The True Theory of Induction. By the Rev. W. G. DAVIES, B.D., Rector of Llansantffraed, Abergavenny, late Chaplain of the Joint Counties' Asylum, Abergavenny.

It has been said that recognition will come sooner or later to the man who can wait. With the gratifying exception of his long connection with this Journal, the writer cannot say that this has been his experience. In a work named "The Alphabet of Thought," &c., published twenty-five years ago, was contained what he fully believes, after painstaking subsequent research, to have been the foreshadowing, at least, of one of the most important Laws of Thought. The late Dr. Mansel, Dean of St. Paul's, was acquainted with the writer's views, the work mentioned and the chief contents of this essay having been submitted to him, and the writer would here record his gratitude to the late Dean for the unusual courtesy with which he examined their contents. Since, however, the writer's views were strongly opposed to the Dean's, he never expected from that gentleman anything but adverse criticism. This fact has, however, completely failed to shake the author's confidence in conclusions which for nearly forty years he has submitted in vain to the most pitiless scepticism he could bring to bear upon them. Most of Mansel's strictures, together with the passages to which they refer, are here presented to the reader, and also extracts from letters received from the same gentleman bearing on the chief point herein discussed. Replies to both are given, combined with the later views at which the author has arrived.

1. That it is of the highest importance to ascertain how first principles are obtained will readily be acknowledged by every one who is keenly alive to the influence which ideas exert upon the advancement of the human race. To describe the origin of such principles is the object of the following discussion.

The inconceivableness of the negation is by many held to be the test of necessary truth. J. S. Mill, however, in his controversy with Whewell, contends that certain beliefs were once held to be indubitably true, their negation being inconceivable, which beliefs—for example, that the earth could not be round, else objects would fall off its surface at the Antipodes—are now exploded, and, therefore, that such inconceivableness is no criterion of the necessity of a truth.

Herbert Spencer, on the contrary, says:—"Mean what we

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may by the word truth, we have no other choice but to hold that a belief which is proved by the inconceivableness of its negation to invariably exist is true."*

After some controversy on this point between these two able psychologists, Herbert Spencer, having been brought to see the variety of meaning which is attached to the term inconceivableness, defines more clearly the cognitions of which we cannot entertain the negation, namely, those "of which the predicates invariably exist along with their subjects."† . . . "The discovery that the predicate invariably exists along with its subject is the discovery that this cognition is one we are compelled to accept." This position, with one modification, Mill accepts. This modification is thus stated by him :—"If the invariable existence of the predicate along with its subject is to be understood in the most obvious meaning, as an existence in actual Nature, or, in other words, in our objective or sensational experience, I, of course, admit that this, once ascertained, compels us to accept the proposition; but then I do not admit that the failure of an attempt to conceive the negative proves the predicate to be always coexistent with the subject in actual Nature." Inseparability between the predicate and the subject in thought, or to the conceptive faculty, Mill holds, does not prove a corresponding inseparability in fact or perception, for the former has often existed, and afterwards proved erroneous, in more than a few instances.

Now if we seek to know the source from which both J. S. Mill and Herbert Spencer derive these, our most irresistible beliefs, we shall find a clue in these forcible words of the latter :—"If there be, as Mr. J. S. Mill holds, certain absolute uniformities in Nature; if these absolute uniformities produce, as they must, absolute uniformities in our experience, and if, as he shows, 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 cognise, there must exist in us a belief of which the negation is inconceivable, and which is absolutely true."‡ From this conclusion Mill, however, dissents. "If," says Mill, "all past experience is in favour of a belief, let

* "Principles of Psychology." Introduction.

† As in: A straight line is the shortest distance between two points.

‡ The discussion between Mill and Herbert Spencer on this point is ably set forth in the 7th chapter, Book II., "Of Reasoning"—Mill's "Logic," latest edition.

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. . . . 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 enclose 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.*" Mill is here alluding specially to the Law of Causation, the notion of cause being, with him, the root of the whole theory of Induction; but this notion he interprets in the same way as Hume does.

