Logic*, p. 36. Mr. De Morgan's general proposition and his example are at variance; for the peculiar mode of drinking of the elephant certainly forms no part of the meaning of the word elephant. It could not be said, because a person happened to be ignorant of this property, that he did not know what an elephant means.

45 In the only attempt which, so far as I know, has been made to refute the preceding argumentation, it is maintained that in the first form of the syllogism,

A dragon is a thing which breathes flame, A dragon is a serpent, Therefore some serpent or serpents breathe flame,

"there is just as much truth in the conclusion as there is in the premises, or rather, no more in the latter than in the former. If the general name serpent includes both real and imaginary serpents, there is no falsity in the conclusion; if not, there is falsity in the minor premise."

Let us, then, try to set out the syllogism on the hypothesis that the name serpent includes imaginary serpents. We shall find that it is now necessary to alter the predicates; for it can not be asserted that an imaginary creature breathes flame; in predicating of it such a fact, we assert by the most positive implication that it is real, and not imaginary. The conclusion must run thus, "Some serpent or serpents either do or are *imagined* to breathe flame." And to prove this conclusion by the instance of dragons, the premises must be, A dragon is *imagined* as breathing flame. A dragon is a (real or imaginary) serpent: from which it undoubtedly follows, that there are serpents which are imagined to breathe flame; but the major premise is not a definition, nor part of a definition; which is all that I am concerned to prove.

Let us now examine the other assertion--that if the word serpent stands for none but real serpents, the minor premise (a dragon is a serpent) is false. This is exactly what I have myself said of the premise, considered as a statement of fact: but it is not false as part of the definition of a dragon; and since the premises, or one of them, must be false (the conclusion being so), the real premise can not be the definition, which is true, but the statement of fact, which is false.

46 "Few people" (I have said in another place) "have reflected how great a knowledge of Things is required to enable a man to affirm that any given argument turns wholly upon words. There is, perhaps, not one of the leading terms of philosophy which is not used in almost innumerable shades of meaning, to express ideas more or less widely different from one another. Between two of these ideas a sagacious and penetrating mind will discern, as it were intuitively, an unobvious link of connection, upon which, though perhaps unable to give a logical account of it, he will found a perfectly valid argument, which his critic, not having so keen an insight into the Things, will mistake for a fallacy turning on the double meaning of a term. And the greater the genius of him who thus safely leaps over the chasm, the greater will probably be the crowing and vainglory of the mere logician, who, hobbling after him, evinces his own superior wisdom by pausing on its brink, and giving up as desperate his proper business of bridging it over."

47 The different cases of Equipollency, or "Equivalent Propositional Forms," are set forth with some fullness in Professor Bain's *Logic*. One of the commonest of these changes of expression, that from affirming a proposition to denying its negative, or *vicè versa*, Mr. Bain designates, very happily, by the name Obversion.

48 As Sir William Hamilton has pointed out, "Some A is not B" may also be converted in the following form: "No B is *some* A." Some men are not negroes; therefore, No negroes are *some* men (*e.g.*, Europeans).

49 Contraries: All A is B No A is B

Subtraries: Some A is B Some A is not B

Contradictories: All A is B Some A is not B

Also contradictories: No A is B Some A is B

Respectively subalternate: All A is B and No A is B Some A is B and Some A is not B

50 Professor Bain denies the claim of Singular Propositions to be classed, for the purposes of ratiocination, with Universal; though they come within the designation which he himself proposes as an equivalent for Universal, that of Total. He would even, to use his own expression, banish them entirely from the syllogism. He takes as an example,

Socrates is wise, Socrates is poor, therefore Some poor men are wise,

or more properly (as he observes) "one poor man is wise." "Now, if wise, poor, and a man, are attributes belonging to the meaning of the word Socrates, there is then no march of reasoning at all. We have given in Socrates, *inter alia*, the facts wise, poor, and a man, and we merely repeat the concurrence which is selected from the whole aggregate of properties making up the whole, Socrates. The case is one under the head 'Greater and Less Connotation' in Equivalent Propositional Forms, or Immediate Inference.

"But the example in this form does not do justice to the syllogism of singulars. We must suppose both propositions to be real, the predicates being in no way involved in the subject. Thus

Socrates was the master of Plato, Socrates fought at Delium, The master of Plato fought at Delium.

"It may fairly be doubted whether the transitions, in this instance, are any thing more than equivalent forms. For the proposition 'Socrates was the master of Plato and fought at Delium,' compounded out of the two premises, is obviously nothing more than a grammatical abbreviation. No one can say that there is here any change of meaning, or any thing beyond a verbal modification of the original form. The next step is, 'The master of Plato fought at Delium,' which is the previous statement cut down by the omission of Socrates. It contents itself with reproducing a part of the meaning, or saying less than had been previously said. The full equivalent of the affirmation is, 'The master of Plato fought at Delium, and the master of Plato was Socrates:' the new form omits the last piece of information, and gives only the first. Now, we never consider that we have made a real inference, a step in advance, when we repeat *less* than we are entitled to say, or drop from a complex statement some portion not desired at the moment. Such an operation keeps strictly within the domain of equivalence, or Immediate Inference. In no way, therefore, can a syllogism with two singular premises be viewed as a genuine syllogistic or deductive inference." (*Logic*, i., 159.)

The first argument, as will have been seen, rests upon the supposition that the name Socrates has a meaning; that man, wise, and poor, are parts of this meaning; and that by predicating them of Socrates we convey no information; a view of the signification of names which, for reasons already given (Note to § 4 of the chapter on Definition, *supra*, pp. 110, 111.), I can not admit, and which, as applied to the class of names which Socrates belongs to, is at war with Mr. Bain's own definition of a Proper Name (i., 148), "a single *meaningless* mark or designation appropriated to the thing." Such names, Mr. Bain proceeded to say, do not necessarily indicate even human beings: much less then does the name Socrates include the meaning of wise or poor. Otherwise it would follow that if Socrates had grown rich, or had lost his mental faculties by illness, he would no longer have been called Socrates.

The second part of Mr. Bain's argument, in which he contends that even when the premises convey real information, the conclusion is merely the premises with a part left out, is applicable, if at all, as much to universal propositions as to singular. In every syllogism the conclusion contains less than is asserted in the two premises taken together. Suppose the syllogism to be

All bees are intelligent, All bees are insects, therefore Some insects are intelligent:

one might use the same liberty taken by Mr. Bain, of joining together the two premises as if they were one--"All bees are insects and intelligent"--and might say that in omitting the middle term *bees* we make no real inference, but merely reproduce part of what had been previously said. Mr. Bain's is really an objection to the syllogism itself, or at all events to the third figure: it has no special applicability to singular propositions.

51 His conclusions are, "The first figure is suited to the discovery or proof of the properties of a thing; the second to the discovery or proof of the distinctions between things; the third to the discovery or proof of instances and exceptions; the fourth to the discovery, or exclusion, of the different species of a genus." The reference of syllogisms in the last three figures to the *dictum de omni et nullo* is, in Lambert's opinion, strained and unnatural: to each of the three belongs, according to him, a separate axiom, co-ordinate and of equal authority with that *dictum*, and to which he gives the names of *dictum de diverso* for the second figure, *dictum de exemplo* for the third, and *dictum de reciproco* for the fourth. See part i., or *Dianoiologie*, chap, iv., § 229 *et seqq.* Mr. Bailey (*Theory of Reasoning*, 2d ed., pp. 70-74) takes a similar view of the subject.

52 Since this chapter was written, two treatises have appeared (or rather a treatise and a fragment of a treatise), which aim at a further improvement in the theory of the forms of ratiocination: Mr. De Morgan's "Formal Logic; or, the Calculus of Inference, Necessary and Probable;" and the "New Analytic of Logical Forms," attached as an Appendix to Sir William Hamilton's *Discussions on Philosophy*, and at greater length, to his posthumous *Lectures on Logic*.

In Mr. De Morgan's volume--abounding, in its more popular parts, with valuable observations felicitously expressed--the principal feature of originality is an attempt to bring within strict technical rules the cases in which a conclusion can be drawn from premises of a form usually classed as particular. Mr. De Morgan observes, very justly, that from the premises most Bs are Cs, most Bs are As, it may be concluded with certainty that some As are Cs, since two portions of the class B, each of them comprising more than half, must necessarily in part consist of the same individuals. Following out this line of thought, it is equally evident that if we knew exactly what proportion the "most" in each of the premises bear to the entire class B, we could increase in a corresponding degree the definiteness of the conclusion. Thus if 60 per cent. of B are included in C, and 70 per cent. in A, 30 per cent. at least must be common to both; in other words, the number of As which are Cs, and of Cs which are As, must be at least equal to 30 per cent. of the class B. Proceeding on this conception of "numerically definite propositions," and extending it to such forms as these:--"45 Xs (or more) are each of them one of 70 Ys," or "45 Xs (or more) are no one of them to be found among 70 Ys," and examining what inferences admit of being drawn from the various combinations which may be made of premises of this description, Mr. De Morgan establishes universal formulæ for such inferences; creating for that purpose not only a new technical language, but a formidable array of symbols analogous to those of algebra.

Since it is undeniable that inferences, in the cases examined by Mr. De Morgan, can legitimately be drawn, and that the ordinary theory takes no account of them, I will not say that it was not worth while to show in detail how these also could be reduced to formulæ as rigorous as those of Aristotle. What Mr. De Morgan has done was worth doing once (perhaps more than once, as a school exercise); but I question if its results are worth studying and mastering for any practical purpose. The practical use of technical forms of reasoning is to bar out fallacies: but the fallacies which require to be guarded against in ratiocination properly so called, arise from the incautious use of the common forms of language; and the logician must track the fallacy into that territory, instead of waiting for it on a territory of his own. While he remains among propositions which have acquired the numerical precision of the Calculus of Probabilities, the enemy is left in possession of the only ground on which he can be formidable. And since the propositions (short of universal) on which a thinker has to depend, either for purposes of speculation or of practice, do not, except in a few peculiar cases, admit of any numerical precision; common reasoning can not be translated into Mr. De Morgan's forms, which therefore can not serve any purpose as a test of it.

Sir William Hamilton's theory of the "quantification of the predicate" may be described as follows:

"Logically" (I quote his words) "we ought to take into account the quantity, always understood in thought, but usually, for manifest reasons, elided in its expression, not only of the subject, but also of the predicate of a judgment." All A is B, is equivalent to all A is *some* B. No A is B, to No A is *any* B. Some A is B, is tantamount to some A is *some* B. Some A is not B, to Some A is *not any* B. As in these forms of assertion the

predicate is exactly co-extensive with the subject, they all admit of simple conversion; and by this we obtain two additional forms--Some B is *all* A, and No B is *some* A. We may also make the assertion All A is all B, which will be true if the classes A and B are exactly co-extensive. The last three forms, though conveying real assertions, have no place in the ordinary classification of Propositions. All propositions, then, being supposed to be translated into this language, and written each in that one of the preceding forms which answers to its signification, there emerges a new set of syllogistic rules, materially different from the common ones. A general view of the points of difference may be given in the words of Sir W. Hamilton (*Discussions*, 2d ed., p. 651):

"The revocation of the two terms of a Proposition to their true relation; a proposition being always an *equation* of its subject and its predicate.

"The consequent reduction of the Conversion of Propositions from three species to one--that of Simple Conversion.

"The reduction of all the *General Laws* of Categorical Syllogisms to a single Canon.

"The evolution from that one canon of all the Species and varieties of Syllogisms.

"The abrogation of all the *Special Laws* of Syllogism.

"A demonstration of the exclusive possibility of Three Syllogistic Figures; and (on new grounds) the scientific and final abolition of the Fourth.

"A manifestation that Figure is an unessential variation in syllogistic form; and the consequent absurdity of Reducing the syllogisms of the other figures to the first.

"An enouncement of *one Organic Principle* for each Figure.

"A determination of the true number of the Legitimate Moods; with

"Their amplification in number (thirty-six);

"Their numerical equality under all the figures; and

"Their relative equivalence, or virtual identity, throughout every schematic difference.

"That, in the second and third figures, the extremes holding both the same relation to the middle term, there is not, as in the first, an opposition and subordination between a term major and a term minor, mutually containing and contained, in the counter wholes of Extension and Comprehension.

"Consequently, in the second and third figures, there is no determinate major and minor premises, and there are two indifferent conclusions: whereas in the first the premises are determinate, and there is a single proximate conclusion."

This doctrine, like that of Mr. De Morgan previously noticed, is a real addition to the syllogistic theory; and has moreover this advantage over Mr. De Morgan's "numerically definite Syllogism," that the forms it supplies are really available as a test of the correctness of ratiocination; since propositions in the common form may always have their predicates quantified, and so be made amenable to Sir W. Hamilton's rules. Considered, however, as a contribution to the *Science* of Logic, that is, to the analysis of the mental processes concerned in reasoning, the new doctrine appears to me, I confess, not merely superfluous, but erroneous; since the form in which it clothes propositions does not, like the ordinary form, express what is in the mind of

the speaker when he enunciates the proposition. I can not think Sir William Hamilton right in maintaining that the quantity of the predicate is "always understood in thought." It is implied, but is not present to the mind of the person who asserts the proposition. The quantification of the predicate, instead of being a means of bringing out more clearly the meaning of the proposition, actually leads the mind out of the proposition, into another order of ideas. For when we say, All men are mortal, we simply mean to affirm the attribute mortality of all men; without thinking at all of the *class* mortal in the concrete, or troubling ourselves about whether it contains any other beings or not. It is only for some artificial purpose that we ever look at the proposition in the aspect in which the predicate also is thought of as a class-name, either including the subject only, or the subject and something more. (See above, p. 77, 78.)

For a fuller discussion of this subject, see the twenty-second chapter of a work already referred to, "An Examination of Sir William Hamilton's Philosophy."

53 Mr. Herbert Spencer (*Principles of Psychology*, pp. 125-7), though his theory of the syllogism coincides with all that is essential of mine, thinks it a logical fallacy to present the two axioms in the text, as the regulating principles of syllogism. He charges me with falling into the error pointed out by Archbishop Whately and myself, of confounding exact likeness with literal identity; and maintains, that we ought not to say that Socrates possesses *the same* attributes which are connoted by the word Man, but only that he possesses attributes *exactly like* them: according to which phraseology, Socrates, and the attribute mortality, are not two things co-existing with the same thing, as the axiom asserts, but two things coexisting with two different things.

The question between Mr. Spencer and me is merely one of language; for neither of us (if I understand Mr. Spencer's opinions rightly) believes an attribute to be a real thing, possessed of objective existence; we believe it to be a particular mode of naming our sensations, or our expectations of sensation, when looked at in their relation to an external object which excites them. The question raised by Mr. Spencer does not, therefore, concern the properties of any really existing thing, but the comparative appropriateness, for philosophical purposes, of two different modes of using a name. Considered in this point of view, the phraseology I have employed, which is that commonly used by philosophers, seems to me to be the best. Mr. Spencer is of opinion that because Socrates and Alcibiades are not the same man, the attribute which constitutes them men should not be called the same attribute; that because the humanity of one man and that of another express themselves to our senses not by the same individual sensations but by sensations exactly alike, humanity ought to be regarded as a different attribute in every different man. But on this showing, the humanity even of any one man should be considered as different attributes now and half an hour hence; for the sensations by which it will then manifest itself to my organs will not be a continuation of my present sensations, but a repetition of them; fresh sensations, not identical with, but only exactly like the present. If every general conception, instead of being "the One in the Many," were considered to be as many different conceptions as there are things to which it is applicable, there would be no such thing as general language. A name would have no general meaning if *man* connoted one thing when predicated of John, and another, though closely resembling, thing when predicated of William. Accordingly a recent pamphlet asserts the impossibility of general knowledge on this precise ground.

The meaning of any general name is some outward or inward phenomenon, consisting, in the last resort, of feelings; and these feelings, if their continuity is for an instant broken, are no longer the same feelings, in the sense of individual identity. What, then, is the common something which gives a meaning to the general name? Mr. Spencer can only say, it is the similarity of the feelings; and I rejoin, the attribute is precisely that similarity. The names of attributes are in their ultimate analysis names for the resemblances of our sensations (or other feelings). Every general name, whether abstract or concrete, denotes or connotes one or more of those resemblances. It will not, probably, be denied, that if a hundred sensations are undistinguishably alike, their resemblance ought to be spoken of as one resemblance, and not a hundred resemblances which merely *resemble* one another. The things compared are many, but the something common to all of them must be conceived as one, just as the name is conceived as one, though corresponding to numerically different

sensations of sound each time it is pronounced. The general term *man* does not connote the sensations derived once from one man, which, once gone, can no more occur again than the same flash of lightning. It connotes the general type of the sensations derived always from all men, and the power (always thought of as one) of producing sensations of that type. And the axiom might be thus worded: Two *types of sensation* each of which co-exists with a third type, co-exist with another; or Two *powers* each of which co-exists with a third power co-exist with one another.

Mr. Spencer has misunderstood me in another particular. He supposes that the co-existence spoken of in the axiom, of two things with the same third thing, means simultaneousness in time. The co-existence meant is that of being jointly attributes of the same subject. The attribute of being born without teeth, and the attribute of having thirty-two teeth in mature age, are in this sense co-existent, both being attributes of man, though *ex vi termini* never of the same man at the same time.

