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LOGIC

BERNARD BOSANQUET

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LOGIC

OR THE MORPHOLOGY OF KNOWLEDGE

BY

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ABBREVIATIONS

Bradley's Appearance = Bradley's Appearance and Reality, ed. 2. Sonnenschein, 1897.

Bradley's Logic = Bradley's Principles of Logic. Kegan Paul, Trench & Co., 1883.

Keynes = Keynes's Formal Logic, ed. 4. Macmillan, 1906.

Prichard = H. A. Prichard's Kant's Theory of Knowledge. Clarendon Press, 1909.

Essentials = Bosanquet's Essentials of Logic. Macmillan, 1895.

Sigwart = Logik, von Dr. Christoph Sigwart. 2nd edition. Freiburg, 1889.

BOOK II

OF INFERENCE

CHAPTER I

THE NATURE OF INFERENCE

1. INFERENCE shares the essence of Judgment, but, at least *qua* explicit Inference, has in addition a *differentia* of its own. The essence of Judgment is the reference of an ideal content to Reality; the *differentia* of Inference affects the mode of this reference, and consists in Mediation. Inference then is the *mediate* reference of an ideal content to Reality. If I affirm that I spoke to you in the street yesterday simply because I find it in my memory that I did so speak to you, that is, apart from refinements of analysis, simply a judgment. If, as against your denial of the fact, I corroborate my recollection by pointing out that I *must* have spoken to you, because you afterwards acted upon something that I then told you, then I am reasserting the content of my original judgment, but with an addition and modification that turns it into an Inference. I then refer an ideal content to Reality, not as directly given in memory or in perception, but on the strength of a content distinguishable from the former content, bearing a certain relation to it, and itself referred directly to reality. The Essence of Inference.

By speaking of 'mediate' reference to reality we have mentioned the *differentia* of Inference, but have not explained it. Direct affirmation appears to explain itself; but mediate affirmation is even at first sight somewhat mysterious. We are at once met with the old question, 'How are synthetic judgments *a priori* possible?' The qualification *a priori* adds nothing to the qualification 'true' which is claimed by all judgment as such. The question therefore is in plain

English, 'How can one content claim to be true of Reality on the strength of another content distinct from the first?' 'How can any synthetic judgment *qua* synthetic—i. e. going *from* content *to* content and not simply accepting either a mere occurrence or a mere conjunction—how can such a judgment conceivably be justified?' The answer to this difficulty, like all answers in philosophy, is at first sight a mere restatement of it. Whether such a restatement is an explanation depends on its congruity and coherence with reason and with experience. It is possible—so the answer must run—to proceed in knowledge from content to content, because the world as known consists of universals exhibited in differences, and the contents from which and to which we proceed are not shut up within their respective selves, but depend on a pervading identical character or universal of which they are the differences. '*Of which* they are the differences'[a]—for here is the objection which meets us on the threshold. Suppose that I find in a room a hundred different objects—books, guns, china—all marked with the same label, say with the owner's name. Well then, it may be said, here is your 'identical character' or 'universal', but what can you infer from it beyond itself? It tells you nothing of the object to which it is attached. You may go on for fifty cases affirming that *a* having the label *x* is a book, *b* having the label *x* is a book and so on, but you cannot tell in the least what the fifty-first object that has the label will be, whether a sporting rifle or a china teapot. There is an identity throughout all the objects, but they are not, or seem not to be, *its* differences. They simply contain it, and are in no way leavened by it. You cannot in any way determine their predicates on the basis furnished by this pervading identity.

The whole of our previous and subsequent discussion really deals with this radical difficulty. Logic is little more than an account of the forms and modes in which a universal does or does not affect the differences through which it persists. I can only point out that all turns on the distinction between the abstract or powerless and the concrete or dominant universal. To interpret the latter by the former,

[a] Cf. vol. i., p. 45 note.

to reduce all universals to marks, i. e. to the level of the example just mentioned, is a fatal tendency of popular logic. A very elementary example of a relatively concrete universal may be found in the nature of a geometrical figure, say of the circle or the triangle. Given an arc of a circle, we have the radius and centre, and can lay down the whole circumference. The given arc is not simply repeated, it is continued according to a universal nature which controls its parts, and with a result which though involved in the given arc is yet outwardly and as an actual content distinct from it. This is clearer if instead of a circle we take an ellipse, in which the given fragment of the curve cannot in any sense be said to be simply repeated without change in constructing the remainder. There is something in the curve as given which is capable of dictating a continuation and completion of its outline distinguishable from the given arc or fragment itself. Just so with a triangle—given two sides and an angle, we can find the third side and remaining two angles.