Hume, in his essay entitled, "Of the Idea of Necessary Connection," it is well known, holds that every idea must be derived from an impression, and that in a case of causation we have no impression of necessary connection between the consequent and the antecedent. Whence, then, does the feeling of necessary connection take its rise? Hume's answer is as follows :—"As this idea" (necessary connection) "arises from a number of similar instances, and not from any single instance" (note this), "it must arise from that circumstance in which the number of instances differ from every individual instance." He then points out that customary connection is the only circumstance in which the former case differs from the latter, and this, consequently, must be the sole origin of the feeling of necessary connection. This doctrine, which, in all essential respects, remains with the *à posteriori* school as Hume left it, J. S. Mill endeavours to fortify against criticism, and to expand to fuller dimensions.

Hume's famous doctrine let us proceed to discuss. It is true that in an instance of causation we have no impression or direct perception of necessary connection; but it does not follow that we have no indirect perception of the same. On the contrary, our contention is that we have. J. S. Mill, believing with Hume and Brown that the feeling of necessary connection is due to long-continued association, observes :—"When we have often seen and thought of two things together, and have never, in any one instance, either seen or thought of them separately, there is, by the primary

* This must mean "not always the fact" in a certain class of cases, but it is always the fact in the class of cases here mentioned.

law of association, an increasing difficulty, which, in the end, may become *insuperable*, of conceiving the two things apart."* According to this view, the belief in necessary connection, so called, is the result of habitually finding two things together and never apart. This does, indeed, as in cases of causation, lead to a very strong expectation of future connection between two things, but, as Mill strongly contended, does not establish necessary connection between one and the other. In reference to such attacks as were made upon Hume's doctrine by Reid, Mill argues as follows:—"If there be any meaning which confessedly belongs to the term necessity, it is unconditionalness. That which is necessary, that which *must* be, is that which *will* be, whatever supposition we may make in regard to all other things." To the same effect he continues:—"Invariable sequence is not, therefore, synonymous with causation unless the sequence besides being invariable is unconditional. There are sequences as uniform in past experience as any others whatever, which yet we do not regard as cases of causation, but as conjunctions, in some sort, accidental. Such, to an accurate thinker, is that of day and night."† What Mill holds, then, is that the belief in so-called necessary truth springs from the habit of perceiving that connections exist, notably in causation, which are not only invariable but unconditional, the way to establish this fact being by the Method of Difference, "by which alone," he says, "we can ever, in the way of direct experience, arrive, with certainty, at causes."‡ Thus, then, according to Mill, is that uniformity of experience ascertained which amounts to "the strongest possible proof" and which "pervades all Nature."

J. S. Mill, in his exposition of Induction, exhibits, to our mind, two facts which are specially noteworthy, firstly, that the implicit process of Induction operating in all minds is forcibly drawing him as closely to the correct method as his theory, stretched to the utmost, permits, but, secondly, his theory being only a partially explicit statement of inductive thought, all he succeeds in accomplishing is to bring his sailing ship, so to speak, to tack very closely to the wind,

* Mill's "Logic," People's Edition, p. 157. This is also the view which Prof. Huxley, in his Sketch of Hume ("English Men of Letters") takes of this question. He regards the axiom of causation as "a purely automatic act of the mind, which is altogether extra-logical, and would be illogical, if it were not constantly verified by experience" (p. 123).

† "Logic," People's Edition, p. 222.

‡ *Ibid.*, p. 258.

but no more. It is the steam-ship of fully explicit Induction alone that can tear along into the mouth of the wind—fully explicit Induction being that which is expressed in a perfectly formal dress, and accurately sets forth the spontaneous Induction taking place in the mind of every human being. As a pioneer in exploring the region of Induction, Mill, we believe, has no equal. But a pioneer cannot do more than open a way for others to follow.

2.—Having thus opened the question, we proceed to state our view of the origin of what is called necessary and universal truth. After patient research, extending over a period of nearly forty years, we have arrived at the firm conviction that necessary truth so-called is obtained by a form of reasoning which may be expressed as follows:—

If it is perceived that *this* is connected with *that*, as 4 with $2+2$;

And if it is also perceived that *this* without *that* cannot exist, as 4 without $2+2$;

Then it is mediately perceived that *this* is necessarily connected with *that*, namely, 4 with $2+2$, *i.e.*, cannot (absolutely) exist without it.