54 Supra, p. 93.

55 Professor Bain (*Logic*, i., 157) considers the axiom (or rather axioms) here proposed as a substitute for the *dictum de omni*, to possess certain advantages, but to be "unworkable as a basis of the syllogism. The fatal defect consists in this, that it is ill-adapted to bring out the difference between total and partial coincidence of terms, the observation of which is the essential precaution in syllogizing correctly. If all the terms were co-extensive, the axiom would flow on admirably; A carries B, all B and none but B; B carries C in the same manner; at once A carries C, without limitation or reserve. But in point of fact, we know that while A carries B, other things carry B also; whence a process of limitation is required, in transferring A to C through B. A (in common with other things) carries B; B (in common with other things) carries C; whence A (in common with other things) carries C. The axiom provides no means of making this limitation; if we were to follow A literally, we should be led to suppose A and C co-extensive: for such is the only obvious meaning of 'the attribute A coincides with the attribute C.' "

It is certainly possible that a careless learner here and there may suppose that if A carries B, it follows that B carries A. But if any one is so incautious as to commit this mistake, the very earliest lesson in the logic of inference, the Conversion of propositions, will correct it. The first of the two forms in which I have stated the axiom, is in some degree open to Mr. Bain's criticism: when B is said to co-exist with A (it must be by a *lapsus calami* that Mr. Bain uses the word *coincide*), it is possible, in the absence of warning, to suppose the meaning to be that the two things are only found together. But this misinterpretation is excluded by the other, or practical, form of the maxim; *Nota notoe est nota rei ipsius.* No one would be in any danger of inferring that because *a* is a mark of *b, b* can never exist without *a*; that because being in a confirmed consumption is a mark of being about to die, no one dies who is not in a consumption; that because being coal is a mark of having come out of the earth, nothing can come out of the earth except coal. Ordinary knowledge of English seems a sufficient protection against these mistakes, since in speaking of a mark of any thing we are never understood as implying reciprocity.

A more fundamental objection is stated by Mr. Bain in a subsequent passage (p. 158). "The axiom does not accommodate itself to the type of Deductive Reasoning as contrasted with Induction--the application of a general principle to a special case. Any thing that fails to make prominent this circumstance is not adapted as a foundation for the syllogism." But though it may be proper to limit the term Deduction to the application of a general principle to a special case, it has never been held that Ratiocination or Syllogism is subject to the same limitation; and the adoption of it would exclude a great amount of valid and conclusive syllogistic reasoning. Moreover, if the *dictum de omni* makes prominent the fact of the application of a general principle to a particular case, the axiom I propose makes prominent the condition which alone makes that application a real inference.

I conclude, therefore, that both forms have their value, and their place in Logic. The *dictum de omni* should be retained as the fundamental axiom of the logic of mere consistency, often called Formal Logic; nor have I

ever quarreled with the use of it in that character, nor proposed to banish it from treatises on Formal Logic. But the other is the proper axiom for the logic of the pursuit of truth by way of Deduction; and the recognition of it can alone show how it is possible that deductive reasoning can be a road to truth.

56 Logic, p. 239 (9th ed.).

57 It is hardly necessary to say, that I am not contending for any such absurdity as that we *actually* "ought to have known" and considered the case of every individual man, past, present, and future, before affirming that all men are mortal: although this interpretation has been, strangely enough, put upon the preceding observations. There is no difference between me and Archbishop Whately, or any other defender of the syllogism, on the practical part of the matter; I am only pointing out an inconsistency in the logical theory of it, as conceived by almost all writers. I do not say that a person who affirmed, before the Duke of Wellington was born, that all men are mortal, *knew* that the Duke of Wellington was mortal; but I do say that he *asserted* it; and I ask for an explanation of the apparent logical fallacy, of adducing in proof of the Duke of Wellington's mortality, a general statement which presupposes it. Finding no sufficient resolution of this difficulty in any of the writers on Logic, I have attempted to supply one.

58 The language of ratiocination would, I think, be brought into closer agreement with the real nature of the process, if the general propositions employed in reasoning, instead of being in the form All men are mortal, or Every man is mortal, were expressed in the form Any man is mortal. This mode of expression, exhibiting as the type of all reasoning from experience "The men A, B, C, etc., are so and so, therefore *any* man is so and so," would much better manifest the true idea--that inductive reasoning is always, at bottom, inference from particulars to particulars, and that the whole function of general propositions in reasoning, is to vouch for the legitimacy of such inferences.

59 Review of Quetelet on Probabilities, *Essays*, p. 367.

60 Philosophy of Discovery, p. 289.

61 Theory of Reasoning, chap. iv., to which I may refer for an able statement and enforcement of the grounds of the doctrine.

62 On a recent careful reperusal of Berkeley's whole works, I have been unable to find this doctrine in them. Sir John Herschel probably meant that it is implied in Berkeley's argument against abstract ideas. But I can not find that Berkeley saw the implication, or had ever asked himself what bearing his argument had on the theory of the syllogism. Still less can I admit that the doctrine is (as has been affirmed by one of my ablest and most candid critics) "among the standing marks of what is called the empirical philosophy."

63 Logic, book iv., chap. i., sect. 1.

64 See the important chapter on Belief, in Professor Bain's great treatise, *The Emotions and the Will*, pp. 581-4.

65 A writer in the "British Quarterly Review" (August, 1846), in a review of this treatise, endeavors to show that there is no *petitio principii* in the syllogism, by denying that the proposition, All men are mortal, asserts or assumes that Socrates is mortal. In support of this denial, he argues that we may, and in fact do, admit the general proposition that all men are mortal, without having particularly examined the case of Socrates, and even without knowing whether the individual so named is a man or something else. But this of course was never denied. That we can and do draw conclusions concerning cases specifically unknown to us, is the datum from which all who discuss this subject must set out. The question is, in what terms the evidence, or ground, on which we draw these conclusions, may best be designated--whether it is most correct to say, that the unknown case is proved by known cases, or that it is proved by a general proposition including both sets of

cases, the unknown and the known? I contend for the former mode of expression. I hold it an abuse of language to say, that the proof that Socrates is mortal, is that all men are mortal. Turn it in what way we will, this seems to me to be asserting that a thing is the proof of itself. Whoever pronounces the words, All men are mortal, has affirmed that Socrates is mortal, though he may never have heard of Socrates; for since Socrates, whether known to be so or not, really is a man, he is included in the words, All men, and in every assertion of which they are the subject. If the reviewer does not see that there is a difficulty here, I can only advise him to reconsider the subject until he does: after which he will be a better judge of the success or failure of an attempt to remove the difficulty. That he had reflected very little on the point when he wrote his remarks, is shown by his oversight respecting the *dictum de omni et nullo*. He acknowledges that this maxim as commonly expressed--"Whatever is true of a class, is true of every thing included in the class," is a mere identical proposition, since the class *is* nothing but the things included in it. But he thinks this defect would be cured by wording the maxim thus--"Whatever is true of a class, is true of every thing which *can be shown* to be a member of the class:" as if a thing could "be shown" to be a member of the class without being one. If a class means the sum of all the things included in the class, the things which can "be shown" to be included in it are part of the sum, and the *dictum* is as much an identical proposition with respect to them as to the rest. One would almost imagine that, in the reviewer's opinion, things are not members of a class until they are called up publicly to take their place in it--that so long, in fact, as Socrates is not known to be a man, he *is not* a man, and any assertion which can be made concerning men does not at all regard him, nor is affected as to its truth or falsity by any thing in which he is concerned.

The difference between the reviewer's theory and mine may be thus stated. Both admit that when we say, All men are mortal, we make an assertion reaching beyond the sphere of our knowledge of individual cases; and that when a new individual, Socrates, is brought within the field of our knowledge by means of the minor premise, we learn that we have already made an assertion respecting Socrates without knowing it: our own general formula being, to that extent, for the first time *interpreted* to us. But according to the reviewer's theory, the smaller assertion is proved by the larger: while I contend, that both assertions are proved together, by the same evidence, namely, the grounds of experience on which the general assertion was made, and by which it must be justified.

The reviewer says, that if the major premise included the conclusion, "we should be able to affirm the conclusion without the intervention of the minor premise; but every one sees that that is impossible." A similar argument is urged by Mr. De Morgan (*Formal Logic*, p. 259): "The whole objection tacitly assumes the superfluity of the minor; that is, tacitly assumes we know Socrates (Mr. De Morgan says 'Plato,' but to prevent confusion I have kept to my own *exemplum*.) to be a man as soon as we know him to be Socrates." The objection would be well grounded if the assertion that the major premise includes the conclusion, meant that it individually specifies all it includes. As, however, the only indication it gives is a description by marks, we have still to compare any new individual with the marks; and to show that this comparison has been made, is the office of the minor. But since, by supposition, the new individual has the marks, whether we have ascertained him to have them or not; if we have affirmed the major premise, we have asserted him to be mortal. Now my position is that this assertion can not be a necessary part of the argument. It can not be a necessary condition of reasoning that we should begin by making an assertion, which is afterward to be employed in proving a part of itself. I can conceive only one way out of this difficulty, viz., that what really forms the proof is *the other* part of the assertion: the portion of it, the truth of which has been ascertained previously: and that the unproved part is bound up in one formula with the proved part in mere anticipation, and as a memorandum of the nature of the conclusions which we are prepared to prove.

With respect to the minor premise in its formal shape, the minor as it stands in the syllogism, predicating of Socrates a definite class name, I readily admit that it is no more a necessary part of reasoning than the major. When there is a major, doing its work by means of a class name, minors are needed to interpret it: but reasoning can be carried on without either the one or the other. They are not the conditions of reasoning, but a precaution against erroneous reasoning. The only minor premise necessary to reasoning in the example under consideration, is, Socrates is *like* A, B, C, and the other individuals who are known to have died. And this is

the only universal type of that step in the reasoning process which is represented by the minor. Experience, however, of the uncertainty of this loose mode of inference, teaches the expediency of determining beforehand what *kind* of likeness to the cases observed, is necessary to bring an unobserved case within the same predicate; and the answer to this question is the major. The minor then identifies the precise kind of likeness possessed by Socrates, as being the kind required by the formula. Thus the syllogistic major and the syllogistic minor start into existence together, and are called forth by the same exigency. When we conclude from personal experience without referring to any record--to any general theorems, either written, or traditional, or mentally registered by ourselves as conclusions of our own drawing--we do not use, in our thoughts, either a major or a minor, such as the syllogism puts into words. When, however, we revise this rough inference from particulars to particulars, and substitute a careful one, the revision consists in selecting two syllogistic premises. But this neither alters nor adds to the evidence we had before; it only puts us in a better position for judging whether our inference from particulars to particulars is well grounded.

66 Infra, book iii., chap. ii.

67 Infra, book iii., ch. iv., § 3, and elsewhere.

68 It is justly remarked by Professor Bain (*Logic*, ii., 134) that the word Hypothesis is here used in a somewhat peculiar sense. An hypothesis, in science, usually means a supposition not proved to be true, but surmised to be so, because if true it would account for certain known facts; and the final result of the speculation may be to prove its truth. The hypotheses spoken of in the text are of a different character; they are known not to be literally true, while as much of them as is true is not hypothetical, but certain. The two cases, however, resemble in the circumstance that in both we reason, not from a truth, but from an assumption, and the truth therefore of the conclusions is conditional, not categorical. This suffices to justify, in point of logical propriety, Stewart's use of the term. It is of course needful to bear in mind that the hypothetical element in the definitions of geometry is the assumption that what is very nearly true is exactly so. This unreal exactitude might be called a fiction, as properly as an hypothesis; but that appellation, still more than the other, would fail to point out the close relation which exists between the fictitious point or line and the points and lines of which we have experience.

69 Mechanical Euclid, pp. 149 *et seqq.*

70 We might, it is true, insert this property into the definition of parallel lines, framing the definition so as to require, both that when produced indefinitely they shall never meet, and also that any straight line which intersects one of them shall, if prolonged, meet the other. But by doing this we by no means get rid of the assumption; we are still obliged to take for granted the geometrical truth, that all straight lines in the same plane, which have the former of these properties, have also the latter. For if it were possible that they should not, that is, if any straight lines in the same plane, other than those which are parallel according to the definition, had the property of never meeting although indefinitely produced, the demonstrations of the subsequent portions of the theory of parallels could not be maintained.

71 Some persons find themselves prevented from believing that the axiom, Two straight lines can not inclose a space, could ever become known to us through experience, by a difficulty which may be stated as follows: If the straight lines spoken of are those contemplated in the definition--lines absolutely without breadth and absolutely straight--that such are incapable of inclosing a space is not proved by experience, for lines such as these do not present themselves in our experience. If, on the other hand, the lines meant are such straight lines as we do meet with in experience, lines straight enough for practical purposes, but in reality slightly zigzag, and with some, however trifling, breadth; as applied to these lines the axiom is not true, for two of them may, and sometimes do, inclose a small portion of space. In neither case, therefore, does experience prove the axiom.

Those who employ this argument to show that geometrical axioms can not be proved by induction, show

themselves unfamiliar with a common and perfectly valid mode of inductive proof; proof by approximation. Though experience furnishes us with no lines so unimpeachably straight that two of them are incapable of inclosing the smallest space, it presents us with gradations of lines possessing less and less either of breadth or of flexure, of which series the straight line of the definition is the ideal limit. And observation shows that just as much, and as nearly, as the straight lines of experience approximate to having no breadth or flexure, so much and so nearly does the space-inclosing power of any two of them approach to zero. The inference that if they had no breadth or flexure at all, they would inclose no space at all, is a correct inductive inference from these facts, conformable to one of the four Inductive Methods hereinafter characterized, the Method of Concomitant Variations; of which the mathematical Doctrine of Limits presents the extreme case.

72 Whewell's *History of Scientific Ideas*, i., 140.

73 Dr. Whewell (*Philosophy of Discovery*, p. 289) thinks it unreasonable to contend that we know by experience, that our idea of a line exactly resembles a real line. "It does not appear," he says, "how we can compare our ideas with the realities, since we know the realities only by our ideas." We know the realities by our sensations. Dr. Whewell surely does not hold the "doctrine of perception by means of ideas," which Reid gave himself so much trouble to refute. If Dr. Whewell doubts whether we compare our ideas with the corresponding sensations, and assume that they resemble, let me ask on what evidence do we judge that a portrait of a person not present is like the original. Surely because it is like our idea, or mental image of the person, and because our idea is like the man himself.

Dr. Whewell also says, that it does not appear why this resemblance of ideas to the sensations of which they are copies, should be spoken of as if it were a peculiarity of one class of ideas, those of space. My reply is, that I do not so speak of it. The peculiarity I contend for is only one of degree. All our ideas of sensation of course resemble the corresponding sensations, but they do so with very different degrees of exactness and of reliability. No one, I presume, can recall in imagination a color or an odor with the same distinctness and accuracy with which almost every one can mentally reproduce an image of a straight line or a triangle. To the extent, however, of their capabilities of accuracy, our recollections of colors or of odors may serve as subjects of experimentation, as well as those of lines and spaces, and may yield conclusions which will be true of their external prototypes. A person in whom, either from natural gift or from cultivation, the impressions of color were peculiarly vivid and distinct, if asked which of two blue flowers was of the darkest tinge, though he might never have compared the two, or even looked at them together, might be able to give a confident answer on the faith of his distinct recollection of the colors; that is, he might examine his mental pictures, and find there a property of the outward objects. But in hardly any case except that of simple geometrical forms, could this be done by mankind generally, with a degree of assurance equal to that which is given by a contemplation of the objects themselves. Persons differ most widely in the precision of their recollection, even of forms: one person, when he has looked any one in the face for half a minute, can draw an accurate likeness of him from memory; another may have seen him every day for six months, and hardly know whether his nose is long or short. But every body has a perfectly distinct mental image of a straight line, a circle, or a rectangle. And every one concludes confidently from these mental images to the corresponding outward things. The truth is, that we may, and continually do, study nature in our recollections, when the objects themselves are absent; and in the case of geometrical forms we can perfectly, but in most other cases only imperfectly, trust our recollections.

74 Logic, i., 222.

75 Ibid., 226.

76 History of Scientific Ideas, i., 65-67.

77 Ibid., i., 60.

78 Ibid., 58, 59.

79 "If all mankind had spoken one language, we can not doubt that there would have been a powerful, perhaps a universal, school of philosophers, who would have believed in the inherent connection between names and things, who would have taken the sound *man* to be the mode of agitating the air which is essentially communicative of the ideas of reason, cookery, bipedality, etc."--De Morgan, *Formal Logic*, p. 246.

80 It would be difficult to name a man more remarkable at once for the greatness and the wide range of his mental accomplishments, than Leibnitz. Yet this eminent man gave as a reason for rejecting Newton's scheme of the solar system, that God *could not* make a body revolve round a distant centre, unless either by some impelling mechanism, or by miracle: "Tout ce qui n'est pas explicable," says he in a letter to the Abbé Conti, "par la nature des créatures, est miraculeux. Il ne suffit pas de dire: Dieu a fait une telle loi de nature; donc la chose est naturelle. Il faut que la loi soit exécutable par les natures des créatures. Si Dien donnait cette loi, par exemple, à un corps libre, de tourner à l'entour d'un certain centre, *il faudrait ou qu'il y joignît d'autres corps qui par leur impulsion l'obligeassent de rester toujours dans son orbite circulaire, ou qu'il mît un ange à ses trousses, ou enfin il faudrait qu'il y concourût extraordinairement*; car naturellement il s'écartera par la tangente."--*Works of Leibnitz*, ed. Dutens, iii., 446.