And we can now see that in the first example, which seemed so hopeless, the same relation would be traceable assuming the label to have any meaning at all. A *mere* mark, which conveys nothing, is not even a mark, for what is it a mark of? But supposing the label to indicate A's ownership of the things, then we could infer all sorts of legal consequences about them from this ownership; and these consequences would not be the same for all the objects, but would be modified by their nature; e. g. it is probable that some of the things would be liable to seizure by a judgment creditor and some would not. Thus here too the universal would be an identity pervading different manifestations.

The universal in its differences is then the basis of mediate judgment or inference. But it is also the basis, as we have amply seen, of judgment as such, i. e. what would usually be called immediate judgment. The above examples, however, furnish the further distinction to which we shall find it convenient on the whole to adhere. Mediate judgment or inference is the indirect reference to reality of differences within a universal by means of the exhibition of this universal in differences directly referred to reality. The differences

indirectly referred to reality may fall outside, or include, or even consist exclusively of, the differences directly referred to reality. Immediate judgment, according to its idea, would be the mere reference to reality of differences as united within the identity or universal. It might be more intelligible if we were to substitute 'parts' and 'whole' for 'differences' and 'universal'; but then it would have to be borne in mind that we are not speaking of quantitative parts, i. e. that the kind of whole in question is not necessarily the sum of its parts. Subject to this reservation, I have no objection to defining Inference as the indirect reference to reality of parts within a whole on the strength of the nature of that whole as revealed in parts directly referred to Reality. And the definition of Judgment would bear a corresponding modification. Of course I do not mean that all the forms which have already been discussed under the head of Judgment are *substantially* confined within the definition of Judgment and excluded from that of Inference. But for the present, in order to obtain a clear view *prima facie*, we are considering only explicit Inference and excluding all that takes the outward shape of mere Judgment.

Some Accidents of Inference.

2. The above account of the essence of Inference will be best illustrated by considering some accidents of inference which I have endeavoured to exclude from the definition.

Mental Transition in Time.

i. First among these comes the attribute of mental transition in time, with which that of an advance from known to unknown may in one sense be identified.

The account given above [1] of the Judgment in time applies also to Inference as a mental process in Time. The first and most fatal error as regards both Judgment and Inference is to introduce the idea of an actual and instantaneous transition from content to content. This idea combines the error of denying that inference, as a mental process, has duration in time, with that of denying that as intellectual insight its parts are inward to each other and exempt from temporal succession. The universal itself, or intellectual synthesis or differences, is not a fact in time; and throughout the interval which inference occupies as a psychical process the operation

[1] Bk. I. chap. i.

of the universal as a growing insight is traceable in every point of time, but is not shut up within any atomic moment.

But apart from the idea of instantaneous transition, there is an idea of advance in time which has great appearance of truth and which is indeed in one sense true. It is unquestionable that in inference we start from data, from facts thrown down before us, it may be in chaotic disorder and with no suggestion of a result.[1] We go to work upon these facts, and after the labour of hours, of days, or of a lifetime,[2] we light upon a conclusion which issues from them and to which they are related as premises; i.e. which exhibits them as differences in a universal. How is it possible to deny that we have here an advance in time from data without conclusion, at any rate to data *plus* conclusion, and, if we go by the old syllogism, to conclusion *minus* a large part of the data? The difficulty which I find in stating the above antithesis is a first indication of its fallaciousness. It was impossible to write simply 'from data without conclusion to conclusion without data'. A conclusion without data is an obvious contradiction in terms, and if even part of the data are dropped (as the middle term in the syllogism) the conclusion sinks *pro tanto* into a ὅτι rather than a διότι—a fact instead of an inference. No doubt we are apt to pluck off our conclusion like a fruit from a plant and carry it away for consumption. Practical life requires this procedure. But we must remember that from the moment of severance death has begun, and that the intellectual product can bear isolation far less than the material. The idea of an actual transition *from* data *to* result, so far as it is founded on this habit, is in science simply a pernicious blunder. The case in which the result is a systematic insight that includes the premises in a transmuted form does not of course fall under this censure. But this case is not as a rule contemplated by the traditional forms of inference.