This form, we call the Canon of Induction, a Law of Thought constantly in operation, and of a most important character. It is expressed more briefly in the following formula:—

This A is *b* (*e.g.*, $4=2+2$);

Minus this *b* is *minus* this A;

Therefore, this A is necessarily (or *sine medio*) *b*.

Observe that the Canon is a form of reasoning. We have in it a positive and a negative premise; for example, $4=2+2$, this is directly perceived; take away the $2+2$ and you take away the 4, this is also *directly* perceived; but it is by *indirect* perception, by comparing the above data, that we get to know the necessary connection existing between 4 and $2+2$. The Canon, then, seems to be the criterion of necessary truth. According to it, there is no alternative save for a connection among facts, whether of the mental or the physical world, to be proved necessary in character, or not necessary, that is, contingent.

In reference to this Canon, Mansel puts the following question:—"How does the conclusion differ from the second premise? What is the difference between *cannot exist without*, and *is necessarily connected with?* Can we perceive (empirically) *cannot?* We can only perceive *is not*. To go from *is*

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not to *cannot,* or from *is* to *must be* requires an *à priori* intuition."

Answer.—The *cannot* is a perceived or empirical *cannot,* just as when one says "I cannot lift this stone;" the difference between *cannot exist without* in the premise and *is necessarily connected with* in the conclusion is this: the former is *directly* perceived, the latter *indirectly;* it is a succinct mode of expressing what has been stated in the two direct perceptions which precede it, the contents of which it summarises. All reasoning is mediate cognition, and the conclusion of an argument, if fully, that is, explicitly stated, should clearly convey this idea. We invite attention to this statement, because it seems to elucidate the fact that the conclusion of the Canon given above means, in explicit language, that *this* is so connected with *that* as not to be able to exist apart from it.*

It has always been held that a necessary truth is virtually universal. Now, it appears that the universality of a necessary truth is inferred from the fact that its contradictory cannot be thought true. Who can think that $2 + 2$ (our $2 + 2$) can ever equal 5? Let us proceed to explain the reason of this. If it is proved by Induction according to the Canon that 4 must equal $2 + 2$, then when, by an effort of conception, we multiply cases of $4 = 2 + 2$, if we would not subvert our *principium*—a conclusion proved by Induction—we are compelled to conceive each case as precisely similar to this, our model. Out of the mould of Victoria sovereigns we can never believe that spade guineas can ever issue. "You say," remarks our critic, in words, the discussion of which is calculated to throw some light on this question, "you cannot conceive that the fact $2 + 2 = 4$, *while thought of as such,* can be also thought of as $2 + 2 = 5$. This is perfectly true, but it is not what I meant. Why cannot I cease to think of the 4 and begin to think of the 5? No one holds that I can believe two contradictory judgments *at one and the same time,* but why, in this case, can I not do it at different times?" My critic admits that $2 + 2 = 4$ *while* thought of as such, cannot also be thought of as $2 + 2 = 5$, but asks "why cannot I cease to think of the 4 and begin to think of the 5?" We answer, because, on his theory (as, of course, he would contend), an *à priori* intuition, and on ours, an induction, would have to be negatived. No one believes two contradictory

* Hamilton's postulate, "That we be allowed to express in language what is contained in Thought," here applies.

judgments at the same time, but why, in this case, our critic asks, "can I not do it at different times?" Because such an alternative is excluded by the nature of the case; for when at any time the supposition is made that $2+2=5$ then will also, without fail, be the time when we shall think of $2+2=4$ as the only believable judgment. At no time can we suppose the negation without being confronted by the correct induction $2+2$ must equal 4, for, indeed, that which contradicts involves that which is contradicted. It seems, then, to be undeniable that every case of this kind proves to be one of attempting, at one and the same time, to hold contradictory judgments, with the result that the inductive judgment is found to be one of the most irresistible and indestructible of even speculative or final beliefs. The law here involved we name the Law of Universalization.