81 Novum Organum Renovatum, pp. 32, 33.

82 History of Scientific Ideas, i., 264.

83 Ibid., i., 263.

84 Ibid., 240.

85 Hist. Scientific Ideas, ii., 25, 26.

86 Phil. of Disc., p. 339.

87 Phil. of Disc., p. 338.

88 Ibid., p. 463.

89 Phil. of Disc., pp. 472, 473.

90 The *Quarterly Review* for June, 1841, contained an article of great ability on Dr. Whewell's two great works (since acknowledged and reprinted in Sir John Herschel's Essays) which maintains, on the subject of axioms, the doctrine advanced in the text, that they are generalizations from experience, and supports that opinion by a line of argument strikingly coinciding with mine. When I state that the whole of the present chapter (except the last four pages, added in the fifth edition) was written before I had seen the article (the greater part, indeed, before it was published), it is not my object to occupy the reader's attention with a matter so unimportant as the degree of originality which may or may not belong to any portion of my own speculations, but to obtain for an opinion which is opposed to reigning doctrines, the recommendation derived from a striking concurrence of sentiment between two inquirers entirely independent of one another. I embrace the opportunity of citing from a writer of the extensive acquirements in physical and metaphysical knowledge and the capacity of systematic thought which the article evinces, passages so remarkably in unison with my own views as the following:

"The truths of geometry are summed up and embodied in its definitions and axioms.... Let us turn to the axioms, and what do we find? A string of propositions concerning magnitude in the abstract, which are equally true of space, time, force, number, and every other magnitude susceptible of aggregation and

subdivision. Such propositions, where they are not mere definitions, as some of them are, carry their inductive origin on the face of their enunciation.... Those which declare that two straight lines can not inclose a space, and that two straight lines which cut one another can not both be parallel to a third, are in reality the only ones which express characteristic properties of space, and these it will be worth while to consider more nearly. Now the only clear notion we can form of straightness is uniformity of direction, for space in its ultimate analysis is nothing but an assemblage of distances and directions. And (not to dwell on the notion of continued contemplation, *i.e.*, mental experience, as included in the very idea of uniformity; nor on that of transfer of the contemplating being from point to point, and of experience, during such transfer, of the homogeneity of the interval passed over) we can not even propose the proposition in an intelligible form to any one whose experience ever since he was born has not assured him of the fact. The unity of direction, or that we can not march from a given point by more than one path direct to the same object, is matter of practical experience long before it can by possibility become matter of abstract thought. *We can not attempt mentally to exemplify the conditions of the assertion in an imaginary case opposed to it, without violating our habitual recollection of this experience, and defacing our mental picture of space as grounded on it.* What but experience, we may ask, can possibly assure us of the homogeneity of the parts of distance, time, force, and measurable aggregates in general, on which the truth of the other axioms depends? As regards the latter axiom, after what has been said it must be clear that the very same course of remarks equally applies to its case, and that its truth is quite as much forced on the mind as that of the former by daily and hourly experience, ... *including always, be it observed, in our notion of experience, that which is gained by contemplation of the inward picture which the mind forms to itself in any proposed case, or which it arbitrarily selects as an example--such picture, in virtue of the extreme simplicity of these primary relations, being called up by the imagination with as much vividness and clearness as could be done by any external impression, which is the only meaning we can attach to the word intuition, as applied to such relations*."

And again, of the axioms of mechanics: "As we admit no such propositions, other than as truths inductively collected from observation, even in geometry itself, it can hardly be expected that, in a science of obviously contingent relations, we should acquiesce in a contrary view. Let us take one of these axioms and examine its evidence: for instance, that equal forces perpendicularly applied at the opposite ends of equal arms of a straight lever will balance each other. What but experience, we may ask, in the first place, can possibly inform us that a force so applied will have any tendency to turn the lever on its centre at all? or that force can be so transmitted along a rigid line perpendicular to its direction, as to act elsewhere in space than along its own line of action? Surely this is so far from being self-evident that it has even a paradoxical appearance, which is only to be removed by giving our lever thickness, material composition, and molecular powers. Again, we conclude, that the two forces, being equal and applied under precisely similar circumstances, must, if they exert any effort at all to turn the lever, exert equal and opposite efforts: but what *a priori* reasoning can possibly assure us that they *do* act under precisely similar circumstances? that points which differ in place *are* similarly circumstanced as regards the exertion of force? that universal space may not have relations to universal force--or, at all events, that the organization of the material universe may not be such as to place that portion of space occupied by it in such relations to the forces exerted in it, as may invalidate the absolute similarity of circumstances assumed? Or we may argue, what have we to do with the notion of angular movement in the lever at all? The case is one of rest, and of quiescent destruction of force by force. Now how is this destruction effected? Assuredly by the counter-pressure which supports the fulcrum. But would not this destruction equally arise, and by the same amount of counteracting force, if each force simply pressed its own half of the lever against the fulcrum? And what can assure us that it is not so, except removal of one or other force, and consequent tilting of the lever? The other fundamental axiom of statics, that the pressure on the point of support is the sum of the weights ... is merely a scientific transformation and more refined mode of stating a coarse and obvious result of universal experience, viz., that the weight of a rigid body is the same, handle it or suspend it in what position or by what point we will, and that whatever sustains it sustains its total weight. Assuredly, as Mr. Whewell justly remarks, 'No one probably ever made a trial for the purpose of showing that the pressure on the support is equal to the sum of the weights.' ... But it is precisely because in every action of his life from earliest infancy he has been continually making the trial, and seeing it made by every other living being about him, that he never dreams of staking its result on one additional attempt made

with scientific accuracy. This would be as if a man should resolve to decide by experiment whether his eyes were useful for the purpose of seeing, by hermetically sealing himself up for half an hour in a metal case."

On the "paradox of universal propositions obtained by experience," the same writer says: "If there be necessary and universal truths expressible in propositions of axiomatic simplicity and obviousness, and having for their subject-matter the elements of all our experience and all our knowledge, surely these are the truths which, if experience suggest to us any truths at all, it ought to suggest most readily, clearly, and unceasingly. If it were a truth, universal and necessary, that a net is spread over the whole surface of every planetary globe, we should not travel far on our own without getting entangled in its meshes, and making the necessity of some means of extrication an axiom of locomotion.... There is, therefore, nothing paradoxical, but the reverse, in our being led by observation to a recognition of such truths, as *general* propositions, co-extensive at least with all human experience. That they pervade all the objects of experience, must insure their continual suggestion *by* experience; that they are true, must insure that consistency of suggestion, that iteration of uncontradicted assertion, which commands implicit assent, and removes all occasion of exception; that they are simple, and admit of no misunderstanding, must secure their admission by every mind."

"A truth, necessary and universal, relative to any object of our knowledge, must verify itself in every instance where that object is before our contemplation, and if at the same time it be simple and intelligible, its verification must be obvious. *The sentiment of such a truth can not, therefore, but be present to our minds whenever that object is contemplated, and must therefore make a part of the mental picture or idea of that object which we may on any occasion summon before our imagination.... All propositions, therefore, become not only untrue but inconceivable*, if ... axioms be violated in their enunciation."

Another eminent mathematician had previously sanctioned by his authority the doctrine of the origin of geometrical axioms in experience. "Geometry is thus founded likewise on observation; but of a kind so familiar and obvious, that the primary notions which it furnishes might seem intuitive."--*Sir John Leslie*, quoted by Sir William Hamilton, *Discourses*, etc., p. 272.

91 Principles of Psychology.

92 Mr. Spencer is mistaken in supposing me to claim any peculiar "necessity" for this axiom as compared with others. I have corrected the expressions which led him into that misapprehension of my meaning.

93 Mr. Spencer, in recently returning to the subject (Principles of Psychology, new edition, chap. xii.: "The Test of Relative Validity"), makes two answers to the preceding remarks. One is:

"Were an argument formed by repeating the same proposition over and over again, it would be true that any intrinsic fallibility of the postulate would not make the conclusion more untrustworthy than the first step. But an argument consists of unlike propositions. Now, since Mr. Mill's criticism on the Universal Postulate is that in some cases, which he names, it has proved to be an untrustworthy test; it follows that in any argument consisting of heterogeneous propositions, there is a risk, increasing as the number of propositions increases, that some one of them belongs to this class of cases, and is wrongly accepted because of the inconceivableness of its negation."

No doubt: but this supposes new *premises* to be taken in. The point we are discussing is the fallibility not of the premises, but of the reasoning, as distinguished from the premises. Now the validity of the reasoning depends always upon the same axiom, repeated (in thought) "over and over again," viz., that whatever has a mark, has what it is a mark of. Even, therefore, on the assumption that this axiom rests ultimately on the Universal Postulate, and that, the Postulate not being wholly trustworthy, the axiom may be one of the cases of its failure; all the risk there is of this is incurred at the very first step of the reasoning, and is not added to, however long may be the series of subsequent steps.

I am here arguing, of course, from Mr. Spencer's point of view. From my own the case is still clearer; for, in my view, the truth that whatever has a mark has what it is a mark of, is wholly trustworthy, and derives none of its evidence from so very untrustworthy a test as the inconceivability of the negative.

Mr. Spencer's second answer is valid up to a certain point; it is, that every prolongation of the process involves additional chances of casual error, from carelessness in the reasoning operation. This is an important consideration in the private speculations of an individual reasoner; and even with respect to mankind at large, it must be admitted that, though mere oversights in the syllogistic process, like errors of addition in an account, are special to the individual, and seldom escape detection, confusion of thought produced (for example) by ambiguous terms has led whole nations or ages to accept fallacious reasoning as valid. But this very fact points to causes of error so much more dangerous than the mere length of the process, as quite to vitiate the doctrine that the "test of the relative validities of conflicting conclusions" is the number of times the fundamental postulate is involved. On the contrary, the subjects on which the trains of reasoning are longest, and the assumption, therefore, oftenest repeated, are in general those which are best fortified against the really formidable causes of fallacy; as in the example already given of mathematics.

94 Mr. Spencer makes a distinction between conceiving myself looking into darkness, and conceiving *that I am* then and there looking into darkness. To me it seems that this change of the expression to the form *I am*, just marks the transition from conception to belief, and that the phrase "to conceive that *I am*," or "that any thing *is*," is not consistent with using the word conceive in its rigorous sense.

95 I have myself accepted the contest, and fought it out on this battle-ground, in the eleventh chapter of *An Examination of Sir William Hamilton's Philosophy.*

96 Chap. xi.

97 In one of the three cases, Mr. Spencer, to my no small surprise, thinks that the belief of mankind "can not be rightly said to have undergone" the change I allege. Mr. Spencer himself still thinks we are unable to conceive gravitation acting through empty space. "If an astronomer avowed that he could conceive gravitative force as exercised through space absolutely void, my private opinion would be that he mistook the nature of conception. Conception implies representation. Here the elements of the representation are the two bodies and an agency by which either affects the other. To conceive this agency is to represent it in some terms derived from our experiences--that is, from our sensations. As this agency gives us no sensations, we are obliged (if we try to conceive it) to use symbols idealized from our sensations--imponderable units forming a medium."

If Mr. Spencer means that the action of gravitation gives us no sensations, the assertion is one than which I have not seen, in the writings of philosophers, many more startling. What other sensation do we need than the sensation of one body moving toward another? "The elements of the representation" are not two bodies and an "agency," but two bodies and an effect; viz., the fact of their approaching one another. If we are able to conceive a vacuum, is there any difficulty in conceiving a body falling to the earth through it?

98 Discussions, etc., 2d ed., p. 624.

99 Professor Bain (*Logic*, i., 16) identifies the Principle of Contradiction with his Law of Relativity, viz., that "every thing that can be thought of, every affirmation that can be made, has an opposite or counter notion or affirmation;" a proposition which is one of the general results of the whole body of human experience. For further considerations respecting the axioms of Contradiction and Excluded Middle, see the twenty-first chapter of *An Examination of Sir William Hamilton's Philosophy*.

100 Dr. Whewell thinks it improper to apply the term Induction to any operation not terminating in the establishment of a general truth. Induction, he says (*Philosophy of Discovery*, p. 245), "is not the same thing as experience and observation. Induction is experience or observation *consciously* looked at in a *general* form.

This consciousness and generality are necessary parts of that knowledge which is science." And he objects (p. 241) to the mode in which the word Induction is employed in this work, as an undue extension of that term "not only to the cases in which the general induction is consciously applied to a particular instance, but to the cases in which the particular instance is dealt with by means of experience in that rude sense in which experience can be asserted of brutes, and in which of course we can in no way imagine that the law is possessed or understood as a general proposition." This use of the term he deems a "confusion of knowledge with practical tendencies."

I disclaim, as strongly as Dr. Whewell can do, the application of such terms as induction, inference, or reasoning, to operations performed by mere instinct, that is, from an animal impulse, without the exertion of any intelligence. But I perceive no ground for confining the use of those terms to cases in which the inference is drawn in the forms and with the precautions required by scientific propriety. To the idea of Science, an express recognition and distinct apprehension of general laws as such, is essential: but nine-tenths of the conclusions drawn from experience in the course of practical life, are drawn without any such recognition: they are direct inferences from known cases, to a case supposed to be similar. I have endeavored to show that this is not only as legitimate an operation, but substantially the same operation, as that of ascending from known cases to a general proposition; except that the latter process has one great security for correctness which the former does not possess. In science, the inference must necessarily pass through the intermediate stage of a general proposition, because Science wants its conclusions for record, and not for instantaneous use. But the inferences drawn for the guidance of practical affairs, by persons who would often be quite incapable of expressing in unexceptionable terms the corresponding generalizations, may and frequently do exhibit intellectual powers quite equal to any which have ever been displayed in science; and if these inferences are not inductive, what are they? The limitation imposed on the term by Dr. Whewell seems perfectly arbitrary; neither justified by any fundamental distinction between what he includes and what he desires to exclude, nor sanctioned by usage, at least from the time of Reid and Stewart, the principal legislators (as far as the English language is concerned) of modern metaphysical terminology.

101 Supra, p. 145.

102 Novum Organum Renovatum, pp. 72, 73.

103 Novum Organum Renovatum, p. 32.

104 Cours de Philosophie Positive, vol. ii., p. 202.

105 Dr. Whewell, in his reply, contests the distinction here drawn, and maintains, that not only different descriptions, but different explanations of a phenomenon, may all be true. Of the three theories respecting the motions of the heavenly bodies, he says (*Philosophy of Discovery*, p. 231): "Undoubtedly all these explanations may be true and consistent with each other, and would be so if each had been followed out so as to show in what manner it could be made consistent with the facts. And this was, in reality, in a great measure done. The doctrine that the heavenly bodies were moved by vortices was successfully modified, so that it came to coincide in its results with the doctrine of an inverse-quadratic centripetal force.... When this point was reached, the vortex was merely a machinery, well or ill devised, for producing such a centripetal force, and therefore did not contradict the doctrine of a centripetal force. Newton himself does not appear to have been averse to explaining gravity by impulse. So little is it true that if one theory be true the other must be false. The attempt to explain gravity by the impulse of streams of particles flowing through the universe in all directions, which I have mentioned in the *Philosophy*, is so far from being inconsistent with the Newtonian theory, that it is founded entirely upon it. And even with regard to the doctrine, that the heavenly bodies move by an inherent virtue; if this doctrine had been maintained in any such way that it was brought to agree with the facts, the inherent virtue must have had its laws determined; and then it would have been found that the virtue had a reference to the central body; and so, the 'inherent virtue' must have coincided in its effect with the Newtonian force; and then, the two explanations would agree, except so far as the word 'inherent' was

concerned. And if such a part of an earlier theory as this word *inherent* indicates, is found to be untenable, it is of course rejected in the transition to later and more exact theories, in Inductions of this kind, as well as in what Mr. Mill calls Descriptions. There is, therefore, still no validity discoverable in the distinction which Mr. Mill attempts to draw between descriptions like Kepler's law of elliptical orbits, and other examples of induction."

If the doctrine of vortices had meant, not that vortices existed, but only that the planets moved *in the same manner* as if they had been whirled by vortices; if the hypothesis had been merely a mode of representing the facts, not an attempt to account for them; if, in short, it had been only a Description; it would, no doubt, have been reconcilable with the Newtonian theory. The vortices, however, were not a mere aid to conceiving the motions of the planets, but a supposed physical agent, actively impelling them; a material fact, which might be true or not true, but could not be both true and not true. According to Descartes's theory it was true, according to Newton's it was not true. Dr. Whewell probably means that since the phrases, centripetal and projectile force, do not declare the nature but only the direction of the forces, the Newtonian theory does not absolutely contradict any hypothesis which may be framed respecting the mode of their production. The Newtonian theory, regarded as a mere *description* of the planetary motions, does not; but the Newtonian theory as an *explanation* of them does. For in what does the explanation consist? In ascribing those motions to a general law which obtains between all particles of matter, and in identifying this with the law by which bodies fall to the ground. If the planets are kept in their orbits by a force which draws the particles composing them toward every other particle of matter in the solar system, they are not kept in those orbits by the impulsive force of certain streams of matter which whirl them round. The one explanation absolutely excludes the other. Either the planets are not moved by vortices, or they do not move by a law common to all matter. It is impossible that both opinions can be true. As well might it be said that there is no contradiction between the assertions, that a man died because somebody killed him, and that he died a natural death.

So, again, the theory that the planets move by a virtue inherent in their celestial nature, is incompatible with either of the two others: either that of their being moved by vortices, or that which regards them as moving by a property which they have in common with the earth and all terrestrial bodies. Dr. Whewell says that the theory of an inherent virtue agrees with Newton's when the word inherent is left out, which of course it would be (he says) if "found to be untenable." But leave that out, and where is the theory? The word inherent *is* the theory. When that is omitted, there remains nothing except that the heavenly bodies move "by a virtue," *i.e.*, by a power of some sort; or by virtue of their celestial nature, which directly contradicts the doctrine that terrestrial bodies fall by the same law.

If Dr. Whewell is not yet satisfied, any other subject will serve equally well to test his doctrine. He will hardly say that there is no contradiction between the emission theory and the undulatory theory of light; or that there can be both one and two electricities; or that the hypothesis of the production of the higher organic forms by development from the lower, and the supposition of separate and successive acts of creation, are quite reconcilable; or that the theory that volcanoes are fed from a central fire, and the doctrines which ascribe them to chemical action at a comparatively small depth below the earth's surface, are consistent with one another, and all true as far as they go.

If different explanations of the same fact can not both be true, still less, surely, can different predictions. Dr. Whewell quarrels (on what ground it is not necessary here to consider) with the example I had chosen on this point, and thinks an objection to an illustration a sufficient answer to a theory. Examples not liable to his objection are easily found, if the proposition that conflicting predictions can not both be true, can be made clearer by many examples. Suppose the phenomenon to be a newly-discovered comet, and that one astronomer predicts its return once in every 300 years--another once in every 400: can they both be right? When Columbus predicted that by sailing constantly westward he should in time return to the point from which he set out, while others asserted that he could never do so except by turning back, were both he and his opponents true prophets? Were the predictions which foretold the wonders of railways and steamships, and those which averred that the Atlantic could never be crossed by steam navigation, nor a railway train

propelled ten miles an hour, both (in Dr. Whewell's words) "true, and consistent with one another?"