[1] I put the case at its extreme against myself. We must however remember that we can only see in the facts what we are ready to see there, what we bring with us. So however disorderly in fact, the data are really from the beginning theorised upon by our apprehension, because it can only apprehend them on the strength of its own existing content. [2] See the famous preface to the 'Origin of Species'.

And of course it might be correlatively maintained that facts are not data, except by virtue of a result; or if this is not true of data but only of premises, then that inference does not start from data but only from premises.[1] At first sight such a contention seems to blink the difficulty. The conclusion, it seems, may be removed by a week's work from the data or premises; and granting that they are not rightly called data or premises till the week's end when the conclusion is won, still the facts concerned were present and active at the beginning of the week and certainly entered into the advance that has been made.

Two things are here to be distinguished, viz. mere reproduction and inferential reproduction. The universal active in the mind is not apparent as a whole within the mere psychical facts of the transition. Its operation is extended throughout a series of the fugitive psychical facts or ideas, and although in *logical* thinking its operation is conscious, i.e. selects and modifies within the content of these ideas, yet it is not in itself necessarily a conscious activity. It acts in consciousness, but need not be conscious of its own principle of action. In rudimentary reproduction we see a man far off, and a name comes into our mind, apparently as a detached fact, without any reason that we can assign or think of trying to assign. It is only later, when we *clearly* recognise the man, that we become aware either *that* we recognise him, or how and why we recognise him. Logical thinking consists of making this process conscious; but essentially and fundamentally the intellectual tendency which controls reproduction need not be present as a distinct content operating in reproduction. So far the psychical process might in theory begin with data alone and then go on leaving them behind to result alone, *not* carrying throughout the transition any conscious unity or continuity of content.

But in *explicit* inference, at any rate, this is not the case. The essence of inference is to drag into consciousness the operation of the active universal as a pervading unity of content on which inference depends. The conscious operation of the active universal in inference is what we have to dis-

[1] But then it would seem the data must be premises of the premises.

tinguish from the mere implicit action of the universal in rudimentary reproduction. Therefore when we speak not of mere reproduction, but of inferential reproduction or passage from data to conclusion, then it is true that you can no more have data or premises without conclusion than conclusion without data or premises. The appearance to the contrary, which I have admitted to exist, arises from our fixing our attention exclusively on the conclusion *par excellence* in which and not before it we happen to rest. This conclusion, though it may close a stage of science or set at rest a longing of our hearts, is in no way different in logical character from the first steps of preparatory activity with which reason penetrates the facts laid before it. We meet the data with a judgment when they are laid before us, and we modify this judgment continuously throughout our inference. Any section taken, so to speak, across the interval of intellectual activity which elapses from first data to ultimate conclusion would lay bare the *whole* structure of an inference, just as a section across the time during which a chord is sounding on the organ would exhibit the *whole* harmonic structure of the compound tone. Of course we may draw partial conclusions, discard their data, and work with these conclusions as with fresh data, and so far we make an advance from content to content, discarding the old in favour of the new. But this process, though necessary in practice, comes under the observation made above upon a conclusion severed from its proof, and is not typical of inference, but of its limitations.

Transition in time from content to content as between data and conclusion in inference is not really possible. But it is true that the process of inference, though continuous and bound together by a conscious unity, is extended in time and includes considerable modifications of the judgments from which it starts. The appearance of a transition arises from discarding data, which is unjustifiable, from transforming data, which is right but is no transition, or from comparing ultimate conclusions and primary data while neglecting the intermediate phases which constitute the continuous and—not *transitional* but—*inclusive* inferential evolution. It is in

this character of transition without conscious continuity that rudimentary reproduction differs from explicit Inference.

Thus our definition of Inference did not say that the differences which form the data are *previously* affirmed of reality, although it is only from them as affirmed of reality that the reality of the inferred differences can flow.

