CHAPTER VII.

EXAMINATION OF SOME OPINIONS OPPOSED TO THE PRECEDING DOCTRINES.

Sec. 1. Polemical discussion is foreign to the plan of this work. But an opinion which stands in need of much illustration, can often receive it most effectually, and least tediously, in the form of a defence against objections. And on subjects concerning which speculative minds are still divided, a writer does but half his duty by stating his own doctrine, if he does not also examine, and to the best of his ability judge, those of other thinkers.

In the dissertation which Mr. Herbert Spencer has prefixed to his, in many respects, highly philosophical treatise on the Mind,[39] he criticises some of the doctrines of the two preceding chapters, and propounds a theory of his own on the subject of first principles. Mr. Spencer agrees with me in considering axioms to be "simply our earliest inductions from experience." But he differs from me "widely as to the worth of the test of inconceivableness." He thinks that it is the ultimate test of all beliefs. He arrives at this conclusion by two steps. First, we never can have any stronger ground for believing anything, than that the belief of it "invariably exists." Whenever any fact or proposition is invariably believed; that is, if I understand Mr. Spencer rightly, believed by all persons, and by oneself at all times; it is entitled to be received as one of the primitive truths, or original premises of our knowledge. Secondly, the criterion by which we decide whether anything is invariably believed to be true, is our inability to conceive it as false. "The inconceivability of its negation is the test by which we ascertain whether a given belief invariably exists or not." "For our primary beliefs, the fact of invariable existence, tested by an abortive effort to cause their non-existence, is the only reason assignable." He thinks this the sole ground of our belief in our own sensations. If I believe that I feel cold, I only receive this as true because I cannot conceive that I am not feeling cold. "While the proposition remains true, the negation of it remains inconceivable." There are numerous other beliefs which Mr. Spencer considers to rest on the same basis; being chiefly those, or a part of those, which the metaphysicians of the Reid and Stewart school consider as truths of immediate intuition. That there exists a material world; that this is the very world which we directly and immediately perceive, and not merely the hidden cause of our perceptions; that Space, Time, Force, Extension, Figure, are not modes of our consciousness, but objective realities; are regarded by Mr. Spencer as truths known by the inconceivableness of their negatives. We cannot, he says, by any effort, conceive these objects of thought as mere states of our mind; as not having an existence external to us. Their real existence is, therefore, as certain as our sensations themselves. The truths which are the subject of direct knowledge, being, according to this doctrine, known to be truths only by the inconceivability of their negation; and the truths which are not the object of direct knowledge, being known as inferences from those which are; and those inferences being believed to follow from the premises, only because we cannot conceive them not to follow; inconceivability is thus the ultimate ground of all assured beliefs.

Thus far, there is no very wide difference between Mr. Spencer's doctrine and the ordinary one of philosophers of the intuitive school, from Descartes to Dr. Whewell; but at this point Mr. Spencer diverges from them. For he does not, like them, set up the test of inconceivability as infallible. On the contrary, he holds that it may be fallacious, not from any fault in the test itself, but because "men have mistaken for inconceivable things, some things which were not inconceivable." And he himself, in this very book, denies not a few propositions usually regarded as among the most marked examples of truths whose negations are inconceivable. But occasional failure, he says, is incident to all tests. If such failure vitiates "the test of inconceivableness," it "must similarly vitiate all tests whatever. We consider an inference logically drawn from established premises to be true. Yet in millions of cases men have been wrong in the inferences they have thought thus drawn. Do we therefore argue that it is absurd to consider an inference true on no other ground than that it is logically drawn from established premises? No: we say that though men may have taken for logical inferences, inferences that were not logical, there nevertheless *are* logical inferences, and that we are justified in assuming the truth of what seem to us such, until better instructed. Similarly, though men may have thought some things inconceivable which were not so, there may still be inconceivable things; and the inability to conceive the negation of a thing, may still be our best warrant for believing it.... Though

occasionally it may prove an imperfect test, yet, as our most certain beliefs are capable of no better, to doubt any one belief because we have no higher guarantee for it, is really to doubt all beliefs." Mr. Spencer's doctrine, therefore, does not erect the curable, but only the incurable limitations of the human conceptive faculty, into laws of the outward universe.