Dr. Whewell sees no distinction between holding contradictory opinions on a question of fact, and merely employing different analogies to facilitate the conception of the same fact. The case of different Inductions belongs to the former class, that of different Descriptions to the latter.

106 Phil. of Discov., p. 256.

107 Essays on the Pursuit of Truth.

108 In the first edition a note was appended at this place, containing some criticism on Archbishop Whately's mode of conceiving the relation between Syllogism and Induction. In a subsequent issue of his *Logic*, the Archbishop made a reply to the criticism, which induced me to cancel part of the note, incorporating the remainder in the text. In a still later edition, the Archbishop observes in a tone of something like disapprobation, that the objections, "doubtless from their being fully answered and found untenable, were silently suppressed," and that hence he might appear to some of his readers to be combating a shadow. On this latter point, the Archbishop need give himself no uneasiness. His readers, I make bold to say, will fully credit his mere affirmation that the objections have actually been made.

But as he seems to think that what he terms the suppression of the objections ought not to have been made "silently," I now break that silence, and state exactly what it is that I suppressed, and why. I suppressed that alone which might be regarded as personal criticism on the Archbishop. I had imputed to him the having omitted to ask himself a particular question. I found that he had asked himself the question, and could give it an answer consistent with his own theory. I had also, within the compass of a parenthesis, hazarded some remarks on certain general characteristics of Archbishop Whately as a philosopher. These remarks, though their tone, I hope, was neither disrespectful nor arrogant, I felt, on reconsideration, that I was hardly entitled to make; least of all, when the instance which I had regarded as an illustration of them, failed, as I now saw, to bear them out. The real matter at the bottom of the whole dispute, the different view we take of the function of the major premise, remains exactly where it was; and so far was I from thinking that my opinion had been fully "answered" and was "untenable," that in the same edition in which I canceled the note, I not only enforced the opinion by further arguments, but answered (though without naming him) those of the Archbishop.

For not having made this statement before, I do not think it needful to apologize. It would be attaching very great importance to one's smallest sayings, to think a formal retractation requisite every time that one falls into an error. Nor is Archbishop Whately's well-earned fame of so tender a quality as to require that in withdrawing a slight criticism on him I should have been bound to offer a public *amende* for having made it.

109 But though it is a condition of the validity of every induction that there be uniformity in the course of nature, it is not a necessary condition that the uniformity should pervade all nature. It is enough that it pervades the particular class of phenomena to which the induction relates. An induction concerning the motions of the planets, or the properties of the magnet, would not be vitiated though we were to suppose that wind and weather are the sport of chance, provided it be assumed that astronomical and magnetic phenomena are under the dominion of general laws. Otherwise the early experience of mankind would have rested on a very weak foundation; for in the infancy of science it could not be known that *all* phenomena are regular in their course.

Neither would it be correct to say that every induction by which we infer any truth, implies the general fact of uniformity *as foreknown*, even in reference to the kind of phenomena concerned. It implies, *either* that this general fact is already known, *or* that we may now know it: as the conclusion, the Duke of Wellington is mortal, drawn from the instances A, B, and C, implies either that we have already concluded all men to be mortal, or that we are now entitled to do so from the same evidence. A vast amount of confusion and

paralogism respecting the grounds of Induction would be dispelled by keeping in view these simple considerations.

110 Infra, chap. xxi.

111 Infra, chap. xxi., xxii.

112 In strictness, wherever the present constitution of space exists; which we have ample reason to believe that it does in the region of the fixed stars.

113 Dr. Whewell (*Phil. of Discov.*, p. 246) will not allow these and similar erroneous judgments to be called inductions; inasmuch as such superstitious fancies "were not collected from the facts by seeking a law of their occurrence, but were suggested by an imagination of the anger of superior powers, shown by such deviations from the ordinary course of nature." I conceive the question to be, not in what manner these notions were at first suggested, but by what evidence they have, from time to time, been supposed to be substantiated. If the believers in these erroneous opinions had been put on their defense, they would have referred to experience: to the comet which preceded the assassination of Julius Cæsar, or to oracles and other prophecies known to have been fulfilled. It is by such appeals to facts that all analogous superstitions, even in our day, attempt to justify themselves; the supposed evidence of experience is necessary to their hold on the mind. I quite admit that the influence of such coincidences would not be what it is, if strength were not lent to it by an antecedent presumption; but this is not peculiar to such cases; preconceived notions of probability form part of the explanation of many other cases of belief on insufficient evidence. The *a priori* prejudice does not prevent the erroneous opinion from being sincerely regarded as a legitimate conclusion from experience; though it improperly predisposes the mind to that interpretation of experience.

Thus much in defense of the sort of examples objected to. But it would be easy to produce instances, equally adapted to the purpose, and in which no antecedent prejudice is at all concerned. "For many ages," says Archbishop Whately, "all farmers and gardeners were firmly convinced--and convinced of their knowing it by experience--that the crops would never turn out good unless the seed were sown during the increase of the moon." This was induction, but bad induction; just as a vicious syllogism is reasoning, but bad reasoning.

114 The assertion, that any and every one of the conditions of a phenomenon may be and is, on some occasions and for some purposes, spoken of as the cause, has been disputed by an intelligent reviewer of this work in the *Prospective Review* (the predecessor of the justly esteemed *National Review*), who maintains that "we always apply the word cause rather to that element in the antecedents which exercises *force*, and which would *tend* at all times to produce the same or a similar effect to that which, under certain conditions, it would actually produce." And he says, that "every one would feel" the expression, that the cause of a surprise was the sentinel's being off his post, to be incorrect; but that the "allurement or force which *drew* him off his post, might be so called, because in doing so it removed a resisting power which would have prevented the surprise." I can not think that it would be wrong to say, that the event took place because the sentinel was absent, and yet right to say that it took place because he was bribed to be absent. Since the only direct effect of the bribe was his absence, the bribe could be called the remote cause of the surprise, only on the supposition that the absence was the proximate cause; nor does it seem to me that any one (who had not a theory to support) would use the one expression and reject the other.

The reviewer observes, that when a person dies of poison, his possession of bodily organs is a necessary condition, but that no one would ever speak of it as the cause. I admit the fact; but I believe the reason to be, that the occasion could never arise for so speaking of it; for when in the inaccuracy of common discourse we are led to speak of some one condition of a phenomenon as its cause, the condition so spoken of is always one which it is at least possible that the hearer may require to be informed of. The possession of bodily organs is a known condition, and to give that as the answer, when asked the cause of a person's death, would not supply the information sought. Once conceive that a doubt could exist as to his having bodily organs, or that he were

to be compared with some being who had them not, and cases may be imagined in which it might be said that his possession of them was the cause of his death. If Faust and Mephistopheles together took poison, it might be said that Faust died because he was a human being, and had a body, while Mephistopheles survived because he was a spirit.

It is for the same reason that no one (as the reviewer remarks) "calls the cause of a leap, the muscles or sinews of the body, though they are necessary conditions; nor the cause of a self-sacrifice, the knowledge which was necessary for it; nor the cause of writing a book, that a man has time for it, which is a necessary condition." These conditions (besides that they are antecedent *states*, and not proximate antecedent *events*, and are therefore never the conditions in closest apparent proximity to the effect) are all of them so obviously implied, that it is hardly possible there should exist that necessity for insisting on them, which alone gives occasion for speaking of a single condition as if it were the cause. Wherever this necessity exists in regard to some one condition, and does not exist in regard to any other, I conceive that it is consistent with usage, when scientific accuracy is not aimed at, to apply the name cause to that one condition. If the only condition which can be supposed to be unknown is a negative condition, the negative condition may be spoken of as the cause. It might be said that a person died for want of medical advice: though this would not be likely to be said, unless the person was already understood to be ill, and in order to indicate that this negative circumstance was what made the illness fatal, and not the weakness of his constitution, or the original virulence of the disease. It might be said that a person was drowned because he could not swim; the positive condition, namely, that he fell into the water, being already implied in the word drowned. And here let me remark, that his falling into the water is in this case the only positive condition: all the conditions not expressly or virtually included in this (as that he could not swim, that nobody helped him, and so forth) are negative. Yet, if it were simply said that the cause of a man's death was falling into the water, there would be quite as great a sense of impropriety in the expression, as there would be if it were said that the cause was his inability to swim; because, though the one condition is positive and the other negative, it would be felt that neither of them was sufficient, without the other, to produce death.

With regard to the assertion that nothing is termed the cause, except the element which exerts active force; I waive the question as to the meaning of active force, and accepting the phrase in its popular sense, I revert to a former example, and I ask, would it be more agreeable to custom to say that a man fell because his foot slipped in climbing a ladder, or that he fell because of his weight? for his weight, and not the motion of his foot, was the active force which determined his fall. If a person walking out in a frosty day, stumbled and fell, it might be said that he stumbled because the ground was slippery, or because he was not sufficiently careful: but few people, I suppose, would say, that he stumbled because he walked. Yet the only active force concerned was that which he exerted in walking: the others were mere negative conditions; but they happened to be the only ones which there could be any necessity to state; for he walked, most likely, in exactly his usual manner, and the negative conditions made all the difference. Again, if a person were asked why the army of Xerxes defeated that of Leonidas, he would probably say, because they were a thousand times the number; but I do not think he would say, it was because they fought, though that was the element of active force. To borrow another example, used by Mr. Grove and by Mr. Baden Powell, the opening of flood-gates is said to be the cause of the flow of water; yet the active force is exerted by the water itself, and opening the flood-gates merely supplies a negative condition. The reviewer adds, "There are some conditions absolutely passive, and yet absolutely necessary to physical phenomena, viz., the relations of space and time; and to these no one ever applies the word cause without being immediately arrested by those who hear him." Even from this statement I am compelled to dissent. Few persons would feel it incongruous to say (for example) that a secret became known because it was spoken of when A. B. was within hearing; which is a condition of space: or that the cause why one of two particular trees is taller than the other, is that it has been longer planted; which is a condition of time.

115 There are a few exceptions; for there are some properties of objects which seem to be purely preventive; as the property of opaque bodies, by which they intercept the passage of light. This, as far as we are able to understand it, appears an instance not of one cause counteracting another by the same law whereby it produces

its own effects, but of an agency which manifests itself in no other way than in defeating the effects of another agency. If we knew on what other relations to light, or on what peculiarities of structure, opacity depends, we might find that this is only an apparent, not a real, exception to the general proposition in the text. In any case it needs not affect the practical application. The formula which includes all the negative conditions of an effect in the single one of the absence of counteracting causes, is not violated by such cases as this; though, if all counteracting agencies were of this description, there would be no purpose served by employing the formula.

116 I mean by this expression, the ultimate laws of nature (whatever they may be) as distinguished from the derivative laws and from the collocations. The diurnal revolution of the earth (for example) is not a part of the constitution of things, because nothing can be so called which might possibly be terminated or altered by natural causes.

117 I use the words "straight line" for brevity and simplicity. In reality the line in question is not exactly straight, for, from the effect of refraction, we actually see the sun for a short interval during which the opaque mass of the earth is interposed in a direct line between the sun and our eyes; thus realizing, though but to a limited extent, the coveted desideratum of seeing round a corner.

118 Second Burnett Prize Essay, by Principal Tulloch, p. 25.

119 Letters on the Philosophy of the Human Mind, First Series, p. 219.

120 Essays, pp. 206-208.

121 To the universality which mankind are agreed in ascribing to the Law of Causation, there is one claim of exception, one disputed case, that of the Human Will; the determinations of which, a large class of metaphysicians are not willing to regard as following the causes called motives, according to as strict laws as those which they suppose to exist in the world of mere matter. This controverted point will undergo a special examination when we come to treat particularly of the Logic of the Moral Sciences (Book vi., chap. 2). In the mean time, I may remark that these metaphysicians, who, it must be observed, ground the main part of their objection on the supposed repugnance of the doctrine in question to our consciousness, seem to me to mistake the fact which consciousness testifies against. What is really in contradiction to consciousness, they would, I think, on strict self-examination, find to be, the application to human actions and volitions of the ideas involved in the common use of the term Necessity; which I agree with them in objecting to. But if they would consider that by saying that a person's actions *necessarily* follow from his character, all that is really meant (for no more is meant in any case whatever of causation) is that he invariably *does* act in conformity to his character, and that any one who thoroughly knew his character could certainly predict how he would act in any supposable case; they probably would not find this doctrine either contrary to their experience or revolting to their feelings. And no more than this is contended for by any one but an Asiatic fatalist.

122 I believe, however, the accredited authorities do suppose that molecular motion, equivalent in amount to that which will be manifested in the combustion of the coal, is actually taking place during the whole of the long interval, if not in the coal, yet in the oxygen which will then combine with it. But how purely hypothetical this supposition is, need hardly be remarked; I venture to say, unnecessarily and extravagantly hypothetical.

123 Lectures on Metaphysics, vol. ii., Lect. xxxix., pp. 391-2.

I regret that I can not invoke the authority of Sir William Hamilton in favor of my own opinions on Causation, as I can against the particular theory which I am now combating. But that acute thinker has a theory of Causation peculiar to himself, which has never yet, as far as I know, been analytically examined, but which, I venture to think, admits of as complete refutation as any one of the false or insufficient psychological theories

which strew the ground in such numbers under his potent metaphysical scythe. (Since examined and controverted in the sixteenth chapter of *An Examination of Sir William Hamilton's Philosophy*.)

124 Unless we are to consider as such the following statement, by one of the writers quoted in the text: "In the case of mental exertion, the result to be accomplished is *preconsidered* or meditated, and is therefore known *a priori*, or before experience."--(Bowen's *Lowell Lectures on the Application of Metaphysical and Ethical Science to the Evidence of Religion*. Boston, 1849.) This is merely saying that when we will a thing we have an idea of it. But to have an idea of what we wish to happen, does not imply a prophetic knowledge that it will happen. Perhaps it will be said that the *first time* we exerted our will, when we had of course no experience of any of the powers residing in us, we nevertheless must already have known that we possessed them, since we can not will that which we do not believe to be in our power. But the impossibility is perhaps in the words only, and not in the facts; for we may *desire* what we do not know to be in our power; and finding by experience that our bodies move according to our *desire*, we may then, and only then, pass into the more complicated mental state which is termed will.

After all, even if we had an instinctive knowledge that our actions would follow our will, this, as Brown remarks, would prove nothing as to the nature of Causation. Our knowing, previous to experience, that an antecedent will be followed by a certain consequent, would not prove the relation between them to be any thing more than antecedence and consequence.

125 Reid's *Essays on the Active Powers*, Essay iv., chap. 3.

126 Prospective Review for February, 1850.

127 Vide supra, p. 178, note.

128 Westminster Review for October, 1855.

129 See the whole doctrine in Aristotle *de Ánimâ*, where the {~GREEK SMALL LETTER THETA~}{~GREEK SMALL LETTER RHO~}{~GREEK SMALL LETTER EPSILON~}{~GREEK SMALL LETTER PI~}{~GREEK SMALL LETTER TAU~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER KAPPA~}{~GREEK SMALL LETTER ETA WITH VARIA~} {~GREEK SMALL LETTER PSI~}{~GREEK SMALL LETTER UPSILON~}{~GREEK SMALL LETTER CHI~}{~GREEK SMALL LETTER ETA WITH VARIA~} is treated as exactly equivalent to {~GREEK SMALL LETTER THETA~}{~GREEK SMALL LETTER RHO~}{~GREEK SMALL LETTER EPSILON~}{~GREEK SMALL LETTER PI~}{~GREEK SMALL LETTER TAU~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER KAPPA~}{~GREEK SMALL LETTER ETA WITH VARIA~} {~GREEK SMALL LETTER DELTA~}{~GREEK SMALL LETTER UPSILON WITH OXIA~}{~GREEK SMALL LETTER NU~}{~GREEK SMALL LETTER ALPHA~}{~GREEK SMALL LETTER MU~}{~GREEK SMALL LETTER IOTA~}{~GREEK SMALL LETTER FINAL SIGMA~}.

130 It deserves notice that the parts of nature which Aristotle regards as representing evidence of design, are the Uniformities: the phenomena in so far as reducible to law. {~GREEK CAPITAL LETTER TAU~}{~GREEK SMALL LETTER UPSILON WITH OXIA~}{~GREEK SMALL LETTER CHI~}{~GREEK SMALL LETTER ETA~} and {~GREEK SMALL LETTER TAU~}{~GREEK SMALL LETTER OMICRON WITH VARIA~} {~GREEK SMALL LETTER ALPHA~}{~GREEK SMALL LETTER UPSILON WITH PSILI~}{~GREEK SMALL LETTER TAU~}{~GREEK SMALL LETTER OMICRON~}{~GREEK SMALL LETTER MU~}{~GREEK SMALL LETTER ALPHA WITH OXIA~}{~GREEK SMALL LETTER TAU~}{~GREEK SMALL LETTER OMICRON~}{~GREEK SMALL LETTER NU~} satisfy him as explanations of the variable element in phenomena, but their occurring according to a fixed rule can only, to his conceptions, be accounted for by an Intelligent Will. The common, or what may be called the instinctive, religious interpretation of nature, is the reverse of this. The

events in which men spontaneously see the hand of a supernatural being, are those which can not, as they think, be reduced to a physical law. What they can distinctly connect with physical causes, and especially what they can predict, though of course ascribed to an Author of Nature, if they already recognize such an author, might be conceived, they think, to arise from a blind fatality, and in any case do not appear to them to bear so obviously the mark of a divine will. And this distinction has been countenanced by eminent writers on Natural Theology, in particular by Dr. Chalmers, who thinks that though design is present everywhere, the irresistible evidence of it is to be found not in the *laws* of nature but in the collocations, *i.e.*, in the part of nature in which it is impossible to trace any law. A few properties of dead matter might, he thinks, conceivably account for the regular and invariable succession of effects and causes; but that the different kinds of matter have been so placed as to promote beneficent ends, is what he regards as the proof of a Divine Providence. Mr. Baden Powell, in his Essay entitled "Philosophy of Creation," has returned to the point of view of Aristotle and the ancients, and vigorously re-asserts the doctrine that the indication of design in the universe is not special adaptations, but Uniformity and Law, these being the evidences of mind, and not what appears to us to be a provision for our uses. While I decline to express any opinion here on this *vexata quæstio*, I ought not to mention Mr. Powell's volume without the acknowledgment due to the philosophic spirit which pervades generally the three Essays composing it, forming in the case of one of them (the "Unity of Worlds") an honorable contrast with the other dissertations, so far as they have come under my notice, which have appeared on either side of that controversy.