Discovery or Novelty.

ii. Secondly, it follows from the above considerations that *discovery* is an accident and not an essential of inference. Inference is not essentially passage in time whether instantaneous or extended. Therefore it is not the case that a conclusion ceases to be an inference the moment that it becomes familiar, the moment, that is, that it ceases to be a discovery. On the contrary, discovery without proof is conjecture; an element of proof is needed to constitute inference, and indeed to constitute discovery. The activity of inference cannot be identified with the perception of something new. It is quite a normal occurrence that the elements which are indirectly referred to reality should *also* be directly referred to reality. Whenever, indeed, as the ideal of inference requires, the original data themselves are transformed and freshly elucidated, this happens as a matter of course. When the working of a machine is about to be explained we see a wheel or piston to be there as a fact, and we ask what it does. The answer tells us why there must be such a wheel or piston, and this is not superfluous though we knew beforehand that it was there. The part in question then becomes to us an element or difference in the pervading identity or universal which is the working of the machine. And if we live fifty years and see the machine every day, understanding it thoroughly, still the use of any one of its parts, considered as necessitated by the nature of any other actual part or set of parts combined with the working of the whole machine, remains to us an inference and never becomes a mere fact. Thus novelty or discovery is an accident of Inference.

Omission of relevant matter.

iii. Thirdly, it follows from the above considerations that omission in the conclusion of contents employed in the premises is an accident of inference. Inference is confined neither to what is novel nor to what happens to interest us. The appearance of a necessity of omission arises from various

causes. The transformation of data is an ideal which is likely to be misunderstood. It resumes the old data in a new expression. Again, it is usual and in complicated matters unavoidable to confine ourselves in dealing with any universal to some aspect determined by context or by curiosity. And the habitual omission of the middle term in the Aristotelian syllogism is perhaps due in part to the above causes, and in part to the vicious habit of severing the conclusion from the premises which the rhetorical associations of early logic tended to foster.[1] But the entire content of the universal, so far as recognised in the necessity that unites its differences, is the true content of every inference, and there is no logical reason for neglecting to make explicit any portion of truth which our perception of it generates.

A question arises on the margin of this subject of omission with reference to the systematic realities of which we spoke under the head of the hypothetical and disjunctive judgments. If I directly affirm the reality of a complex system, such as a railway, or a government, or a mind, and include in my affirmation a mention of many parts and properties as systematically interrelated, am I in doing so rightly said to be inferring? It rather seems here as if the absence of omission destroyed all semblance of a *conclusion*, and how can there be inference without a conclusion? 'Cannon Street railway station has interlocking points and signals.' To any one who understands the subject it is unnecessary to complete this by the further explanation (which even if inserted may of course be a mere qualification, not a fresh judgment), 'such that opening any one line *ipso facto* needs the signals to be at danger for all the lines that cross it.' In such a judgment, regarding it, as we have every right to do, in the light of a single affirmation, I am obviously embodying matter which has an inferential character. But whether I am actually inferring or not depends—*not*, as one might be tempted to say, on the novelty of the conclusion implied, but—on the degree of insight with which the judgment is made. It is in

[1] Because the rhetorician only wants to prove, not to understand. If he reaches his conclusion, the steps by which he reached it cease to interest him or his audience.

short either an inference, or the allegation as a fact of relations that must have formed the conclusion of an inference, although the inferential connection *may* now be lost. If however we go into such detail as proves that we have an insight into the why and wherefore of the system, then we have no choice but to say that we are inferring but are stating our inference confusedly. The confusion is in not distinguishing data from conclusion—how much is immediately affirmed of reality, and how much is mediate. The judgment is a mediate judgment simulating an immediate character.[1]

An ordinary hypothetical judgment is really an analogous case to the above (which might be represented by a disjunctive judgment). Inferential matter, a relation or nexus, seems to be affirmed of reality; but yet the omission, which would leave as affirmed what seems to be the conclusion, cannot be made. The ground *per se* is not affirmed of Reality, and so the consequent *per se* is not affirmed to be true. The moment that 'If' passes into 'Because' you can omit the ground and affirm the consequent *per se*. But retaining the 'If' we cannot affirm the consequent. We cannot affirm upon mere supposition, nor can we infer without affirming. Yet certainly, as in the last paragraph, we seem to have before us an inferential activity. 'In four-dimensional space (i. e. supposing such space) a knot can be tied in a string whose ends are held.' In this judgment the nexus between four-dimensional space and tying a knot is undoubtedly inferential. The moment we affirm the reality of the ground, we also affirm the real possibility of the consequent. But the hypothetical judgment as such affirms neither the one nor the other. The entire judgment is no doubt itself a consequence of an underlying reality, the affirmation of which it implies, and on the ground of which—a ground asserted to be real—the *whole* complex content of the hypothetical judgment is asserted to be real, subject to its own inherent reservation

[1] The existence of these ambiguous inferences—half inference and half memory or authority—favours in appearance the restriction of inference to what has novelty. When an inference is just made, then, if ever, it has definite data. When an inference is familiar, it is too likely to rest on the ground that it is remembered to have been approved of. Nevertheless, not novelty, but systematic necessity, is the true differentia.

embodied in its own further ground. But this does not help us to determine the presence or absence of inference within the hypothetical judgment itself.