Sec. 2. The doctrine, that "a belief which is proved by the inconceivableness of its negation to invariably exist, is true," Mr. Spencer enforces by two arguments, one of which may be distinguished as positive, and the other as negative.

The positive argument is, that every such belief represents the aggregate of all past experience. "Conceding the entire truth of" the "position, that during any phase of human progress, the ability or inability to form a specific conception wholly depends on the experiences men have had; and that, by a widening of their experiences, they may, by and by, be enabled to conceive things before inconceivable to them; it may still be argued that as, at any time, the best warrant men can have for a belief is the perfect agreement of all pre-existing experience in support of it, it follows that, at any time, the inconceivableness of its negation is the deepest test any belief admits of.... Objective facts are ever impressing themselves upon us; our experience is a register of these objective facts; and the inconceivableness of a thing implies that it is wholly at variance with the register. Even were this all, it is not clear how, if every truth is primarily inductive, any better test of truth could exist. But it must be remembered that whilst many of these facts, impressing themselves upon us, are occasional; whilst others again are very general; some are universal and unchanging. These universal and unchanging facts are, by the hypothesis, certain to establish beliefs of which the negations are inconceivable; whilst the others are not certain to do this; and if they do, subsequent facts will reverse their action. Hence if, after an immense accumulation of experiences, there remain beliefs of which the negations are still inconceivable, most, if not all of them, must correspond to universal objective facts. If there be ... certain absolute uniformities in nature; if these uniformities produce, as they must, absolute uniformities in our experience; and if ... these absolute uniformities in our experience disable us from conceiving the negations of them; then answering to each absolute uniformity in nature which we can cognize, there must exist in us a belief of which the negation is inconceivable, and which is absolutely true. In this wide range of cases subjective inconceivableness must correspond to objective impossibility. Further experience will produce correspondence where it may not yet exist; and we may expect the correspondence to become ultimately complete. In nearly all cases this test of inconceivableness must be valid now;" (I wish I could think we were so nearly arrived at omniscience) "and where it is not, it still expresses the net result of our experience up to the present time; which is the most that any test can do."

To this I answer: Even if it were true that inconceivableness represents "the net result" of all past experience, why should we stop at the representative when we can get at the thing represented? If our incapacity to conceive the negation of a given supposition is proof of its truth, because proving that our experience has hitherto been uniform in its favour, the real evidence for the supposition is not the inconceivableness, but the uniformity of experience. Now this, which is the substantial and only proof, is directly accessible. We are not obliged to presume it from an incidental consequence. If all past experience is in favour of a belief, let this be stated, and the belief openly rested on that ground: after which the question arises, what that fact may be worth as evidence of its truth? For uniformity of experience is evidence in very different degrees: in some cases it is strong evidence, in others weak, in others it scarcely amounts to evidence at all. That all metals sink in water, was an uniform experience, from the origin of the human race to the discovery of potassium in the present century by Sir Humphry Davy. That all swans are white, was an uniform experience down to the discovery of Australia. In the few cases in which uniformity of experience does amount to the strongest possible proof, as with such propositions as these, Two straight lines cannot inclose a space, Every event has a cause, it is not because their negations are inconceivable, which is not always the fact; but because the experience, which has been thus uniform, pervades all nature. It will be shown in the following Book that none of the conclusions either of induction or of deduction can be considered certain, except as far as their truth is shown to be inseparably bound up with truths of this class.