131 In the words of Fontenelle, another celebrated Cartesian, "les philosophes aussi bien que le peuple avaient cru que l'âme et le corps agissaient réellement et physiquement l'un sur l'autre. Descartes vint, qui prouva que leur nature ne permettait point cette sorte de communication véritable, et qu'ils n'en pouvaient avoir qu'une apparente, dont Dieu était le Médiateur."--(*OEuvres de Fontenelle*, ed. 1767, tom. v., p. 534.)

132 I omit, for simplicity, to take into account the effect, in this latter case, of the diminution of pressure, in diminishing the flow of water through the drain; which evidently in no way affects the truth or applicability of the principle, since when the two causes act simultaneously the conditions of that diminution of pressure do not arise.

133 Professor Bain adds several other well-established chemical generalizations: "The laws that simple substances exhibit the strongest affinities; that compounds are more fusible than their elements; that combination tends to a lower state of matter from gas down to solid;" and some general propositions concerning the circumstances which facilitate or resist chemical combination. (Logic, ii., 254.)

134 Professor Bain (Logic, ii., 39) points out a class of cases, other than that spoken of in the text, which he thinks must be regarded as an exception to the Composition of Causes. "Causes that merely make good the collocation for bringing a prime mover into action, or that release a potential force, do not follow any such rule. One man may direct a gun upon a fort as well as three: two sparks are not more effectual than one in exploding a barrel of gunpowder. In medicine there is a certain dose that answers the end; and adding to it does no more good."

I am not sure that these cases are really exceptions. The law of Composition of Causes, I think, is really fulfilled, and the appearance to the contrary is produced by attending to the remote instead of the immediate effect of the causes. In the cases mentioned, the immediate effect of the causes in action is a collocation, and the duplication of the cause does double the quantity of collocation. Two men could raise the gun to the required angle twice as quickly as one, though one is enough. Two sparks put two sets of particles of the gunpowder into the state of intestine motion which makes them explode, though one is sufficient. It is the collocation itself that does not, by being doubled, always double the effect; because in many cases a certain collocation, once obtained, is all that is required for the production of the whole amount of effect which can be produced at all at the given time and place. Doubling the collocation with difference of time and place, as by pointing two guns, or exploding a second barrel after the first, does double the effect. This remark applies still more to Mr. Bain's third example, that of a double dose of medicine; for a double dose of an aperient does

purge more violently, and a double dose of laudanum does produce longer and sounder sleep. But a double purging, or a double amount of narcotism, may have remote effects different in kind from the effect of the smaller amount, reducing the case to that of heteropathic laws, discussed in the text.

135 Unless, indeed, the consequent was generated, not by the antecedent, but by the means employed to produce the antecedent. As, however, these means are under our power, there is so far a probability that they are also sufficiently within our knowledge to enable us to judge whether that could be the case or not.

136 Discourse on the Study of Natural Philosophy, p. 179.

137 For this speculation, as for many other of my scientific illustrations, I am indebted to Professor Bain, whose subsequent treatise on Logic abounds with apt illustrations of all the inductive methods.

138 This view of the necessary co-existence of opposite excitements involves a great extension of the original doctrine of two electricities. The early theorists assumed that, when amber was rubbed, the amber was made positive and the rubber negative to the same degree; but it never occurred to them to suppose that the existence of the amber charge was dependent on an opposite charge in the bodies with which the amber was contiguous, while the existence of the negative charge on the rubber was equally dependent on a contrary state of the surfaces that might accidentally be confronted with it; that, in fact, in a case of electrical excitement by friction, four charges were the minimum that could exist. But this double electrical action is essentially implied in the explanation now universally adopted in regard to the phenomena of the common electric machine.

139 Pp. 110, 111.

140 Infra, book iv., chap. ii., On Abstraction.

141 I must, however, remark, that this example, which seems to militate against the assertion we made of the comparative inapplicability of the Method of Difference to cases of pure observation, is really one of those exceptions which, according to a proverbial expression, prove the general rule. For in this case, in which Nature, in her experiment, seems to have imitated the type of the experiments made by man, she has only succeeded in producing the likeness of man's most imperfect experiments; namely, those in which, though he succeeds in producing the phenomenon, he does so by employing complex means, which he is unable perfectly to analyze, and can form, therefore, no sufficient judgment what portion of the effects may be due, not to the supposed cause, but to some unknown agency of the means by which that cause was produced. In the natural experiment which we are speaking of, the means used was the clearing off a canopy of clouds; and we certainly do not know sufficiently in what this process consists, or on what it depends, to be certain *a priori* that it might not operate upon the deposition of dew independently of any thermometric effect at the earth's surface. Even, therefore, in a case so favorable as this to Nature's experimental talents, her experiment is of little value except in corroboration of a conclusion already attained through other means.

142 In his subsequent work, *Outlines of Astronomy* (§ 570), Sir John Herschel suggests another possible explanation of the acceleration of the revolution of a comet.

143 Discourse, pp. 156-8, and 171.

144 Outlines of Astronomy, § 856.

145 Philosophy of Discovery, pp. 263, 264.

146 See, on this point, the second chapter of the present book.

147 Ante, chap. vii., § 1.

148 It seems hardly necessary to say that the word *impinge*, as a general term to express collision of forces, is here used by a figure of speech, and not as expressive of any theory respecting the nature of force.

149 Essays on some Unsettled Questions of Political Economy, Essay V.

150 It is justly remarked by Professor Bain, that though the Methods of Agreement and Difference are not applicable to these cases, they are not wholly inaccessible to the Method of Concomitant Variations. "If a cause happens to vary alone, the effect will also vary alone: a cause and effect may be thus singled out under the greatest complications. Thus, when the appetite for food increases with the cold, we have a strong evidence of connection between these two facts, although other circumstances may operate in the same direction. The assigning of the respective parts of the sun and moon in the action of the tides may be effected, to a certain degree of exactness, by the variations of the amount according to the positions of the two attractive bodies. By a series of experiments of Concomitant Variations, directed to ascertain the elimination of nitrogen from the human body under varieties of muscular exercise, Dr. Parkes obtained the remarkable conclusion, that a muscle grows during exercise, and loses bulk during the subsequent rest." (*Logic*, ii., 83.)

It is, no doubt, often possible to single out the influencing causes from among a great number of mere concomitants, by noting what are the antecedents, a variation in which is followed by a variation in the effect. But when there are many influencing causes, no one of them greatly predominating over the rest, and especially when some of these are continually changing, it is scarcely ever possible to trace such a relation between the variations of the effect and those of any one cause as would enable us to assign to that cause its real share in the production of the effect.

151 Bain's *Logic*, ii., 360.

152 What is said in the text on the applicability of the experimental methods to resolve particular questions of medical treatment, does not detract from their efficacy in ascertaining the general laws of the animal or human system. The functions, for example, of the different classes of nerves have been discovered, and probably could only have been discovered, by experiments on living animals. Observation and experiment are the ultimate basis of all knowledge: from them we obtain the elementary laws of life, as we obtain all other elementary truths. It is in dealing with the complex combinations that the experimental methods are for the most part illusory, and the deductive mode of investigation must be invoked to disentangle the complexity.

153 Professor Bain, though concurring generally in the views expressed in this chapter, seems to estimate more highly than I do the scope for specific experimental evidence in politics. (*Logic*, ii., 333-337.) There are, it is true, as he remarks (p. 336), some cases "when an agent suddenly introduced is almost instantaneously followed by some other changes, as when the announcement of a diplomatic rupture between two nations is followed the same day by a derangement of the money-market." But this experiment would be quite inconclusive merely as an experiment. It can only serve, as any experiment may, to verify the conclusion of a deduction. Unless we already knew by our knowledge of the motives which act on business men, that the prospect of war *tends* to derange the money-market, we should never have been able to prove a connection between the two facts, unless after having ascertained historically that the one followed the other in too great a number of instances to be consistent with their having been recorded with due precautions. Whoever has carefully examined any of the attempts continually made to prove economic doctrines by such a recital of instances, knows well how futile they are. It always turns out that the circumstances of scarcely any of the cases have been fully stated; and that cases, in equal or greater numbers, have been omitted which would have tended to an opposite conclusion.

154 Vide Memoir by Thomas Graham, F.R.S., Master of the Mint, "On Liquid Diffusion applied to Analysis," in the *Philosophical Transactions* for 1862, reprinted in the *Journal of the Chemical Society*, and also

separately as a pamphlet.

155 It was an old generalization in surgery, that tight bandaging had a tendency to prevent or dissipate local inflammation. This sequence, being, in the progress of physiological knowledge, resolved into more general laws, led to the important surgical invention made by Dr. Arnott, the treatment of local inflammation and tumors by means of an equable pressure, produced by a bladder partially filled with air. The pressure, by keeping back the blood from the part, prevents the inflammation, or the tumor, from being nourished: in the case of inflammation, it removes the stimulus, which the organ is unfit to receive; in the case of tumors, by keeping back the nutritive fluid, it causes the absorption of matter to exceed the supply, and the diseased mass is gradually absorbed and disappears.

156 Since acknowledged and reprinted in Mr. Martineau's *Miscellanies*.

157 Dissertations and Discussions, vol. i., fourth paper.

158 Written before the rise of the new views respecting the relation of heat to mechanical force; but confirmed rather than contradicted by them.

159 As is well remarked by Professor Bain, in the very valuable chapter of his Logic which treats of this subject (ii., 121), "scientific explanation and inductive generalization being the same thing, the limits of Explanation are the limits of Induction," and "the limits to inductive generalization are the limits to the agreement or community of facts. Induction supposes similarity among phenomena; and when such similarity is discovered, it reduces the phenomena under a common statement. The similarity of terrestrial gravity to celestial attraction enables the two to be expressed as one phenomenon. The similarity between capillary attraction, solution, the operation of cements, etc., leads to their being regarded not as a plurality, but as a unity, a single causative link, the operation of a single agency.... If it be asked whether we can merge gravity itself in some still higher law, the answer must depend upon the facts. Are there any other forces, at present held distinct from gravity, that we may hope to make fraternize with it, so as to join in constituting a higher unity? Gravity is an attractive force; and another great attractive force is cohesion, or the force that binds together the atoms of solid matter. Might we, then, join these two in a still higher unity, expressed under a more comprehensive law? Certainly we might, but not to any advantage. The two kinds of force agree in the one point, attraction, but they agree in no other; indeed, in the manner of the attraction, they differ widely; so widely that we should have to state totally distinct laws for each. Gravity is common to all matter, and equal in amount in equal masses of matter, whatever be the kind; it follows the law of the diffusion of space from a point (the inverse square of the distance); it extends to distances unlimited; it is indestructible and invariable. Cohesion is special for each separate substance; it decreases according to distance much more rapidly than the inverse square, vanishing entirely at very small distances. Two such forces have not sufficient kindred to be generalized into one force; the generalization is only illusory; the statement of the difference would still make two forces; while the consideration of one would not in any way simplify the phenomena of the other, as happened in the generalization of gravity itself."

To the impassable limit of the explanation of laws of nature, set forth in the text, must therefore be added a further limitation. Although, when the phenomena to be explained are not, in their own nature, generically distinct, the attempt to refer them to the same cause is scientifically legitimate; yet to the success of the attempt it is indispensable that the cause should be shown to be capable of producing them according to the same law. Otherwise the unity of cause is a mere guess, and the generalization only a nominal one, which, even if admitted, would not diminish the number of ultimate laws of nature.

160 Cours de Philosophie Positive, ii., 656.

161 Vide supra, book iii., chap. xi.

162 Philosophy of Discovery, p. 185 et seq.

163 Comte, *Philosophie Positive*, ii., 434-437.

164 As an example of legitimate hypothesis according to the test here laid down, has been justly cited that of Broussais, who, proceeding on the very rational principle that every disease must originate in some definite part or other of the organism, boldly assumed that certain fevers, which not being known to be local were called constitutional, had their origin in the mucous membrane of the alimentary canal. The supposition was, indeed, as is now generally admitted, erroneous; but he was justified in making it, since by deducing the consequences of the supposition, and comparing them with the facts of those maladies, he might be certain of disproving his hypothesis if it was ill founded, and might expect that the comparison would materially aid him in framing another more conformable to the phenomena.

The doctrine now universally received that the earth is a natural magnet, was originally an hypothesis of the celebrated Gilbert.

Another hypothesis, to the legitimacy of which no objection can lie, and which is well calculated to light the path of scientific inquiry, is that suggested by several recent writers, that the brain is a voltaic pile, and that each of its pulsations is a discharge of electricity through the system. It has been remarked that the sensation felt by the hand from the beating of a brain, bears a strong resemblance to a voltaic shock. And the hypothesis, if followed to its consequences, might afford a plausible explanation of many physiological facts, while there is nothing to discourage the hope that we may in time sufficiently understand the conditions of voltaic phenomena to render the truth of the hypothesis amenable to observation and experiment.

The attempt to localize, in different regions of the brain, the physical organs of our different mental faculties and propensities, was, on the part of its original author, a legitimate example of a scientific hypothesis; and we ought not, therefore, to blame him for the extremely slight grounds on which he often proceeded, in an operation which could only be tentative, though we may regret that materials barely sufficient for a first rude hypothesis should have been hastily worked up into the vain semblance of a science. If there be really a connection between the scale of mental endowments and the various degrees of complication in the cerebral system, the nature of that connection was in no other way so likely to be brought to light as by framing, in the first instance, an hypothesis similar to that of Gall. But the verification of any such hypothesis is attended, from the peculiar nature of the phenomena, with difficulties which phrenologists have not shown themselves even competent to appreciate, much less to overcome.

Mr. Darwin's remarkable speculation on the Origin of Species is another unimpeachable example of a legitimate hypothesis. What he terms "natural selection" is not only a *vera causa*, but one proved to be capable of producing effects of the same kind with those which the hypothesis ascribes to it; the question of possibility is entirely one of degree. It is unreasonable to accuse Mr. Darwin (as has been done) of violating the rules of Induction. The rules of Induction are concerned with the conditions of Proof. Mr. Darwin has never pretended that his doctrine was proved. He was not bound by the rules of Induction, but by those of Hypothesis. And these last have seldom been more completely fulfilled. He has opened a path of inquiry full of promise, the results of which none can foresee. And is it not a wonderful feat of scientific knowledge and ingenuity to have rendered so bold a suggestion, which the first impulse of every one was to reject at once, admissible and discussible, even as a conjecture?

165 Whewell's *Phil. of Discovery*, pp. 275, 276.

166 What has most contributed to accredit the hypothesis of a physical medium for the conveyance of light, is the certain fact that light *travels* (which can not be proved of gravitation); that its communication is not instantaneous, but requires time; and that it is intercepted (which gravitation is not) by intervening objects. These are analogies between its phenomena and those of the mechanical motion of a solid or fluid substance.

But we are not entitled to assume that mechanical motion is the only power in nature capable of exhibiting those attributes.

167 Phil. of Discovery, p. 274.

168 P. 271.

169 P. 251 and the whole of Appendix G.

170 In Dr. Whewell's latest version of his theory (*Philosophy of Discovery*, p. 331) he makes a concession respecting the medium of the transmission of light, which, taken in conjunction with the rest of his doctrine on the subject, is not, I confess, very intelligible to me, but which goes far toward removing, if it does not actually remove, the whole of the difference between us. He is contending, against Sir William Hamilton, that all matter has weight. Sir William, in proof of the contrary, cited the luminiferous ether, and the calorific and electric fluids, "which," he said, "we can neither denude of their character of substance, nor clothe with the attribute of weight." "To which," continues Dr. Whewell, "my reply is, that precisely because I can not clothe these agents with the attribute of Weight, I *do* denude them of the character of Substance. They are not substances, but agencies. These Imponderable Agents are not properly called Imponderable Fluids. This I conceive that I have proved." Nothing can be more philosophical. But if the luminiferous ether is not matter, and fluid matter, too, what is the meaning of its undulations? Can an agency undulate? Can there be alternate motion forward and backward of the particles of an agency? And does not the whole mathematical theory of the undulations imply them to be material? Is it not a series of deductions from the known properties of elastic fluids? *This* opinion of Dr. Whewell reduces the undulations to a figure of speech, and the undulatory theory to the proposition which all must admit, that the transmission of light takes place according to laws which present a very striking and remarkable agreement with those of undulations. If Dr. Whewell is prepared to stand by this doctrine, I have no difference with him on the subject.

171 Thus water, of which eight-ninths in weight are oxygen, dissolves most bodies which contain a high proportion of oxygen, such as all the nitrates (which have more oxygen than any others of the common salts), most of the sulphates, many of the carbonates, etc. Again, bodies largely composed of combustible elements, like hydrogen and carbon, are soluble in bodies of similar composition; resin, for instance, will dissolve in alcohol, tar in oil of turpentine. This empirical generalization is far from being universally true; no doubt because it is a remote, and therefore easily defeated, result of general laws too deep for us at present to penetrate; but it will probably in time suggest processes of inquiry, leading to the discovery of those laws.