The fact seems to be that hypothetical affirmation is a contradiction in terms, and so too is hypothetical inference. The whole process, apart from any categorical meaning which it may make explicit, which is a matter of degree, is a mere make-believe. You choose to treat as real in one sense what you do not affirm to be really real,[1] and you record the groove of necessity which manifests itself when the artificial reality is considered as though forming part of the real reality. Of the differences within the universal which determine the remaining differences (in this case the consequent) part (the hypothetical ground) are only sham reality, and therefore although we seem to exert inferential activity, yet we cannot affirm the conclusion of the inference. Here then we have the two degrees of impropriety in omission. Even when the ground of inference is affirmed, as with ordinary premises, the reality of the conclusion is restricted to the precise sense imposed by that ground, and it is therefore theoretically unsafe to affirm the conclusion apart from the ground. But when part of the ground of inference is not affirmed, then we have really the case of the problematic judgment, and if the consequent is affirmed with omission of the supposed ground it can only be affirmed problematically, i. e. cannot be affirmed as true, or in the proper sense affirmed at all. The reference to reality is then incompletely mediated. But on a pure supposition no inference can be erected. The element of supposed reality is the element of reservation, and the element of real reality is the element of affirmation. A pure supposition would be all reservation and no affirmation. If I suppose that over a certain spot of ground gravity ceases to operate, I can form some kind

[1] This process has many degrees. The content of supposition may be real all but some very minute relation. The conclusion from the supposition can then be affirmed subject to a very minute reservation. The *main* content of the conclusion may depend on what is absolute fact. 'If that picture were $\frac{1}{8}$ in. to the left it would hang symmetrically with that other picture' gives the conclusion. The picture A hangs symmetrically to $\frac{1}{8}$ in. with the picture B.

of conception of the consequence. I affirm the present state of things with reservation for the modification introduced by the limited absence of gravity. But if I suppose that there is to be no gravity at all in the world, the reservation gets the upper hand, and nothing, I presume, is left for me to affirm —not even, as when part of the conditions only is affirmed, a problematic conclusion.

Omission in inference is thus accidental and hazardous in various degrees. It is, as we saw, in one form (as omission of the condition or reservation in judgment) the mark of problematic judging. Omission however as here discussed is omission of matter relevant to the inference, or, which is the same thing, falling within the conclusion. In this sense, as within the relevant content, selection is the converse of omission, and is equally an accident of Inference. If you select, you omit; and if you omit, you select. But you need not do either.

Omission of irrelevant matter.

iv. On the other hand, actual data must always present irrelevancies, and must be exhibited as transformed—not necessarily *be* transformed *de novo* by an act of discovery—in the inferential operation. Otherwise there could not be the circuit through the universal which we have taken to be the differentia of inference. It is natural therefore to think of Omission and Selection with reference to the *actual* data on which, as referred to reality in their crude form, a given inference depends. Within these actual data Selection is of the essence of Inference, but Omission depends on the existence of irrelevancies in the data, and although in theory these disguises and superfluities cannot be wanting, yet they may be reduced to an almost inappreciable margin, and the element of omission in that case becomes inappreciable also. There is then, apparently, selection without omission; there can never be omission without selection.

Three terms.

v. It has been maintained that the presence of three 'terms', as required by the Aristotelian syllogism, is an accident of inference and does not touch its essence. I must leave this question, which is largely verbal, to decide itself in detail from our whole account of the subject. Here I will merely indicate the distinction on which in my opinion the