We would here point out a source of ambiguity in the language of the question with which we have to deal. Any truth, it has been urged, if it be in reality what it professes to be, is necessarily true. To say that a truth is contingently true implies that it may be untrue. This, however, is not what is commonly understood by a contingent truth. Contingency is rarely used as a synonym for probability, because many a so-called contingent truth is true beyond all doubt, is, indeed, necessarily true. For instance, it is as undeniably true that a man is smoking while he is doing so, as it is that a whole is greater than its part, and the former of these we call a contingent truth. By a necessary truth, then, must be understood a necessary connection between one thing and another, and by a contingent truth a connection which is not necessary. When by inductive reasoning a connection cannot be proved to be necessary, it is contingent. Necessity and contingency are thus related terms, the whole universe of connections among things, or thoughts, being exhausted by these two alternatives. There are, therefore, in Nature, two kinds of uniformity—the one kind is that which rigidly satisfies the demands of the Inductive Canon, the other that which fails to do so, and yet to which no exception is known. Thus, in the induction—a triangle is a trilateral figure; without being trilateral, it cannot (empirically) be triangular; therefore, a triangle is necessarily a trilateral figure—we have the basis of a notion of uniformity, the negation of which, indeed, cannot be conceived without involving a *subversio principii, i.e.*, the subversion of an induction admitting only of the above conclusion. But in the induction—the Atlantic

Ocean is salt, we can conceive the possibility of its losing its saltness without ceasing to be an ocean—indeed, we are able to separate the salt from portions of its volume—so we are forced to infer that there is only a contingent connection between the Atlantic and its saltness.

Having now indicated how necessary and universal connections are known, let us, by way of more clearly elucidating the position herein maintained, proceed to indicate the relation in which it stands to J. S. Mill's doctrine.

3.—That the general is derived from the particular, we hold as strongly as J. S. Mill does. When, however, he contends that necessary connections have not, as a separate class, any existence, we are compelled to part company with him. The source and only source of these truths, he contends, is association, specially controlled by the Method of Difference. We allow that it is impossible to deny to association much of the force which Mill and others claim for it. But we must hold that association cannot be thought sufficient to account for the inconceivableness of the negation of quite recently ascertained instances of necessary connection, say, the few first times that a youthful student of geometry realizes some of the elementary truths of that science. Mill, when arguing in favour of association as the origin of our firmest beliefs, makes use of such expressions as these:—"Long-established and familiar experience;" "old familiar habits of thought;" "when we have often seen and thought of two things together, and have never in any one instance either seen or thought of them separately;" "in cases in which the association is still older, more confirmed, and more familiar;" "a sufficient repetition of the process." Now all these expressions imply that it is not possible to have the notion of a necessary connection without much repetition of experience, and a very considerable lapse of time. But this, we must think, is not true. For we hold that, from a single instance of inductive reasoning, a necessary connection can be inferred; and this can legitimately be extended to a universal connection. Even in early youth, long before oft-repeated and familiar experience can be gained, we feel confident of many instances of necessary connection. That 2 + 2 must make 4, the youth, by the implicit action of his reasoning power, very soon feels as certain as he ever will in the course of years. Now it is here maintained that truths thus known do not depend on long-continued association for their necessity, but are known to be necessary connections by Induction, that their necessity is as evident when first inferred as at any subsequent period; and that the incapacity for conceiving the negation of them to be true is not acquired by habit, association becoming insuperable, but proceeds from the constitution of the human mind, as much as Judgment and its expression by a subject, a predicate, and a copula, proceeds from the same constitution.

Be it known, then, that Induction commences with the establishment of individual cases of necessary connection. Inference from a conclusion thus derived to a similar case, or a number of such cases, involves generalization, but such inference is not formally valid, unless the remotest possibility of an exception is most completely excluded, and this end is not secured, except, as has been described above, by universalization from one or more instances of necessary connection. Particulars can only with perfect validity be derived from particulars, when the latter are instances of necessary connection inductively proved to be such, and, therefore, warranting a universal conclusion that embraces every particular. Thus is the passage from inductive to deductive logic bridged over.