I maintain then, first, that uniformity of past experience is very far from being universally a criterion of truth. But secondly, inconceivableness is still farther from being a test even of that test. Uniformity of contrary experience is only one of many causes of inconceivability. Tradition handed down from a period of more limited knowledge, is one of the commonest. The mere familiarity of one mode of production of a phenomenon, often suffices to make every other mode appear inconceivable. Whatever connects two ideas by a strong association may, and continually does, render their separation in thought impossible; as Mr. Spencer, in other parts of his speculations, frequently recognises. It was not for want of experience that the Cartesians were unable to conceive that one body could produce motion in another without contact. They had as much experience of other modes of producing motion, as they had of that mode. The planets had revolved, and heavy bodies had fallen, every hour of their lives. But they fancied these phenomena to be produced by a hidden machinery which they did not see, because without it they were unable to conceive what they did see. The inconceivableness, instead of representing their experience, dominated and overrode their experience. It is needless to dwell farther on what I have termed the positive argument of Mr. Spencer in support of his criterion of truth. I pass to his negative argument, on which he lays more stress.

Sec. 3. The negative argument is, that, whether inconceivability be good evidence or bad, no stronger evidence is to be obtained. That what is inconceivable cannot be true, is postulated in every act of thought. It is the foundation of all our original premises. Still more it is assumed in all conclusions from those premises. The invariability of belief, tested by the inconceivableness of its negation, "is our sole warrant for every demonstration. Logic is simply a systematization of the process by which we indirectly obtain this warrant for beliefs that do not directly possess it. To gain the strongest conviction possible respecting any complex fact, we either analytically descend from it by successive steps, each of which we unconsciously test by the inconceivableness of its negation, until we reach some axiom or truth which we have similarly tested; or we synthetically ascend from such axiom or truth by such steps. In either case we connect some isolated belief, with a belief which invariably exists, by a series of intermediate beliefs which invariably exist." The following passage sums up the whole theory: "When we perceive that the negation of the belief is inconceivable, we have all possible warrant for asserting the invariability of its existence: and in asserting this, we express alike our logical justification of it, and the inexorable necessity we are under of holding it.... We have seen that this is the assumption on which every conclusion whatever ultimately rests. We have no other guarantee for the reality of consciousness, of sensations, of personal existence; we have no other guarantee for any axiom; we have no other guarantee for any step in a demonstration. Hence, as being taken for granted in every act of the understanding, it must be regarded as the Universal Postulate." But as this postulate which we are under an "inexorable necessity" of holding true, is sometimes false; as "beliefs that once were shown by the inconceivableness of their negations to invariably exist, have since been found untrue," and as "beliefs that now possess this character may some day share the same fate;" the canon of belief laid down by Mr. Spencer is, that "the most certain conclusion" is that "which involves the postulate the fewest times." Reasoning, therefore, never ought to prevail against one of the immediate beliefs (the belief in Matter, in the outward reality of Extension, Space, and the like), because each of these involves the postulate only once; while an argument, besides involving it in the premises, involves it again in every step of the ratiocination, no one of the successive acts of inference being recognised as valid except because we cannot conceive the conclusion not to follow from the premises.

It will be convenient to take the last part of this argument first. In every reasoning, according to Mr. Spencer, the assumption of the postulate is renewed at every step. At each inference we judge that the conclusion follows from the premises, our sole warrant for that judgment being that we cannot conceive it not to follow. Consequently if the postulate is fallible, the conclusions of reasoning are more vitiated by that uncertainty than direct intuitions; and the disproportion is greater, the more numerous the steps of the argument.

To test this doctrine, let us first suppose an argument consisting only of a single step, which would be represented by one syllogism. This argument does rest on an assumption, and we have seen in the preceding chapters what the assumption is. It is, that whatever has a mark, has what it is a mark of. The evidence of this axiom I shall not consider at present;[40] let us suppose it (with Mr. Spencer) to be the inconceivableness of

its reverse.