answer to it depends. Of course an inference is constantly drawn by the combination of very numerous facts and conceptions. Aristotle's [1] or Lotze's Inductive syllogism, or a Sorites, or a Euclidean construction, are familiar examples of inference so drawn. The only question is whether these numerous facts or conceptions correspond to phases or elements in the logical act of Inference, and whether, if they do not, they can claim the title of logical 'terms'. Must there not always be (i) differences or parts directly referred to reality, (ii) the universal nature or continuous identity which binds these differences or parts into a whole, pregnant with a capacity of accepting and arranging further differences or parts, and (iii) further differences, identified as parts within the pregnant whole which controls the inference, and, on the strength of this identity, referred to reality? It may be observed that this last 'term', moment or element of inference, may and ought to include the two former. But it contains them in another sense than that in which they appear as isolated elements of inference, and therefore is not superfluous nor tautologous. We may have a thousand observations of the places of a moving heavenly body, but these thousand data are not a thousand terms. The thousand observed places fuse into the law of the orbit, and the law of the orbit dictates the remaining places which form the path that the body traverses. Or, as the above instance really verges upon geometrical construction, we may take an example more cognate to what is commonly meant by Induction, though it is hard to find a good example of a process which does not exist. If typhoid fever attends a certain milk-supply through a large portion of its ins and outs, including many dozens of cases, then we shall no doubt be apt to suspect that danger attaches to that milk supply as a whole, and consequently menaces any localities as yet unexamined to

[1] τὸ καθ' ἕκαστον is a term in both premises of the Aristotelian Inductive Syllogism. Obviously this means that each premise would be a conjunction of judgments, or a conjunctive judgment. Such a group of judgments would correspond to the so-called premises in Lotze's Inductive Syllogism, which 'premises' are really only a single premise, out of which Lotze takes his conclusion *per saltum*. If the other premise were filled in, his inference would show three terms.

which this same supply extends its operations. Here again the three elements of Inference are conspicuous, though, as we shall see, they are in any such statement exceedingly ill-defined and their connection ill-warranted.

The lower limit of Inference.

3. I have thus far been speaking of explicit Inference, that is to say, of inference in which three or more 'terms' or intellectual elements are consciously distinguished and combined. And it is true, as I said above, that the nature and phases of implicit Inference must really be gathered from the whole theory of judgment which I have stated in Book I to the best of my power. But a few remarks and a few examples may be useful in throwing light on the modifications which have to be traced.

The function of which I have attempted, in the theory of judgment, to write the later history, is the activity of the universal in the mind, or in other words, of the mind as the universal.

The reproduction of Ideas.

i. I have at present neither space nor competence to enter upon psychological controversy with reference to the so-called Association of Ideas. But it is necessary to define my position by explaining that in as far as any doctrine of Association involves the hypothesis of reproduction by other ideas of ideas as separate particular units, i. e. the denial of real identity or of the active universal, I am unable to reconcile such a doctrine with logical phenomena. And logical phenomena, if we include in them the judgment from its very beginning, take in by far the larger part of the known phenomena of mind. I cannot suppose a discontinuity—in my opinion moreover wholly unmotived by experience—between distinctly logical phenomena and the quasi-intellectual activities of primitive and animal soul-life. And therefore I shall treat the fundamental activity of thought as the same throughout and as always consisting in the reproduction by a universal or a real identity, presented in a content, of contents distinguishable from the presented content, which also are differences of the same universal.

It may be that in early soul-life this reproduction is unconscious, and that its results, the images which it brings before the mind, are not used as ideas, i.e. are not distinguished

from fact or known to be symbolic of a content other than themselves. The results of experience may be made available for the guidance of action in an animal through suggestion effected by reproduction, but not distinguished *as* suggestion from any presented reality. In this process we have something that does the work of judgment and inference, and that has the same fundamental nature with them. But it is not judgment, because the images which it causes to succeed one another in the mind, not being distinguished from any reality, as a mere meaning necessarily is,[1] cannot be affirmed in qualification of reality.[a] And *a fortiori* such early thought is not inference, because it is not judgment. Inference as we saw involves assertion.

To begin with, then, we may set down the lower limit of inference as at any rate not prior to the beginnings of judgment. Yet even this *prima facie* boundary is drawn subject to a large reservation on account of the primitive reproduction or redintegration to which I have just alluded. The unconscious extension of a sensation by reproduction fulfils some functions of inference.

General necessity of Judgment.

ii. And when we come to judgment in the strict sense, the task of drawing a line between implicit inference and what is not inference at all becomes an impossible one. Fortunately it is also, in this rigid form, an idle one. What we have to say upon it amounts to this. All Judgment, we are told[2] with emphasis, claims necessity. That is to say, every one who makes an assertion,[3] though of course he has, as a rule, never heard of logic or of a ground, yet believes that he cannot think otherwise than as he asserts. In full-blown Inference he backs up this belief by a distinct allegation of separate but connected matters which he takes to justify his conviction. In implicit Inference we must distinguish the feeling that there

[1] When psychical images come to be employed for the sake of a meaning which they convey, *they ex hypothesi* are not treated as fact. And their meaning is not itself a psychical fact, but is an intellectual activity which can only enter into fact by being used to qualify reality.