Having thus paved the way for the examination of J. S. Mill's views—more with the object of elucidating our own by comparing them with his, than of criticising the latter —let us proceed to inquire where inference commences in his system. Mill emphatically insists that all inference is essentially from particulars to particulars without the intervention of general propositions. It may prove more satisfactory to acquire these, but they are not indispensable as part of the reasoning process. Coupling this view with his violent denial of the existence of such an important class of connections as the necessary, his inductive system differs materially from that propounded above. Induction, according to Mill, is purely and simply generalization from experience, resulting from the irresistible force of association.

In both the Canon of the Method of Agreement and that of the Method of Difference—in which, if anywhere, we ought to find the formulation of the essential points of his system—J. S. Mill requires *two* or more instances, but at least *two* which agree with or *resemble* each other. In explanation of the Method of Difference—the more cogent of the two Methods—Mill makes the following statement:— "The two instances which are to be compared with one another must be exactly *similar* in all circumstances, except the one we are attempting to investigate."* So there can be little doubt that similarity is, by him, made the ground of inference. Indeed, his reiterated declarations that all reasoning is essentially from particulars to particulars, *i.e.*, from these to their *like*, admits of no other conclusion. "In the strictest induction, equally with the faintest analogy," he plainly declares, "we conclude, because A *resembles* B in one or more properties, that it does so in a certain other property."† "It seems, then," says Jevons, "that the universal type of the reasoning process wholly turns upon the pivot of resemblance,"‡ according to Mill, he here means; and of himself, the inventor of that ingenious toy —the Logical Abacus, this is doubly true. But this doctrine, be it known, seems to us quite erroneous.

4.—Since the Laws of Association have obtained full recognition, the Law of Contiguity is found to occupy a leading place among intellectual processes. Under the head of this law come Differentiation, the Whole of Comprehension, the Singular or the sphere of Things. It is true that this law never operates apart from the Law of Similarity, but the latter, as we shall see, has two fields of operation, one in advance of the other. The Law of Contiguity, as such, has but a singular number, whereas the Law of Similarity has both a singular and a plural number. Now the theory broached in this essay implies that, fundamentally, Induction does not involve the comparison of two or more similar cases, but can be realized in the Whole of Comprehension, in which all thought, all reasoning, is strictly singular, there being no generalization from this case to that like case. This latter process is the *second* step in inductive reasoning, not the *first*.

"It must be acknowledged," says Reid, "that the objects we perceive are individuals. Every object of sense, of memory, of consciousness, is an individual object." "This," observes Hamilton, "Boethius has well expressed—*Omne quod est, eo quod est, singulare est.*"§ "As the multitude of common nouns," says Cardinal Newman, "have originally been singular, it is not surprising that many of them should so remain still in the apprehension of particular indivi-

* "Logic," People's Edition, p. 256.

† "Logic," People's Edition, p. 365.

‡ Mill's "Philosophy Tested," "Contemporary Review," Jan., 1878, p. 263.

§ Hamilton's "Reid," p. 389.

duals . . . . The terms of a proposition do or do not stand for *things*. If they do, they are singular terms, for all things that are are units." * To the priority, in the Order of Evolution, of the singular to its related general knowledge, we have thus drawn special attention, because our contention is that the first step in Induction is not generalization from experience, but reasoning solely in the singular Whole of Comprehension. † We are fully aware that, in Singular Judgment, as in every other mental process, the Law of Similarity is prominently operative; that is, the conscious manifestations of the present moment are judged to be identical with the latest, later, late existence of the same; an essential condition of all knowing and feeling being this manifestation of past and present consciousness in one present picture composed partly of presentation, partly of representation, partly of perception, partly of memory. But here take special note, that in analyzing the inductive process a broad line should be drawn between likeness as occurring in individual continuity relative to past and present, and likeness as occurring among a plurality of individuals. Although the singular can be realized solely as a continuous thread of similar presentations, yet the fact must not be overlooked that the general involves two or more such singulars or chains of identity. There is, therefore, a higher degree of logical evolution to be detected in the latter than in the former, namely, that which in grammar takes the form of the plural number, in logic, of generalization and classification.

(*To be continued.*)

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* "An Essay in Aid of a Grammar of Assent," p. 22.

† See the writer's latest article in this Journal, "The Border Land between Physiology and Psychology: Singular Judgment," July, 1880.