Let us now add a second step to the argument: we require, what? Another assumption? No: the same assumption a second time; and so on to a third, and a fourth. I confess I do not see how, on Mr. Spencer's own principles, the repetition of the assumption at all weakens the force of the argument. If it were necessary the second time to assume some other axiom, the argument would no doubt be weakened, since it would be necessary to its validity that both axioms should be true, and it might happen that one was true and not the other: making two chances of error instead of one. But since it is the *same* axiom, if it is true once it is true every time; and if the argument, being of a hundred links, assumed the axiom a hundred times, these hundred assumptions would make but one chance of error among them all. It is satisfactory that we are not obliged to suppose the deductions of pure mathematics to be among the most uncertain of argumentative processes, which on Mr. Spencer's theory they could hardly fail to be, since they are the longest. But the number of steps in an argument does not subtract from its reliableness, if no new *premises*, of an uncertain character, are taken up by the way.

To speak next of the premises. Our assurance of their truth, whether they be generalities or individual facts, is grounded, in Mr. Spencer's opinion, on the inconceivableness of their being false. It is necessary to advert to a double meaning of the word inconceivable, which Mr. Spencer is aware of, and would sincerely disclaim founding an argument upon, but from which his case derives no little advantage notwithstanding. By inconceivableness is sometimes meant, inability to form or get rid of an *idea*; sometimes, inability to form or get rid of a *belief*. The former meaning is the most conformable to the analogy of language; for a conception always means an idea, and never a belief. The wrong meaning of "inconceivable" is, however, fully as frequent in philosophical discussion as the right meaning, and the intuitive school of metaphysicians could not well do without either. To illustrate the difference, we will take two contrasted examples. The early physical speculators considered antipodes incredible, because inconceivable. But antipodes were not inconceivable in the primitive sense of the word. An idea of them could be formed without difficulty: they could be completely pictured to the mental eye. What was difficult, and as it then seemed, impossible, was to apprehend them as believable. The idea could be put together, of men sticking on by their feet to the under side of the earth; but the belief *would* follow, that they must fall off. Antipodes were not unimaginable, but they were unbelievable.

On the other hand, when I endeavour to conceive an end to extension, the two ideas refuse to come together. When I attempt to form a conception of the last point of space, I cannot help figuring to myself a vast space beyond that last point. The combination is, under the conditions of our experience, unimaginable. This double meaning of inconceivable it is very important to bear in mind, for the argument from inconceivableness almost always turns on the alternate substitution of each of those meanings for the other.

In which of these two senses does Mr. Spencer employ the term, when he makes it a test of the truth of a proposition that its negation is inconceivable? Until Mr. Spencer expressly stated the contrary, I inferred from the course of his argument, that he meant unbelievable. He has, however, in a paper published in the fifth number of the *Fortnightly Review*, disclaimed this meaning, and declared that by an inconceivable proposition he means, now and always, "one of which the terms cannot, by any effort, be brought before consciousness in that relation which the proposition asserts between them--a proposition of which the subject and predicate offer an insurmountable resistance to union in thought." We now, therefore, know positively that Mr. Spencer always endeavours to use the word inconceivable in this, its proper, sense: but it may yet be questioned whether his endeavour is always successful; whether the other, and popular use of the word does not sometimes creep in with its associations, and prevent him from maintaining a clear separation between the two. When, for example, he says, that when I feel cold, I cannot conceive that I am not feeling cold, this expression cannot be translated into, "I cannot conceive myself not feeling cold," for it is evident that I can: the word conceive, therefore, is here used to express the recognition of a matter of fact--the perception of truth or falsehood; which I apprehend to be exactly the meaning of an act of belief, as distinguished from simple conception. Again, Mr. Spencer calls the attempt to conceive something which is inconceivable, "an abortive effort to cause the non-existence" not of a conception or mental representation, but of a belief. There is need,