[a] On the nature of an implicit idea, which is a mere qualification of sensation or perception, see Bradley, Appearance, ed. 2, 606.

[2] Sigwart, vol. i. p. 237. E. Trans. 1. 182.

[3] A conscious lie is only a sham assertion, except in as far as the hearer is induced to judge it true.

is a justification from the incipient selection of definite matters as forming the justification. It is probable that, as Sigwart implies, the feeling of justification is in one form or another essential to judgment. An uneducated man or a child, if his perception or his memory is doubted, will sometimes merely reiterate his assertion. This reiteration implies on the one hand that he cannot formulate any inferential support for his original judgment; he does not know how to travel outside the content of his assertion in order to invoke external aid. Such a phase of the judging activity is well illustrated by the impersonal judgment, in which the place of the significant subject which develops into the pregnant genus-idea, or ground, or condition, is devoid of all content. Yet on the other hand such reiteration implies an effort and failure on the part of the speaker to get beyond the original content, and a consequent return to that content, which is the germ of the *motived* inability to think otherwise that constitutes the necessity of inference. In such a mind, we may suppose, imagination and conception do not fall apart, and his thinking satisfies the criterion of necessary truth which Mill criticised as defectively explained by Whewell, in that he cannot even *imagine* (not to speak of *conceiving*) the matter to be otherwise than as he asserts it to be.

An educated man makes a similar justification explicit when he tells us that he relies on the evidence of his senses. The phrase is perhaps primarily intended to be ironical, as implying that the senses give the fact and not mere evidence of the fact, but its irony fails because it is strictly true. Sense, though it is a fact, cannot give *the fact*, and is strictly, as the supposed speaker calls it, evidence—circumstantial evidence or datum, not 'testimony'[1] which implies assertion. The phrase 'evidence of the senses' then, if taken seriously, conveys the consciousness that sense-perception has an inferential character, and rests on a necessity arising out of combinations of elements among which sensation is but a part or datum. When this consciousness, which experi-

[1] Evidence in this application may have originally meant obviousness or intuitiveness, 'Evidentia,' 'Evidenz,' and would then have no close connection with the common meaning of 'evidence' as = 'testimony.'

ence of illusions soon forces on reflecting men, is thoroughly attained, then the perceptive judgment is known to need justification, but it is not known in what this justification consists nor that it may lie in a connection of content apparently going beyond the observed conjunction. Attentive observation and precise interrogation of the memory are the engines which suggest themselves as securing the necessity of judgment at this stage. Of course these processes imply a reliance on certain principles. But the inference is so far formal and general, not material and specific. It is rather a general conviction that perception can be relied on, than an individual inference that this particular perception is rightly construed to give this particular content. And therefore the inference falls apart from the judgment as such, and cannot be taken as an element within it. When we pass this point, we come to something much more like Inference proper.

Specific necessity of Judgment.

iii. Prior to Judgment, as we saw reason to suppose, the operation of the universal or the real identity which governs reproduction is unconscious. Of course it has a result in consciousness, but the mind is not aware of the limits and pervading ground of the process from which this result emanates. I cannot say on what definite stimulus my friend's name rises to my mind when I see him at a distance, not being yet aware that I have recognised him, nor what is the operative content which makes a certain room recall a long past incident which occurred elsewhere. In the phase of judgment which has just been alluded to this real identity emerges into consciousness as the meaning of sentences and as the active guide of perception and memory. In this capacity it is attended by a necessity at first actual and then perceived, which at least reveals itself (when men talk of the evidence of their senses) as a partly intellectual necessity. But up to this point the real identity or meaning has simply been suggested and affirmed, as this or that ideal content, to be true of reality, and has not within itself displayed any articulated or selective character. It has shown no systematic organisation to which thought could appeal as a definite individual compulsion prescribing the nature of the ideal content which it reproduced. The matters affirmed have simply

been conjoined within a unity or identity, as philosophy and self-conceit may be conjoined in the same man. They have not been shown to cohere as parts in an intelligible whole, not, that is, as the third angle of a triangle coheres with two given angles and a given side, or as personal liberty in England coheres with the supremacy of law.[1]