172 Or, according to Laplace's theory, the sun and the sun's rotation.

173 Supra, book iii., chap. v., § 7.

174 Supra, book iii., chap. x., § 2

175 In the preceding discussion, the *mean* is spoken of as if it were exactly the same thing with the *average*. But the mean, for purposes of inductive inquiry, is not the average, or arithmetical mean, though in a familiar illustration of the theory the difference may be disregarded. If the deviations on one side of the average are much more numerous than those on the other (these last being fewer but greater), the effect due to the invariable cause, as distinct from the variable ones, will not coincide with the average, but will be either below or above the average, the deviation being toward the side on which the greatest number of the instances are found. This follows from a truth, ascertained both inductively and deductively, that small deviations from the true central point are greatly more frequent than large ones. The mathematical law is, "that the most probable determination of one or more invariable elements from observation is that in which the *sum of the squares* of the individual aberrations," or deviations, "*shall be the least possible*." See this principle stated, and its grounds popularly explained, by Sir John Herschel, in his review of Quetelet on Probabilities, *Essays*,

p. 395 *et seq.*

176 Essai Philosophique sur les Probabilités, fifth Paris edition, p. 7.

177 It even appears to me that the calculation of chances, where there are no data grounded either on special experience or on special inference, must, in an immense majority of cases, break down, from sheer impossibility of assigning any principle by which to be guided in setting out the list of possibilities. In the case of the colored balls we have no difficulty in making the enumeration, because we ourselves determine what the possibilities shall be. But suppose a case more analogous to those which occur in nature: instead of three colors, let there be in the box all possible colors, we being supposed ignorant of the comparative frequency with which different colors occur in nature, or in the productions of art. How is the list of cases to be made out? Is every distinct shade to count as a color? If so, is the test to be a common eye, or an educated eye--a painter's, for instance? On the answer to these questions would depend whether the chances against some particular color would be estimated at ten, twenty, or perhaps five hundred to one. While if we knew from experience that the particular color occurs on an average a certain number of times in every hundred or thousand, we should not require to know any thing either of the frequency or of the number of the other possibilities.

178 Prospective Review for February, 1850.

179 "If this be not so, why do we feel so much more probability added by the first instance than by any single subsequent instance? Why, except that the first instance gives us its possibility (a cause *adequate* to it), while every other only gives us the frequency of its conditions? If no reference to a cause be supposed, possibility would have no meaning; yet it is clear that, antecedent to its happening, we might have supposed the event impossible, *i.e.*, have believed that there was no physical energy really existing in the world equal to producing it.... After the first time of happening, which is, then, more important to the whole probability than any other single instance (because proving the possibility), the *number* of times becomes important as an index to the intensity or extent of the cause, and its independence of any particular time. If we took the case of a tremendous leap, for instance, and wished to form an estimate of the probability of its succeeding a certain number of times; the first instance, by showing its possibility (before doubtful) is of the most importance; but every succeeding leap shows the power to be more perfectly under control, greater and more invariable, and so increases the probability; and no one would think of reasoning in this case straight from one instance to the next, without referring to the physical energy which each leap indicated. Is it not, then, clear that we do not ever" (let us rather say, that we do not in an advanced state of our knowledge) "conclude directly from the happening of an event to the probability of its happening again; but that we refer to the cause, regarding the past cases as an index to the cause, and the cause as our guide to the future?"--*Ibid.*

180 The writer last quoted says that the valuation of chances by comparing the number of cases in which the event occurs with the number in which it does not occur, "would generally be wholly erroneous," and "is not the true theory of probability." It is at least that which forms the foundation of insurance, and of all those calculations of chances in the business of life which experience so abundantly verifies. The reason which the reviewer gives for rejecting the theory is, that it "would regard an event as certain which had hitherto never failed; which is exceedingly far from the truth, even for a very large number of constant successes." This is not a defect in a particular theory, but in any theory of chances. No principle of evaluation can provide for such a case as that which the reviewer supposes. If an event has never once failed, in a number of trials sufficient to eliminate chance, it really has all the certainty which can be given by an empirical law; it *is* certain during the continuance of the same collocation of causes which existed during the observations. If it ever fails, it is in consequence of some change in that collocation. Now, no theory of chances will enable us to infer the future probability of an event from the past, if the causes in operation, capable of influencing the event, have intermediately undergone a change.

181 Pp. 18, 19. The theorem is not stated by Laplace in the exact terms in which I have stated it; but the

identity of import of the two modes of expression is easily demonstrable.

182 For a fuller treatment of the many interesting questions raised by the theory of probabilities, I may now refer to a recent work by Mr. Venn, Fellow of Caius College, Cambridge, "The Logic of Chance;" one of the most thoughtful and philosophical treatises on any subject connected with Logic and Evidence which have been produced, to my knowledge, for many years. Some criticisms contained in it have been very useful to me in revising the corresponding chapters of the present work. In several of Mr. Venn's opinions, however, I do not agree. What these are will be obvious to any reader of Mr. Venn's work who is also a reader of this.

183 Hartley's *Observations on Man*, vol. i., p. 16. The passage is not in Priestley's curtailed edition.

184 I am happy to be able to quote the following excellent passage from Mr. Baden Powell's *Essay on the Inductive Philosophy*, in confirmation, both in regard to history and to doctrine, of the statement made in the text. Speaking of the "conviction of the universal and permanent uniformity of nature," Mr. Powell says (pp. 98-100):

"We may remark that this idea, in its proper extent, is by no means one of popular acceptance or natural growth. Just so far as the daily experience of every one goes, so far indeed he comes to embrace a certain persuasion of this kind, but merely to this limited extent, that what is going on around him at present, in his own narrow sphere of observation, will go on in like manner in future. The peasant believes that the sun which rose to-day will rise again to-morrow; that the seed put into the ground will be followed in due time by the harvest this year as it was last year, and the like; but has no notion of such inferences in subjects beyond his immediate observation. And it should be observed that each class of persons, in admitting this belief within the limited range of his own experience, though he doubt or deny it in every thing beyond, is, in fact, bearing unconscious testimony to its universal truth. Nor, again, is it only among the *most* ignorant that this limitation is put upon the truth. There is a very general propensity to believe that every thing beyond common experience, or especially ascertained laws of nature, is left to the dominion of chance or fate or arbitrary intervention; and even to object to any attempted explanation by physical causes, if conjecturally thrown out for an apparently unaccountable phenomenon.

"The precise doctrine of the *generalization* of this idea of the uniformity of nature, so far from being obvious, natural, or intuitive, is utterly beyond the attainment of the many. In all the extent of its universality it is characteristic of the philosopher. It is clearly the result of philosophic cultivation and training, and by no means the spontaneous offspring of any primary principle naturally inherent in the mind, as some seem to believe. It is no mere vague persuasion taken up without examination, as a common prepossession to which we are always accustomed; on the contrary, all common prejudices and associations are against it. It is pre-eminently *an acquired idea*. It is not attained without deep study and reflection. The best informed philosopher is the man who most firmly believes it, even in opposition to received notions; its acceptance depends on the extent and profoundness of his inductive studies."

185 Supra, book iii., chap. iii., § 1

186 It deserves remark, that these early generalizations did not, like scientific inductions, presuppose causation. What they did presuppose, was *uniformity* in physical facts. But the observers were as ready to presume uniformity in the co-existence of facts as in the sequences. On the other hand, they never thought of assuming that this uniformity was a principle pervading all nature: their generalizations did not imply that there was uniformity in every thing, but only that as much uniformity as existed within their observation, existed also beyond it. The induction, fire burns, does not require for its validity that all nature should observe uniform laws, but only that there should be uniformity in one particular class of natural phenomena; the effects of fire on the senses and on combustible substances. And uniformity to this extent was not assumed, anterior to the experience, but proved by the experience. The same observed instances which proved the narrower truth, proved as much of the wider one as corresponded to it. It is from losing sight of this fact, and

considering the law of causation in its full extent as necessarily presupposed in the very earliest generalizations, that persons have been led into the belief that the law of causation is known *a priori*, and is not itself a conclusion from experience.

187 Book ii., chap. iii.

188 One of the most rising thinkers of the new generation in France, M. Taine (who has given, in the *Revue des Deux Mondes*, the most masterly analysis, at least in one point of view, ever made of the present work), though he rejects, on this and similar points of psychology, the intuition theory in its ordinary form, nevertheless assigns to the law of causation, and to some other of the most universal laws, that certainty beyond the bounds of human experience, which I have not been able to accord to them. He does this on the faith of our faculty of abstraction, in which he seems to recognize an independent source of evidence, not indeed disclosing truths not contained in our experience, but affording an assurance which experience can not give, of the universality of those which it does contain. By abstraction M. Taine seems to think that we are able, not merely to analyze that part of nature which we see, and exhibit apart the elements which pervade it, but to distinguish such of them as are elements of the system of nature considered as a whole, not incidents belonging to our limited terrestrial experience. I am not sure that I fully enter into M. Taine's meaning; but I confess I do not see how any mere abstract conception, elicited by our minds from our experience, can be evidence of an objective fact in universal Nature, beyond what the experience itself bears witness of; or how, in the process of interpreting in general language the testimony of experience, the limitations of the testimony itself can be cast off.

Dr. Ward, in an able article in the *Dublin Review* for October, 1871, contends that the uniformity of nature can not be proved from experience, but from "transcendental considerations" only, and that, consequently, all physical science would be deprived of its basis, if such transcendental proof were impossible.

When physical science is said to depend on the assumption that the course of nature is invariable, all that is meant is that the conclusions of physical science are not known as *absolute* truths: the truth of them is *conditional* on the uniformity of the course of nature; and all that the most conclusive observations and experiments can prove, is that the result arrived at will be true if, and as long as, the present laws of nature are valid. But this is all the assurance we require for the guidance of our conduct. Dr. Ward himself does not think that his transcendental proofs make it practically greater; for he believes, as a Catholic, that the course of nature not only has been, but frequently and even daily is, suspended by supernatural intervention.

But though this conditional conclusiveness of the evidence of experience, which is sufficient for the purposes of life, is all that I was necessarily concerned to prove, I have given reasons for thinking that the uniformity, as itself a part of experience, is sufficiently proved to justify undoubting reliance on it. This Dr. Ward contests, for the following reasons:

First (p. 315), supposing it true that there has hitherto been no well authenticated case of a breach in the uniformity of nature; "the number of natural agents constantly at work is incalculably large; and the observed cases of uniformity in their action must be immeasurably fewer than one thousandth of the whole. Scientific men, we assume for the moment, have discovered that in a certain proportion of instances--immeasurably fewer than one thousandth of the whole--a certain fact has prevailed; the fact of uniformity; and they have not found a single instance in which that fact does *not* prevail. Are they justified, we ask, in inferring from these premises that the fact is universal? Surely the question answers itself. Let us make a very grotesque supposition, in which, however, the conclusion would really be tried according to the arguments adduced. In some desert of Africa there is an enormous connected edifice, surrounding some vast space, in which dwell certain reasonable beings, who are unable to leave the inclosure. In this edifice are more than a thousand chambers, which some years ago were entirely locked up, and the keys no one knew where. By constant diligence twenty-five keys have been found, out of the whole number; and the corresponding chambers, situated promiscuously throughout the edifice, have been opened. Each chamber, when examined, is found to

be in the precise shape of a dodecahedron. Are the inhabitants justified on that account in holding with certitude that the remaining 975 chambers are built on the same plan?"

Not with perfect certitude, but (if the chambers to which the keys have been found are really "situated promiscuously") with so high a degree of probability that they would be justified in acting upon the presumption until an exception appeared.

Dr. Ward's argument, however, does not touch mine as it stands in the text. My argument is grounded on the fact that the uniformity of the course of nature as a whole, is constituted by the uniform sequences of special effects from special natural agencies; that the number of these natural agencies in the part of the universe known to us is not incalculable, nor even extremely great; that we have now reason to think that at least the far greater number of them, if not separately, at least in some of the combinations into which they enter, have been made sufficiently amenable to observation, to have enabled us actually to ascertain some of their fixed laws; and that this amount of experience justifies the same degree of assurance that the course of nature is uniform throughout, which we previously had of the uniformity of sequence among the phenomena best known to us. This view of the subject, if correct, destroys the force of Dr. Ward's first argument.

His second argument is, that many or most persons, both scientific and unscientific, believe that there *are* well authenticated cases of breach in the uniformity of nature, namely, miracles. Neither does this consideration touch what I have said in the text. I admit no other uniformity in the events of nature than the law of Causation; and (as I have explained in the chapter of this volume which treats of the Grounds of Disbelief) a miracle is no exception to that law. In every case of alleged miracle, a *new antecedent* is affirmed to exist; a *counteracting cause*, namely, the volition of a supernatural being. To all, therefore, to whom beings with superhuman power over nature are a *vera causa*, a miracle is a *case* of the Law of Universal Causation, not a deviation from it.

Dr. Ward's last, and as he says, strongest argument, is the familiar one of Reid, Stewart, and their followers--that whatever knowledge experience gives us of the past and present, it gives us none of the future. I confess that I see no force whatever in this argument. Wherein does a future fact differ from a present or a past fact, except in their merely momentary relation to the human beings at present in existence? The answer made by Priestley, in his *Examination of Reid*, seems to me sufficient, viz., that though we have had no experience of what *is* future, we have had abundant experience of what *was* future. The "leap in the dark" (as Professor Bain calls it) from the past to the future, is exactly as much in the dark and no more, as the leap from a past which we have personally observed, to a past which we have not. I agree with Mr. Bain in the opinion that the resemblance of what we have not experienced to what we have, is, by a law of our nature, presumed through the mere energy of the idea, before experience has proved it. This *psychological* truth, however, is not, as Dr. Ward when criticising Mr. Bain appears to think, inconsistent with the *logical* truth that experience does prove it. The proof comes after the presumption, and consists in its invariable *verification* by experience when the experience arrives. The fact which while it was future could not be observed, having as yet no existence, is always, when it becomes present and *can* be observed, found conformable to the past.

Dr. M'Cosh maintains (*Examination of Mr. J. S. Mill's Philosophy*, p. 257) that the uniformity of the course of nature is a different thing from the law of causation; and while he allows that the former is only proved by a long continuance of experience, and that it is not inconceivable nor necessarily incredible that there may be worlds in which it does not prevail, he considers the law of causation to be known intuitively. There is, however, no other uniformity in the events of nature than that which arises from the law of causation: so long therefore as there remained any doubt that the course of nature was uniform throughout, at least when not modified by the intervention of a new (supernatural) cause, a doubt was necessarily implied, not indeed of the reality of causation, but of its universality. If the uniformity of the course of nature has any exceptions--if any events succeed one another without fixed laws--to that extent the law of causation fails; there are events which do not depend on causes.

189 Book i., chap. vii.

190 In some cases, a Kind is sufficiently identified by some one remarkable property: but most commonly several are required; each property considered singly, being a joint property of that and of other Kinds. The color and brightness of the diamond are common to it with the paste from which false diamonds are made; its octohedral form is common to it with alum, and magnetic iron ore; but the color and brightness and the form together, identify its Kind: that is, are a mark to us that it is combustible; that when burned it produces carbonic acid; that it can not be cut with any known substance; together with many other ascertained properties, and the fact that there exist an indefinite number still unascertained.

191 This doctrine of course assumes that the allotropic forms of what is chemically the same substance are so many different Kinds; and such, in the sense in which the word Kind is used in this treatise, they really are.

192 Professor Bain (Logic, ii., 13) mentions two empirical laws, which he considers to be, with the exception of the law connecting Gravity with Resistance to motion, "the two most widely operating laws as yet discovered whereby two distinct properties are conjoined throughout substances generally." The first is, "a law connecting Atomic Weight and Specific Heat by an inverse proportion. For equal weights of the simple bodies, the atomic weight multiplied by a number expressing the specific heat, gives a nearly uniform product. The products, for all the elements, are near the constant number 6." The other is a law which obtains "between the specific gravity of substances in the gaseous state, and the atomic weights. The relationship of the two numbers is in some instances equality; in other instances the one is a multiple of the other."

Neither of these generalizations has the smallest appearance of being an ultimate law. They point unmistakably to higher laws. Since the heat necessary to raise to a given temperature the same weight of different substances (called their specific heat) is inversely as their atomic weight, that is, directly as the number of atoms in a given weight of the substance, it follows that a single atom of every substance requires the same amount of heat to raise it to a given temperature; a most interesting and important law, but a law of causation. The other law mentioned by Mr. Bain points to the conclusion, that in the gaseous state all substances contain, in the same space, the same number of atoms; which, as the gaseous state suspends all cohesive force, might naturally be expected, though it could not have been positively assumed. This law may also be a result of the mode of action of causes, namely, of molecular motions. The cases in which one of the numbers is not identical with the other, but a multiple of it, may be explained on the nowise unlikely supposition, that in our present estimate of the atomic weights of some substances, we mistake two, or three, atoms for one, or one for several.

193 Dr. M'Cosh (p. 324 of his book) considers the laws of the chemical composition of bodies as not coming under the principle of Causation; and thinks it an omission in this work not to have provided special canons for their investigation and proof. But every case of chemical composition is, as I have explained, a case of causation. When it is said that water is composed of hydrogen and oxygen, the affirmation is that hydrogen and oxygen, by the action on one another which they exert under certain conditions, *generate* the properties of water. The Canons of Induction, therefore, as laid down in this treatise, are applicable to the case. Such special adaptations as the Inductive methods may require in their application to chemistry, or any other science, are a proper subject for any one who treats of the logic of the special sciences, as Professor Bain has done in the latter part of his work; but they do not appertain to General Logic.

Dr. M'Cosh also complains (p. 325) that I have given no canons for those sciences in which "the end sought is not the discovery of Causes or of Composition, but of Classes; that is, Natural Classes." Such canons could be no other than the principles and rules of Natural Classification, which I certainly thought that I had expounded at considerable length. But this is far from the only instance in which Dr. M'Cosh does not appear to be aware of the contents of the books he is criticising.

194 Mr. De Morgan, in his *Formal Logic*, makes the just remark, that from two such premises as Most A are

B, and Most A are C, we may infer with certainty that some B are C. But this is the utmost limit of the conclusions which can be drawn from two approximate generalizations, when the precise degree of their approximation to universality is unknown or undefined.