therefore, to revise a considerable part of Mr. Spencer's language, if it is to be kept always consistent with his definition of inconceivability. But in truth the point is of little importance; since inconceivability, in Mr. Spencer's theory, is only a test of truth, inasmuch as it is a test of believability. The inconceivableness of a supposition is the extreme case of its unbelievability. This is the very foundation of Mr. Spencer's doctrine. The invariability of the belief is with him the real guarantee. The attempt to conceive the negative, is made in order to test the inevitableness of the belief. It should be called, an attempt to *believe* the negative. When Mr. Spencer says that while looking at the sun a man cannot conceive that he is looking into darkness, he should have said that a man cannot *believe* that he is doing so. For it is surely possible, in broad daylight, to *imagine* oneself looking into darkness.[41] As Mr. Spencer himself says, speaking of the belief of our own existence: "That he *might* not exist, he can conceive well enough; but that he *does* not exist, he finds it impossible to conceive," *i.e.* to believe. So that the statement resolves itself into this: That I exist, and that I have sensations, I believe, because I cannot believe otherwise. And in this case every one will admit that the necessity is real. Any one's present sensations, or other states of subjective consciousness, that one person inevitably believes. They are facts known *per se*: it is impossible to ascend beyond them. Their negative is really unbelievable, and therefore there is never any question about believing it. Mr. Spencer's theory is not needed for these truths.

But according to Mr. Spencer there are other beliefs, relating to other things than our own subjective feelings, for which we have the same guarantee--which are, in a similar manner, invariable and necessary. With regard to these other beliefs, they cannot be necessary, since they do not always exist. There have been, and are, many persons who do not believe the reality of an external world, still less the reality of extension and figure as the forms of that external world; who do not believe that space and time have an existence independent of the mind--nor any other of Mr. Spencer's objective intuitions. The negations of these alleged invariable beliefs are not unbelievable, for they are believed. It may be maintained, without obvious error, that we cannot *imagine* tangible objects as mere states of our own and other people's consciousness; that the perception of them irresistibly suggests to us the *idea* of something external to ourselves: and I am not in a condition to say that this is not the fact (though I do not think any one is entitled to affirm it of any person besides himself). But many thinkers have believed, whether they could conceive it or not, that what we represent to ourselves as material objects, are mere modifications of consciousness; complex feelings of touch and of muscular action. Mr. Spencer may think the inference correct from the unimaginable to the unbelievable, because he holds that belief itself is but the persistence of an idea, and that what we can succeed in imagining, we cannot at the moment help apprehending as believable. But of what consequence is it what we apprehend at the moment, if the moment is in contradiction to the permanent state of our mind? A person who has been frightened when an infant by stories of ghosts, though he disbelieves them in after years (and perhaps disbelieved them at first), may be unable all his life to be in a dark place, in circumstances stimulating to the imagination, without mental discomposure. The idea of ghosts, with all its attendant terrors, is irresistibly called up in his mind by the outward circumstances. Mr. Spencer may say, that while he is under the influence of this terror he does not disbelieve in ghosts, but has a temporary and uncontrollable belief in them. Be it so; but allowing it to be so, which would it be truest to say of this man on the whole--that he believes in ghosts, or that he does not believe in them? Assuredly that he does not believe in them. The case is similar with those who disbelieve a material world. Though they cannot get rid of the idea; though while looking at a solid object they cannot help having the conception, and therefore, according to Mr. Spencer's metaphysics, the momentary belief, of its externality; even at that moment they would sincerely deny holding that belief: and it would be incorrect to call them other than disbelievers of the doctrine. The belief therefore is not invariable; and the test of inconceivableness fails in the only cases to which there could ever be any occasion to apply it.

That a thing may be perfectly believable, and yet may not have become conceivable, and that we may habitually believe one side of an alternative, and conceive only in the other, is familiarly exemplified in the state of mind of educated persons respecting sunrise and sunset. All educated persons either know by investigation, or believe on the authority of science, that it is the earth and not the sun which moves: but there are probably few who habitually *conceive* the phenomenon otherwise than as the ascent or descent of the sun. Assuredly no one can do so without a prolonged trial; and it is probably not easier now than in the first

generation after Copernicus. Mr. Spencer does not say, "In looking at sunrise it is impossible not to conceive that it is the sun which moves, therefore this is what everybody believes, and we have all the evidence for it that we can have for any truth." Yet this would be an exact parallel to his doctrine about the belief in matter.

The existence of matter, and other Noumena, as distinguished from the phenomenal world, remains a question of argument, as it was before; and the very general, but neither necessary nor universal, belief in them, stands as a psychological phenomenon to be explained, either on the hypothesis of its truth, or on some other. The belief is not a conclusive proof of its own truth, unless there are no such things as *idola tribus*; but, being a fact, it calls on antagonists to show, from what except the real existence of the thing believed, so general and apparently spontaneous a belief can have originated. And its opponents have never hesitated to accept this challenge.[42] The amount of their success in meeting it will probably determine the ultimate verdict of philosophers on the question.

Sec. 4. Sir William Hamilton holds as I do, that inconceivability is no criterion of impossibility. "There is no ground for inferring a certain fact to be impossible, merely from our inability to conceive its possibility." "Things there are which *may*, nay *must*, be true, of which the understanding is wholly unable to construe to itself the possibility."[43] Sir William Hamilton is however a firm believer in the *a priori* character of many axioms, and of the sciences deduced from them; and is so far from considering those axioms to rest on the evidence of experience, that he declares certain of them to be true even of Noumena--of the Unconditioned--of which it is one of the principal aims of his philosophy to prove that the nature of our faculties debars us from having any knowledge. The axioms to which he attributes this exceptional emancipation from the limits which confine all our other possibilities of knowledge; the chinks through which, as he represents, one ray of light finds its way to us from behind the curtain which veils from us the mysterious world of Things in themselves,--are the two principles, which he terms, after the schoolmen, the Principle of Contradiction, and the Principle of Excluded Middle: the first, that two contradictory propositions cannot both be true; the second, that they cannot both be false. Armed with these logical weapons, we may boldly face Things in themselves, and tender to them the double alternative, sure that they must absolutely elect one or the other side, though we may be for ever precluded from discovering which. To take his favourite example, we cannot conceive the infinite divisibility of matter, and we cannot conceive a minimum, or end to divisibility: yet one or the other must be true.

As I have hitherto said nothing of the two axioms in question, those of Contradiction and of Excluded Middle, it is not unseasonable to consider them here. The former asserts that an affirmative proposition and the corresponding negative proposition cannot both be true; which has generally been held to be intuitively evident. Sir William Hamilton and the Germans consider it to be the statement in words of a form or law of our thinking faculty. Other philosophers, not less deserving of consideration, deem it to be an identical proposition; an assertion involved in the meaning of terms; a mode of defining Negation, and the word Not.

I am able to go one step with these last. An affirmative assertion and its negative are not two independent assertions, connected with each other only as mutually incompatible. That if the negative be true, the affirmative must be false, really is a mere identical proposition; for the negative proposition asserts nothing but the falsity of the affirmative, and has no other sense or meaning whatever. The Principium Contradictionis should therefore put off the ambitious phraseology which gives it the air of a fundamental antithesis pervading nature, and should be enunciated in the simpler form, that the same proposition cannot at the same time be false and true. But I can go no farther with the Nominalists; for I cannot look upon this last as a merely verbal proposition. I consider it to be, like other axioms, one of our first and most familiar generalizations from experience. The original foundation of it I take to be, that Belief and Disbelief are two different mental states, excluding one another. This we know by the simplest observation of our own minds. And if we carry our observation outwards, we also find that light and darkness, sound and silence, motion and quiescence, equality and inequality, preceding and following, succession and simultaneousness, any positive phenomenon whatever and its negative, are distinct phenomena, pointedly contrasted, and the one always absent where the other is present. I consider the maxim in question to be a generalization from all these facts.