195 Rationale of Judicial Evidence, vol. iii., p. 224.

196 The evaluation of the chances in this statement has been objected to by a mathematical friend. The correct mode, in his opinion, of setting out the possibilities is as follows. If the thing (let us call it T) which is both an A and a C, is a B, something is true which is only true twice in every thrice, and something else which is only true thrice in every four times. The first fact being true eight times in twelve, and the second being true six times in every eight, and consequently six times in those eight; both facts will be true only six times in twelve. On the other hand, if T, although it is both an A and a C, is not a B, something is true which is only true once in every thrice, and something else which is only true once in every four times. The former being true four times out of twelve, and the latter once in every four, and therefore once in those four; both are only true in one case out of twelve. So that T is a B six times in twelve, and T is not a B, only once: making the comparative probabilities, not eleven to one, as I had previously made them, but six to one.

In the last edition I accepted this reasoning as conclusive. More attentive consideration, however, has convinced me that it contains a fallacy.

The objector argues, that the fact of A's being a B is true eight times in twelve, and the fact of C's being a B six times in eight, and consequently six times in those eight; both facts, therefore, are true only six times in every twelve. That is, he concludes that because among As taken indiscriminately only eight out of twelve are Bs and the remaining four are not, it must equally hold that four out of twelve are not Bs when the twelve are taken from the select portion of As which are also Cs. And by this assumption he arrives at the strange result, that there are fewer Bs among things which are both As and Cs than there are among either As or Cs taken indiscriminately; so that a thing which has both chances of being a B, is less likely to be so than if it had only the one chance or only the other.

The objector (as has been acutely remarked by another correspondent) applies to the problem under consideration, a mode of calculation only suited to the reverse problem. Had the question been--If two of every three Bs are As and three out of every four Bs are Cs, how many Bs will be both As and Cs, his reasoning would have been correct. For the Bs that are both As and Cs must be fewer than either the Bs that are As or the Bs that are Cs, and to find their number we must abate either of these numbers in the ratio due to the other. But when the problem is to find, not how many Bs are both As and Cs, but how many things that are both As and Cs are Bs, it is evident that among these the proportion of Bs must be not less, but greater, than among things which are only A, or among things which are only B.

The true theory of the chances is best found by going back to the scientific grounds on which the proportions rest. The degree of frequency of a coincidence depends on, and is a measure of, the frequency, combined with the efficacy, of the causes in operation that are favorable to it. If out of every twelve As taken indiscriminately eight are Bs and four are not, it is implied that there are causes operating on A which tend to make it a B, and that these causes are sufficiently constant and sufficiently powerful to succeed in eight out of twelve cases, but fail in the remaining four. So if of twelve Cs, nine are Bs and three are not, there must be causes of the same tendency operating on C, which succeed in nine cases and fail in three. Now suppose twelve cases which are both As and Cs. The whole twelve are now under the operation of both sets of causes. One set is sufficient to prevail in eight of the twelve cases, the other in nine. The analysis of the cases shows that six of the twelve will be Bs through the operation of both sets of causes; two more in virtue of the causes operating on A; and three more through those operating on C, and that there will be only one case in which all the causes will be inoperative. The total number, therefore, which are Bs will be eleven in twelve, and the evaluation in the text is correct.

197 Supra, book i., chap. v.

198 Supra, book i., chap. v., § 1, and book ii., chap, v., § 5.

199 The axiom, "Equals subtracted from equals leave equal differences," may be demonstrated from the two axioms in the text. If A = *a* and B = *b*, A-B = *a*-*b*. For if not, let A-B = *a*-*b*+*c*. Then since B = *b*, adding equals to equals, A = *a*+*c*. But A = *a*. Therefore *a* = *a*+*c*, which is impossible.

This proposition having been demonstrated, we may, by means of it, demonstrate the following: "If equals be added to unequals, the sums are unequal." If A = *a* and B not = *b*, A+B is not = *a*+*b*. For suppose it to be so. Then, since A = *a* and A+B = *a*+*b*, subtracting equals from equals, B = *b*; which is contrary to the hypothesis.

So again, it may be proved that two things, one of which is equal and the other unequal to a third thing, are unequal to one another. If A = *a* and A not = B, neither is *a* = B. For suppose it to be equal. Then since A = *a* and *a* = B, and since things equal to the same thing are equal to one another A = B; which is contrary to the hypothesis.

200 Geometers have usually preferred to define parallel lines by the property of being in the same plane and never meeting. This, however, has rendered it necessary for them to assume, as an additional axiom, some other property of parallel lines; and the unsatisfactory manner in which properties for that purpose have been selected by Euclid and others has always been deemed the opprobrium of elementary geometry. Even as a verbal definition, equidistance is a fitter property to characterize parallels by, since it is the attribute really involved in the signification of the name. If to be in the same plane and never to meet were all that is meant by being parallel, we should feel no incongruity in speaking of a curve as parallel to its asymptote. The meaning of parallel lines is, lines which pursue exactly the same direction, and which, therefore, neither draw nearer nor go farther from one another; a conception suggested at once by the contemplation of nature. That the lines will never meet is of course included in the more comprehensive proposition that they are everywhere equally distant. And that any straight lines which are in the same plane and not equidistant will certainly meet, may be demonstrated in the most rigorous manner from the fundamental property of straight lines assumed in the text, viz., that if they set out from the same point, they diverge more and more without limit.

201 Philosophie Positive, iii., 414-416.

202 See the two remarkable notes (A) and (F), appended to his *Inquiry into the Relation of Cause and Effect*.

203 Supra, p. 413.

204 A writer to whom I have several times referred, gives as the definition of an impossibility, that which there exists in the world no cause adequate to produce. This definition does not take in such impossibilities as these--that two and two should make five; that two straight lines should inclose a space; or that any thing should begin to exist without a cause. I can think of no definition of impossibility comprehensive enough to include all its varieties, except the one which I have given: viz., An impossibility is that, the truth of which would conflict with a complete induction, that is, with the most conclusive evidence which we possess of universal truth.

As to the reputed impossibilities which rest on no other grounds than our ignorance of any cause capable of producing the supposed effects; very few of them are certainly impossible, or permanently incredible. The facts of traveling seventy miles an hour, painless surgical operations, and conversing by instantaneous signals between London and New York, held a high place, not many years ago, among such impossibilities.

205 Not, however, as might at first sight appear, 999 times as much. A complete analysis of the cases shows that (always assuming the veracity of the witness to be 9/10) in 10,000 drawings, the drawing of No. 79 will

occur nine times, and be announced incorrectly once; the credibility, therefore, of the announcement of No. 79 is 9/10; while the drawing of a white ball will occur nine times, and be announced incorrectly 999 times. The credibility, therefore, of the announcement of white is 9/1008, and the ratio of the two 1008:10; the one announcement being thus only about a hundred times more credible than the other, instead of 999 times.

206 Supra, book iii., chap. ii., § 3, 4, 5.

207 Mr. Bailey has given the best statement of this theory. "The general name," he says, "raises up the image sometimes of one individual of the class formerly seen, sometimes of another, not unfrequently of many individuals in succession; and it sometimes suggests an image made up of elements from several different objects, by a latent process of which I am not conscious." (Letters on the Philosophy of the Human Mind, 1st series, letter 22.) But Mr. Bailey must allow that we carry on inductions and ratiocinations respecting the class, by means of this idea or conception of some one individual in it. This is all I require. The name of a class calls up some idea, through which we can, to all intents and purposes, think of the class as such, and not solely of an individual member of it.

208 I have entered rather fully into this question in chap. xvii. of *An Examination of Sir William Hamilton's Philosophy*, headed "The Doctrine of Concepts or General Notions," which contains my last views on the subject.

209 Other examples of inappropriate conceptions are given by Dr. Whewell (*Phil. Ind. Sc.* ii., 185) as follows: "Aristotle and his followers endeavored in vain to account for the mechanical relation of forces in the lever, by applying the *inappropriate* geometrical conceptions of the properties of the circle: they failed in explaining the *form* of the luminous spot made by the sun shining through a hole, because they applied the *inappropriate* conception of a circular *quality* in the sun's light: they speculated to no purpose about the elementary composition of bodies, because they assumed the *inappropriate* conception of *likeness* between the elements and the compound, instead of the genuine notion of elements merely *determining* the qualities of the compound." But in these cases there is more than an inappropriate conception; there is a false conception; one which has no prototype in nature, nothing corresponding to it in facts. This is evident in the last two examples, and is equally true in the first; the "properties of the circle" which were referred to, being purely fantastical. There is, therefore, an error beyond the wrong choice of a principle of generalization; there is a false assumption of matters of fact. The attempt is made to resolve certain laws of nature into a more general law, that law not being one which, though real, is inappropriate, but one wholly imaginary.

210 Professor Bain.

211 This sentence having been erroneously understood as if I had meant to assert that belief is nothing but an irresistible association, I think it necessary to observe that I express no theory respecting the ultimate analysis either of reasoning or of belief, two of the most obscure points in analytical psychology. I am speaking not of the powers themselves, but of the previous conditions necessary to enable those powers to exert themselves: of which conditions I am contending that language is not one, senses and association being sufficient without it. The irresistible association theory of belief, and the difficulties connected with the subject, have been discussed at length in the notes to the new edition of Mr. James Mill's *Analysis of the Phenomena of the Human Mind*.

212 Mr. Bailey agrees with me in thinking that whenever "from something actually present to my senses, conjoined with past experience, I feel satisfied that something has happened, or will happen, or is happening, beyond the sphere of my personal observation," I may with strict propriety be said to reason: and of course to reason inductively, for demonstrative reasoning is excluded by the circumstances of the case. (*The Theory of Reasoning*, 2d ed., p. 27.)

213 Novum Organum Renovatum, pp. 35-37.

214 Novum Organum Renovatum, pp. 39, 40.

215 P. 217, 4to edition.

216 "E, ex, extra, extraneus, étranger, stranger."

Another etymological example sometimes cited is the derivation of the English *uncle* from the Latin *avus*. It is scarcely possible for two words to bear fewer outward marks of relationship, yet there is but one step between them, *avus*, *avunculus*, *uncle*. So *pilgrim*, from *ager*: *per agrum*, *peragrinus*, *peregrinus*, *pellegrino*, *pilgrim*. Professor Bain gives some apt examples of these transitions of meaning. "The word 'damp' primarily signified moist, humid, wet. But the property is often accompanied with the feeling of cold or chilliness, and hence the idea of cold is strongly suggested by the word. This is not all. Proceeding upon the superadded meaning, we speak of damping a man's ardor, a metaphor where the cooling is the only circumstance concerned; we go on still further to designate the iron slide that shuts off the draft of a stove, 'the damper,' the primary meaning being now entirely dropped. 'Dry,' in like manner, through signifying the absence of moisture, water, or liquidity, is applied to sulphuric acid containing water, although not thereby ceasing to be a moist, wet, or liquid substance." So in the phrases, dry sherry, or Champagne.

" 'Street,' originally a paved way, with or without houses, has been extended to roads lined with houses, whether paved or unpaved. 'Impertinent' signified at first irrelevant, alien to the purpose in hand: through which it has come to mean, meddling, intrusive, unmannerly, insolent." (*Logic*, ii., 173, 174.)

217 Pp. 226, 227.

218 Essays, p. 214.

219 Essays, p. 215.

220 Though no such evil consequences as take place in these instances are likely to arise from the modern freak of writing *sanatory* instead of sanitary, it deserves notice as a charming specimen of pedantry ingrafted upon ignorance. Those who thus undertake to correct the spelling of the classical English writers, are not aware that the meaning of *sanatory*, if there were such a word in the language, would have reference not to the preservation of health, but to the cure of disease.

221 Historical Introduction, vol. i., pp. 66-68.

222 History of Scientific Ideas, ii., 110, 111.

223 History of Scientific Ideas, ii., 111-113.

224 Nov. Org. Renov., pp. 286, 287.

225 History of Scientific Ideas, ii., 120-122.

226 Nov. Org. Renov., p. 274.

227 Hist. Sc. Id., i. 133.

228 Dr. Whewell, in his reply (*Philosophy of Discovery*, p. 270) says that he "stopped short of, or rather passed by, the doctrine of a series of organized beings," because he "thought it bad and narrow philosophy." If he did, it was evidently without understanding this form of the doctrine; for he proceeds to quote a passage from his "History," in which the doctrine he condemns is designated as that of "a mere linear progression in

nature, which would place each genus in contact only with the preceding and succeeding ones." Now the series treated of in the text agrees with this linear progression in nothing whatever but in being a progression.

229 Supra, p. 137.

230 Vulgar Errors, book v., chap. 21.

231 Pharmacologia, Historical Introduction, p. 16.

232 The author of one of the Bridgewater Treatises has fallen, as it seems to me, into a similar fallacy when, after arguing in rather a curious way to prove that matter may exist without any of the known properties of matter, and may therefore be changeable, he concludes that it can not be eternal, because "eternal (passive) existence necessarily involves incapability of change." I believe it would be difficult to point out any other connection between the facts of eternity and unchangeableness, than a strong association between the two ideas. Most of the *a priori* arguments, both religious and anti-religious, on the origin of things, are fallacies drawn from the same source.

233 Supra, book ii., chap. v., § 6, and chap. vii., § 1, 2, 3, 4. See also *Examination of Sir William Hamilton's Philosophy*, chap. vi. and elsewhere.

234 It seems that this doctrine was, before the time I have mentioned, disputed by some thinkers. Dr. Ward mentions Scotus, Vasquez, Biel, Francis Lugo, and Valentia.

235 I quote this passage from Playfair's celebrated *Dissertation on the Progress of Mathematical and Physical Science*.

236 This statement I must now correct, as too unqualified. The maxim in question was maintained with full conviction by no less an authority than Sir William Hamilton. See my *Examination*, chap. xxiv.

237 Nouveaux Essais sur l'Entendement Humain--Avant-propos. (OEuvres, Paris ed., 1842, vol. i., p. 19.)

238 This doctrine also was accepted as true, and conclusions were grounded on it, by Sir William Hamilton. See *Examination*, chap. xxiv.

239 Not that of Leibnitz, but the principle commonly appealed to under that name by mathematicians.

240 Dissertation, p. 27.

241 Hist. Ind. Sc., Book i., chap. i.

242 Novum Organum, Aph. 75.

243 Supra, book iii., chap. vii., § 4.

244 It is hardly needful to remark that nothing is here intended to be said against the possibility at some future period of making gold--by first discovering it to be a compound, and putting together its different elements or ingredients. But this is a totally different idea from that of the seekers of the grand arcanum.

245 Pharmacologia, pp. 43-45.

246 Vol. i., chap. 8.

247 Nov. Org., Aph. 46.

248 Playfair's *Dissertation*, sect. 4.

249 Nov. Org. Renov., p. 61.

250 Pharmacologia, p. 21.

251 Pharmacologia, pp. 23, 24.

252 Ibid., p. 28.

253 Ibid., p. 62.

254 Ibid., pp. 61, 62.

255 Supra, p. 450.

256 Elements of the Philosophy of the Mind, vol. ii., chap. 4, sect. 5.

257 "Thus Fourcroy," says Dr. Paris, "explained the operation of mercury by its specific gravity, and the advocates of this doctrine favored the general introduction of the preparations of iron, especially in scirrhus of the spleen or liver, upon the same hypothetical principle; for, say they, whatever is most forcible in removing the obstruction must be the most proper instrument of cure: such is steel, which, besides the attenuating power with which it is furnished, has still a greater force in this case from the gravity of its particles, which, being seven times specifically heavier than any vegetable, acts in proportion with a stronger impulse, and therefore is a more powerful deobstruent. This may be taken as a specimen of the style in which these mechanical physicians reasoned and practiced."--*Pharmacologia*, pp. 38, 39.

258 Pharmacologia, pp. 39, 40.

259 I quote from Dr. Whewell's *Hist. Ind. Sc.*, 3d ed., i., 129.

260 Hist. Ind. Sc., i., 52.

261 Nov. Org., Aph. 60.

262 "An advocate," says Mr. De Morgan (*Formal Logic*, p. 270), "is sometimes guilty of the argument *à dicto secundum quid ad dictum simpliciter*: it is his business to do for his client all that his client might *honestly* do for himself. Is not the word in italics frequently omitted? *Might* any man honestly try to do for himself all that counsel frequently try to do for him? We are often reminded of the two men who stole the leg of mutton; one could swear he had not got it, the other that he had not taken it. The counsel is doing his duty by his client, the client has left the matter to his counsel. Between the unexecuted intention of the client, and the unintended execution of the counsel, there may be a wrong done, and, if we are to believe the usual maxims, no wrong-doer."

The same writer justly remarks (p. 251) that there is a converse fallacy, *à dicto simpliciter ad dictum secundum quid*, called by the scholastic logicians *fallacia accidentis*; and another which may be called *à dicto secundum quid ad dictum secundum alterum quid* (p. 265). For apt instances of both, I must refer the reader to Mr. De Morgan's able chapter on Fallacies.

263 An example of this fallacy is the popular error that *strong* drink must be a cause of *strength*. There is here

fallacy within fallacy; for granting that the words "strong" and "strength" were not (as they are) applied in a totally different sense to fermented liquors and to the human body, there would still be involved the error of supposing that an effect must be like its cause; that the conditions of a phenomenon are likely to resemble the phenomenon itself; which we have already treated of as an *a priori* fallacy of the first rank. As well might it be supposed that a strong poison will make the person who takes it strong.

264 In his later editions, Archbishop Whately confines the name of Petitio Principii "to those cases in which one of the premises either is manifestly the same in sense with the conclusion, or is actually proved from it, or is such as the persons you are addressing are not likely to know, or to admit, except as an inference from the conclusion; as, *e.g.*, if any one should infer the authenticity of a certain history, from its recording such and such facts, the reality of which rests on the evidence of that history."

265 No longer even a probable hypothesis, since the establishment of the atomic theory; it being now certain that the integral particles of different substances gravitate unequally. It is true that these particles, though real *minima* for the purposes of chemical combination, may not be the ultimate particles of the substance; and this doubt alone renders the hypothesis admissible, even as an hypothesis.

266 Hist. Ind. Sc., i., 34.

267 "And coxcombs vanquish Berkeley with a grin."