In like manner as the Principle of Contradiction (that one of two contradictories must be false) means that an assertion cannot be *both* true and false, so the Principle of Excluded Middle, or that one of two contradictories must be true, means that an assertion must be *either* true or false: either the affirmative is true, or otherwise the negative is true, which means that the affirmative is false. I cannot help thinking this principle a surprising specimen of a so-called necessity of Thought, since it is not even true, unless with a large qualification. A proposition must be either true or false, *provided* that the predicate be one which can in any intelligible sense be attributed to the subject; (and as this is always assumed to be the case in treatises on logic, the axiom is always laid down there as of absolute truth). "Abracadabra is a second intention" is neither true nor false. Between the true and the false there is a third possibility, the Unmeaning: and this alternative is fatal to Sir William Hamilton's extension of the maxim to Noumena. That Matter must either have a minimum of divisibility or be infinitely divisible, is more than we can ever know. For in the first place, Matter, in any other than the phenomenal sense of the term, may not exist: and it will scarcely be said that a non-entity must be either infinitely or finitely divisible.[44] In the second place, though matter, considered as the occult cause of our sensations, do really exist, yet what we call divisibility may be an attribute only of our sensations of sight and touch, and not of their uncognizable cause. Divisibility may not be predicable at all, in any intelligible sense, of Things in themselves, nor therefore of Matter in itself; and the assumed necessity of being either infinitely or finitely divisible, may be an inapplicable alternative.

On this question I am happy to have the full concurrence of Mr. Herbert Spencer, from whose paper in the *Fortnightly Review* I extract the following passage. The germ of an idea identical with that of Mr. Spencer may be found in the present chapter, about a page back, but in Mr. Spencer it is not an undeveloped thought, but a philosophical theory.

"When remembering a certain thing as in a certain place, the place and the thing are mentally represented together; while to think of the non-existence of the thing in that place, implies a consciousness in which the place is represented, but not the thing. Similarly, if instead of thinking of an object as colourless, we think of its having colour, the change consists in the addition to the concept of an element that was before absent from it--the object cannot be thought of first as red and then as not red, without one component of the thought being totally expelled from the mind by another. The law of the Excluded Middle, then, is simply a generalization of the universal experience that some mental states are directly destructive of other states. It formulates a certain absolutely constant law, that the appearance of any positive mode of consciousness cannot occur without excluding a correlative negative mode; and that the negative mode cannot occur without excluding the correlative positive mode: the antithesis of positive and negative being, indeed, merely an expression of this experience. Hence it follows that if consciousness is not in one of the two modes it must be in the other."[45]

I must here close this supplementary chapter, and with it the Second Book. The theory of Induction, in the most comprehensive sense of the term, will form the subject of the Third.

FOOTNOTES:

[1] 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).

[2] All A is B } contraries. No A is B }

Some A is B } subcontraries. Some A is not B }

All A is B } contradictories. Some A is not B }

No A is B } also contradictories. Some A is B }

All A is B } and No A is B } respectively subalternate. Some A is B } Some A is not B }

[3] 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. Sec. 229 *et seqq.* Mr. Bailey, (*Theory of Reasoning*, 2nd ed. pp. 70-74) takes a similar view of the subject.

[4] 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 formulae 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 formulae 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 cannot be translated into Mr. De Morgan's forms, which therefore cannot serve any purpose as a test of it.

Sir William Hamilton's theory of the "quantification of the predicate" (concerning the originality of which in his case there can be no doubt, however Mr. De Morgan may have also, and independently, originated an equivalent doctrine) may be briefly described as follows:--

"Logically" (I quote his own 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 coextensive 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 coextensive. 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*, 2nd 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 premise, 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 cannot 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. 104.)

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."

[5] 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 coexisting 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 coexists with a third type, coexist with another; or Two *powers* each of which coexists with a third power coexist with one another.

Mr. Spencer has misunderstood me in another particular. He supposes that the coexistence spoken of in the axiom, of two things with the same third thing, means simultaneousness in time. The coexistence 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 coexistent, both being attributes of man, though *ex vi termini* never of the same man at the same time.

[6] Supra, p. 128.

[7] *Logic*, p. 239 (9th ed.).

[8] 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.

[9] 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, &c. 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.

[10] Review of Quetelet on Probabilities, *Essays*, p. 367.

[11] *Philosophy of Discovery*, p. 289.

[12] *Theory of Reasoning*, ch. iv. to which I may refer for an able statement and enforcement of the grounds of the doctrine.