268 Some arguments and explanations, supplementary to those in the text, will be found in *An Examination of Sir William Hamilton's Philosophy*, chap. xxvi.

269 Supra, p. 424.

270 When this chapter was written, Professor Bain had not yet published even the first part ("The Senses and the Intellect") of his profound Treatise on the Mind. In this the laws of association have been more comprehensively stated and more largely exemplified than by any previous writer; and the work, having been completed by the publication of "The Emotions and the Will," may now be referred to as incomparably the most complete analytical exposition of the mental phenomena, on the basis of a legitimate Induction, which has yet been produced. More recently still, Mr. Bain has joined with me in appending to a new edition of the "Analysis," notes intended to bring up the analytic science of Mind to its latest improvements.

Many striking applications of the laws of association to the explanation of complex mental phenomena are also to be found in Mr. Herbert Spencer's "Principles of Psychology."

271 In the case of the moral sentiments the place of direct experiment is to a considerable extent supplied by historical experience, and we are able to trace with a tolerable approach to certainty the particular associations by which those sentiments are engendered. This has been attempted, so far as respects the sentiment of justice, in a little work by the present author, entitled *Utilitarianism*.

272 The most favorable cases for making such approximate generalizations are what may be termed collective instances; where we are fortunately enabled to see the whole class respecting which we are inquiring in action at once, and, from the qualities displayed by the collective body, are able to judge what must be the qualities of the majority of the individuals composing it. Thus the character of a nation is shown in its acts as a nation; not so much in the acts of its government, for those are much influenced by other causes; but in the current popular maxims, and other marks of the general direction of public opinion; in the character of the persons or writings that are held in permanent esteem or admiration; in laws and institutions, so far as they are the work of the nation itself, or are acknowledged and supported by it; and so forth. But even here there is a large margin of doubt and uncertainty. These things are liable to be influenced by many circumstances; they are partially determined by the distinctive qualities of that nation or body of persons, but partly also by external

causes which would influence any other body of persons in the same manner. In order, therefore, to make the experiment really complete, we ought to be able to try it without variation upon other nations: to try how Englishmen would act or feel if placed in the same circumstances in which we have supposed Frenchmen to be placed; to apply, in short, the Method of Differences as well as that of Agreement. Now these experiments we can not try, nor even approximate to.

273 "To which," says Dr. Whewell, "we may add, that it is certain, from the history of the subject, that in that case the hypothesis would never have been framed at all."

Dr. Whewell (*Philosophy of Discovery*, pp. 277-282) defends Bacon's rule against the preceding strictures. But his defense consists only in asserting and exemplifying a proposition which I had myself stated, viz., that though the largest generalizations may be the earliest made, they are not at first seen in their entire generality, but acquire it by degrees, as they are found to explain one class after another of phenomena. The laws of motion, for example, were not known to extend to the celestial regions, until the motions of the celestial bodies had been deduced from them. This, however, does not in any way affect the fact, that the middle principles of astronomy, the central force, for example, and the law of the inverse square, could not have been discovered, if the laws of motion, which are so much more universal, had not been known first. On Bacon's system of step-by-step generalization, it would be impossible in any science to ascend higher than the empirical laws; a remark which Dr. Whewell's own Inductive Tables, referred to by him in support of his argument, amply bear out.

274 Supra, page 317 to the end of the chapter.

275 Biographia Literaria, i., 214.

276 Supra, p. 321.

277 Essays on some Unsettled Questions of Political Economy, pp. 137-140.

278 The quotations in this paragraph are from a paper written by the author, and published in a periodical in 1834.

279 Cours de Philosophie Positive, iv., 325-29.

280 Since reprinted entire in *Dissertations and Discussions*, as the concluding paper of the first volume.

281 Written and first published in 1840.

282 This great generalization is often unfavorably criticised (as by Dr. Whewell, for instance) under a misapprehension of its real import. The doctrine, that the theological explanation of phenomena belongs only to the infancy of our knowledge of them, ought not to be construed as if it was equivalent to the assertion, that mankind, as their knowledge advances, will necessarily cease to believe in any kind of theology. This was M. Comte's opinion; but it is by no means implied in his fundamental theorem. All that is implied is, that in an advanced state of human knowledge, no other Ruler of the World will be acknowledged than one who rules by universal laws, and does not at all, or does not unless in very peculiar cases, produce events by special interpositions. Originally all natural events were ascribed to such interpositions. At present every educated person rejects this explanation in regard to all classes of phenomena of which the laws have been fully ascertained; though some have not yet reached the point of referring all phenomena to the idea of Law, but believe that rain and sunshine, famine and pestilence, victory and defeat, death and life, are issues which the Creator does not leave to the operation of his general laws, but reserves to be decided by express acts of volition. M. Comte's theory is the negation of this doctrine.

Dr. Whewell equally misunderstands M. Comte's doctrine respecting the second or metaphysical stage of speculation. M. Comte did not mean that "discussions concerning ideas" are limited to an early stage of inquiry, and cease when science enters into the positive stage. (*Philosophy of Discovery*, pp. 226 et seq.) In all M. Comte's speculations as much stress is laid on the process of clearing up our conceptions as on the ascertainment of facts. When M. Comte speaks of the metaphysical stage of speculation, he means the stage in which men speak of "Nature" and other abstractions as if they were active forces, producing effects; when Nature is said to do this, or forbid that; when Nature's horror of a vacuum, Nature's non-admission of a break, Nature's *vis medicatrix*, were offered as explanations of phenomena; when the qualities of things were mistaken for real entities dwelling in the things; when the phenomena of living bodies were thought to be accounted for by being referred to a "vital force;" when, in short, the abstract names of phenomena were mistaken for the causes of their existence. In this sense of the word it can not be reasonably denied that the metaphysical explanation of phenomena, equally with the theological, gives way before the advance of real science.

That the final, or positive stage, as conceived by M. Comte, has been equally misunderstood, and that, notwithstanding some expressions open to just criticism, M. Comte never dreamed of denying the legitimacy of inquiry into all causes which are accessible to human investigation, I have pointed out in a former place.

283 Buckle's *History of Civilization*, i., 30.

284 I have been assured by an intimate friend of Mr. Buckle that he would not have withheld his assent from these remarks, and that he never intended to affirm or imply that mankind are not progressive in their moral as well as in their intellectual qualities. "In dealing with his problem, he availed himself of the artifice resorted to by the Political Economist, who leaves out of consideration the generous and benevolent sentiments, and founds his science on the proposition that mankind are actuated by acquisitive propensities alone," not because such is the fact, but because it is necessary to begin by treating the principal influence as if it was the sole one, and make the due corrections afterward. "He desired to make abstraction of the intellect as the determining and dynamical element of the progression, eliminating the more dependent set of conditions, and treating the more active one as if it were an entirely independent variable."

The same friend of Mr. Buckle states that when he used expressions which seemed to exaggerate the influence of general at the expense of special causes, and especially at the expense of the influence of individual minds, Mr. Buckle really intended no more than to affirm emphatically that the greatest men can not effect great changes in human affairs unless the general mind has been in some considerable degree prepared for them by the general circumstances of the age; a truth which, of course, no one thinks of denying. And there certainly are passages in Mr. Buckle's writings which speak of the influence exercised by great individual intellects in as strong terms as could be desired.

285 Essay on Dryden, in Miscellaneous Writings, i., 186.

286 In the *Cornhill Magazine* for June and July, 1861.

287 It is almost superfluous to observe, that there is another meaning of the word Art, in which it may be said to denote the poetical department or aspect of things in general, in contradistinction to the scientific. In the text, the word is used in its older, and I hope, not yet obsolete sense.

288 Professor Bain and others call the selection from the truths of science made for the purposes of an art, a Practical Science, and confine the name Art to the actual rules.

289 The word Teleology is also, but inconveniently and improperly, employed by some writers as a name for the attempt to explain the phenomena of the universe from final causes.

290 For an express discussion and vindication of this principle, see the little volume entitled "Utilitarianism."

CREDIT

S

January 31, 2009

Project Gutenberg TEI edition 1 Produced by David Clarke, David King, and the Online Distributed Proofreading Team at <http://www.pgdp.net/>. (This file was produced from images generously made available by The Internet Archive/Canadian Libraries).

You may charge a reasonable fee for copies of or providing access to or distributing Project Gutenberg{~TRADE MARK SIGN~} electronic works provided that

- You pay a royalty fee of 20% of the gross profits you derive from the use of Project Gutenberg{~TRADE MARK SIGN~} works calculated using the method you already use to calculate your applicable taxes. The fee is owed to the owner of the Project Gutenberg{~TRADE MARK SIGN~} trademark, but he has agreed to donate royalties under this paragraph to the Project Gutenberg Literary Archive Foundation. Royalty payments must be paid within 60 days following each date on which you prepare (or are legally required to prepare) your periodic tax returns. Royalty payments should be clearly marked as such and sent to the Project Gutenberg Literary Archive Foundation at the address specified in Section 4, "Information about donations to the Project Gutenberg Literary Archive Foundation."

You provide a full refund of any money paid by a user who notifies you in writing (or by e-mail) within 30 days of receipt that s/he does not agree to the terms of the full Project Gutenberg{~TRADE MARK SIGN~} License. You must require such a user to return or destroy all copies of the works possessed in a physical medium and discontinue all use of and all access to other copies of Project Gutenberg{~TRADE MARK SIGN~} works.

You provide, in accordance with paragraph 1.F.3, a full refund of any money paid for a work or a replacement copy, if a defect in the electronic work is discovered and reported to you within 90 days of receipt of the work.

You comply with all other terms of this agreement for free distribution of Project Gutenberg{~TRADE MARK SIGN~} works.

1.E.9.

If you wish to charge a fee or distribute a Project Gutenberg{~TRADE MARK SIGN~} electronic work or group of works on different terms than are set forth in this agreement, you must obtain permission in writing from both the Project Gutenberg Literary Archive Foundation and Michael Hart, the owner of the Project Gutenberg{~TRADE MARK SIGN~} trademark. Contact the Foundation as set forth in Section 3 below.

1.F.

1.F.1.

Project Gutenberg volunteers and employees expend considerable effort to identify, do copyright research on, transcribe and proofread public domain works in creating the Project Gutenberg{~TRADE MARK SIGN~} collection. Despite these efforts, Project Gutenberg{~TRADE MARK SIGN~} electronic works, and the medium on which they may be stored, may contain "Defects," such as, but not limited to, incomplete, inaccurate or corrupt data, transcription errors, a copyright or other intellectual property infringement, a defective or damaged disk or other medium, a computer virus, or computer codes that damage or cannot be read by your equipment.

1.F.2.

LIMITED WARRANTY, DISCLAIMER OF DAMAGES -- Except for the "Right of Replacement or Refund" described in paragraph 1.F.3, the Project Gutenberg Literary Archive Foundation, the owner of the Project Gutenberg{~TRADE MARK SIGN~} trademark, and any other party distributing a Project Gutenberg{~TRADE MARK SIGN~} electronic work under this agreement, disclaim all liability to you for damages, costs and expenses, including legal fees. YOU AGREE THAT YOU HAVE NO REMEDIES FOR NEGLIGENCE, STRICT LIABILITY, BREACH OF WARRANTY OR BREACH OF CONTRACT

EXCEPT THOSE PROVIDED IN PARAGRAPH F3. YOU AGREE THAT THE FOUNDATION, THE TRADEMARK OWNER, AND ANY DISTRIBUTOR UNDER THIS AGREEMENT WILL NOT BE LIABLE TO YOU FOR ACTUAL, DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE OR INCIDENTAL DAMAGES EVEN IF YOU GIVE NOTICE OF THE POSSIBILITY OF SUCH DAMAGE.

1.F.3.

LIMITED RIGHT OF REPLACEMENT OR REFUND -- If you discover a defect in this electronic work within 90 days of receiving it, you can receive a refund of the money (if any) you paid for it by sending a written explanation to the person you received the work from. If you received the work on a physical medium, you must return the medium with your written explanation. The person or entity that provided you with the defective work may elect to provide a replacement copy in lieu of a refund. If you received the work electronically, the person or entity providing it to you may choose to give you a second opportunity to receive the work electronically in lieu of a refund. If the second copy is also defective, you may demand a refund in writing without further opportunities to fix the problem.

1.F.4.

Except for the limited right of replacement or refund set forth in paragraph 1.F.3, this work is provided to you 'AS-IS,' WITH NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTIBILITY OR FITNESS FOR ANY PURPOSE.

1.F.5.

Some states do not allow disclaimers of certain implied warranties or the exclusion or limitation of certain types of damages. If any disclaimer or limitation set forth in this agreement violates the law of the state applicable to this agreement, the agreement shall be interpreted to make the maximum disclaimer or limitation permitted by the applicable state law. The invalidity or unenforceability of any provision of this agreement shall not void the remaining provisions.

1.F.6.

INDEMNITY

-- You agree to indemnify and hold the Foundation, the trademark owner, any agent or employee of the Foundation, anyone providing copies of Project Gutenberg{~TRADE MARK SIGN~} electronic works in accordance with this agreement, and any volunteers associated with the production, promotion and distribution of Project Gutenberg{~TRADE MARK SIGN~} electronic works, harmless from all liability, costs and expenses, including legal fees, that arise directly or indirectly from any of the following which you do or cause to occur: (a) distribution of this or any Project Gutenberg{~TRADE MARK SIGN~} work, (b) alteration, modification, or additions or deletions to any Project Gutenberg{~TRADE MARK SIGN~} work, and (c) any Defect you cause.

Section 2.

Information about the Mission of Project Gutenberg{~TRADE MARK SIGN~}

Project Gutenberg{~TRADE MARK SIGN~} is synonymous with the free distribution of electronic works in formats readable by the widest variety of computers including obsolete, old, middle-aged and new computers. It exists because of the efforts of hundreds of volunteers and donations from people in all walks of life.

Volunteers and financial support to provide volunteers with the assistance they need, is critical to reaching

Project Gutenberg{~TRADE MARK SIGN~}'s goals and ensuring that the Project Gutenberg{~TRADE MARK SIGN~} collection will remain freely available for generations to come. In 2001, the Project Gutenberg Literary Archive Foundation was created to provide a secure and permanent future for Project Gutenberg{~TRADE MARK SIGN~} and future generations. To learn more about the Project Gutenberg Literary Archive Foundation and how your efforts and donations can help, see Sections 3 and 4 and the Foundation web page at http://www.pglaf.org.

Section 3.

Information about the Project Gutenberg Literary Archive Foundation

The Project Gutenberg Literary Archive Foundation is a non profit 501(c)(3) educational corporation organized under the laws of the state of Mississippi and granted tax exempt status by the Internal Revenue Service. The Foundation's EIN or federal tax identification number is 64-6221541. Its 501(c)(3) letter is posted at http://www.gutenberg.org/fundraising/pglaf. Contributions to the Project Gutenberg Literary Archive Foundation are tax deductible to the full extent permitted by U.S. federal laws and your state's laws.

The Foundation's principal office is located at 4557 Melan Dr. S. Fairbanks, AK, 99712., but its volunteers and employees are scattered throughout numerous locations. Its business office is located at 809 North 1500 West, Salt Lake City, UT 84116, (801) 596-1887, email business@pglaf.org. Email contact links and up to date contact information can be found at the Foundation's web site and official page at http://www.pglaf.org

For additional contact information:

Dr. Gregory B. Newby Chief Executive and Director gbnewby@pglaf.org

Section 4.

Information about Donations to the Project Gutenberg Literary Archive Foundation

Project Gutenberg{~TRADE MARK SIGN~} depends upon and cannot survive without wide spread public support and donations to carry out its mission of increasing the number of public domain and licensed works that can be freely distributed in machine readable form accessible by the widest array of equipment including outdated equipment. Many small donations ($1 to $5,000) are particularly important to maintaining tax exempt status with the IRS.

The Foundation is committed to complying with the laws regulating charities and charitable donations in all 50 states of the United States. Compliance requirements are not uniform and it takes a considerable effort, much paperwork and many fees to meet and keep up with these requirements. We do not solicit donations in locations where we have not received written confirmation of compliance. To SEND DONATIONS or determine the status of compliance for any particular state visit http://www.gutenberg.org/fundraising/donate

While we cannot and do not solicit contributions from states where we have not met the solicitation requirements, we know of no prohibition against accepting unsolicited donations from donors in such states who approach us with offers to donate.

International donations are gratefully accepted, but we cannot make any statements concerning tax treatment of donations received from outside the United States. U.S. laws alone swamp our small staff.

Please check the Project Gutenberg Web pages for current donation methods and addresses. Donations are accepted in a number of other ways including checks, online payments and credit card donations. To donate, please visit: http://www.gutenberg.org/fundraising/donate

Section 5.

General Information About Project Gutenberg{~TRADE MARK SIGN~} electronic works.

Professor Michael S. Hart is the originator of the Project Gutenberg{~TRADE MARK SIGN~} concept of a library of electronic works that could be freely shared with anyone. For thirty years, he produced and distributed Project Gutenberg{~TRADE MARK SIGN~} eBooks with only a loose network of volunteer support.

Project Gutenberg{~TRADE MARK SIGN~} eBooks are often created from several printed editions, all of which are confirmed as Public Domain in the U.S. unless a copyright notice is included. Thus, we do not necessarily keep eBooks in compliance with any particular paper edition.

Each eBook is in a subdirectory of the same number as the eBook's eBook number, often in several formats including plain vanilla ASCII, compressed (zipped), HTML and others.

Corrected *editions* of our eBooks replace the old file and take over the old filename and etext number. The replaced older file is renamed. *Versions* based on separate sources are treated as new eBooks receiving new filenames and etext numbers.

Most people start at our Web site which has the main PG search facility:

http://www.gutenberg.org

This Web site includes information about Project Gutenberg{~TRADE MARK SIGN~}, including how to make donations to the Project Gutenberg Literary Archive Foundation, how to help produce our new eBooks, and how to subscribe to our email newsletter to hear about new eBooks.

FINIS