[13] It is very probable that the doctrine is not new, and that it was, as Sir John Herschel thinks, substantially anticipated by Berkeley. But I certainly am not aware that it 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."

[14] *Logic*, book iv. ch. i. sect. 1.

[15] See the important chapter on Belief, in Professor Bain's great treatise, *The Emotions and the Will*, pp.

581-4.

[16] A writer in the "British Quarterly Review" (August 1846), in a review of this treatise, endeavours 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 everything 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 everything 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 anything 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[46] 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 cannot be a necessary part of the argument. It cannot be a necessary condition of reasoning that we should begin by making an assertion, which is afterwards 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. 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.

[17] Infra, book iii. ch. ii.

[18] Infra, book iii. ch. iv. Sec. 3, and elsewhere.

[19] *Mechanical Euclid*, pp. 149 *et seqq.*

[20] 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 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.

[21] Some persons find themselves prevented from believing that the axiom, Two straight lines cannot 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 cannot 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.

[22] Whewell's *History of Scientific Ideas*, i. 140.

[23] 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 (I conceive) by our senses. 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 recal in imagination a colour or an odour 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 colours or of odours 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 colour 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 colours; 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 everybody 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.

[24] *History of Scientific Ideas*, i. 65-67.

[25] Ibid. 60.

[26] *History of Scientific Ideas*, i. 58, 59.

[27] "If all mankind had spoken one language, we cannot doubt that there would have been a powerful, perhaps a universal, school of philosophers, who would have believed in the inherent connexion 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, &c."--De Morgan, *Formal Logic*, p. 246.

[28] 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 Abbe Conti, "par la nature des creatures, 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 executable par les natures des creatures. Si Dieu donnait cette loi, par exemple, a un corps libre, de tourner a l'entour d'un certain centre, *il faudrait ou qu'il y joignit d'autres corps qui par leur impulsion l'obligeassent de rester toujours dans son orbite circulaire, ou qu'il mit un ange a ses trousses, ou enfin il faudrait qu'il y concourut extraordinairement*; car naturellement il s'ecartera par la tangente."--*Works of Leibnitz*, ed. Dutens, iii. 446.

[29] *Novum Organum Renovatum*, pp. 32, 33.

[30] *History of Scientific Ideas*, i. 264.

[31] *Hist. Sc. Id.*, i. 263.

[32] Ibid. 240.

[33] *Hist. Sc. Id.*, ii. 25, 26.

[34] *Phil. of Disc.*, p. 339.

[35] *Phil. of Disc.*, p. 338.

[36] Ib. p. 463.

[37] *Phil. of Disc.*, pp. 472, 473.

[38] 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 cannot inclose a space, and that two straight lines which cut one another cannot 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 cannot 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 cannot 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 cannot 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 counter-acting 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, coextensive at least with all human experience. That they pervade all the objects of experience, must ensure their continual suggestion *by* experience; that they are true, must ensure 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 cannot, 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*, &c. p. 272.

[39] *Principles of Psychology.*

[40] 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.

[41] 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 anything *is*," is not consistent with using the word conceive in its rigorous sense.

[42] I have myself accepted the contest, and fought it out on this battleground, in the eleventh chapter of *An Examination of Sir William Hamilton's Philosophy*.

[43] *Discussions*, &c., 2nd ed. p. 624.

[44] If it be said that the *existence* of matter is among the things proved by the principle of Excluded Middle, that principle must prove also the existence of dragons and hippogriffs, because they must be either scaly or not scaly, creeping or not creeping, and so forth.

[45] 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*.

[46] Mr. De Morgan says "Plato," but to prevent confusion I have kept to my own *exemplum*.

BOOK III.

OF INDUCTION.

"According to the doctrine now stated, the highest, or rather the only proper object of physics, is to ascertain those established conjunctions of successive events, which constitute the order of the universe; to record the phenomena which it exhibits to our observations, or which it discloses to our experiments; and to refer these