But a further principle makes its appearance, as we saw, with the judgments of individual character, of ideal measurement or of ideal enumeration. Here the universal takes on the character of a system, which governs its parts on the basis of its pervading nature. From this point onwards we have in fact the full essentials of Inference, and it is very much a question of convenience whether the inference takes implicit or explicit form. So long as we retain the form of direct synthesis our definition forbids us the title of explicit inference. For the identification of the subject-idea with reality is presupposed and not affirmed, and the qualification of reality by the predicated content is therefore direct in form, though indirect to a large extent in substance. 'To a large extent' only, for according to the view which I take of judgment the affirmation in all the more genuine and natural forms of assertion is both direct and indirect even in substance. If I affirm 'The Czar of Russia can throw Europe into a blaze by lifting his finger' I am judging both categorically of the historical individual, and necessarily or inferentially of the wielder of enormous forces. And the same holds good in some degree if I speak of the British Constitution, or of the force of gravity. The educated mind sees an argument in judgments dealing with these matters even without the help of vocal accent and inflexion which can be used to drive home the inference. From the individual judgment then, through the generic, as far as the pure hypothetical which has already been discussed in this context, we have implicit inference which verges upon explicitness in proportion as the operative ground or reason is more clearly set out in the subject-idea.

[1] See Dicey on the Law of the Constitution. I may venture to remark that works of this class are a valuable study for logicians, because they illustrate forms of necessary connection which are not dependent on geometrical perception.

The generic judgment shows the union of the two types in its fullest significance. The individual content here claims to be a presupposed qualification of reality, and therefore, as reality, has the predicated content *directly* identified with it; while the very same self-complete organisation which entitles the subject-content to be taken as real, also enables it to demand the predicated content as a necessary consequence, and to act as a middle term attaching this content *indirectly* to reality. 'Poetry is a form of art which employs ideas as the medium of representation.' Here we are at once qualifying a reality and drawing an inference.

The true immediate inferences.

iv. These principles may advantageously be elucidated by the example of what might be called the true immediate inferences, which may properly be mentioned here on the threshold of Inference. I refer to such processes as Recognition, Abstraction, Comparison, Identification, Discrimination. All these titles are obviously drawn from characteristics which in a certain sense no judgment or inference is without, and which reciprocally imply one another.[1] But they also can be and are used as names of processes, of cases of the judging activity, in which one or other of its aspects asserts itself *par excellence*. They are cross divisions to the progressive stages of judgment which were described in Book I, and might be spoken of, though not with equal appropriateness, as present in all these stages short of disjunction. They are separated from one another and from other forms of judgment rather by practical and methodological than by strictly logical distinctions.

Comparison.

a. Comparison is a good example. The Comparative Judgment, as described in Book I, fills an important place in logical evolution. The variations of a common quality between more and less are the simplest explicit case of identity in difference. But the reflective comparison of common life both stops short of and goes beyond what I have called the comparative judgment. Comparison in the ordinary sense is a name applied to the intentional cross-reference of two or more given contents, in order to establish, between those contents *as given*, a general or special identity, difference,

[1] See Introduction, sect. 5.

or partial identity (likeness). And with the establishment of a relation of equality, or of quantitative difference which implies equality ($a > b$ implies $a = b + x$), popular comparison *diverges* into equation, in which the cross-reference is retained throughout. The equation is essentially *comparative*. You cannot say '*a* is equal' any more than you can say '*a* is the same'.[1] In Comparison, identity &c. is stated as a result, or else very strongly implied, in an abstract form. If it were made concrete and definite the cross-reference to the contents *as given* would be superfluous or impossible, other and profounder standards being introduced and the contents having no longer their original shape. The result required in comparison is such as 'A is like B'. If we say 'A and B are both red', this too is comparison in virtue of the cross-reference implied in 'both'. But if we say 'A is red and B is green' we are passing out of the process popularly called comparison into ordinary investigation, aimed not at a particular cross-reference, but at developing the facts which may come to hand. And if we go to 'All *a* (including *a* and *b*) are coloured surfaces', the original data have disappeared, and comparison in the popular sense has become impossible. When the process has justified in the concrete the abstract idea which guided it, it has put an end to its own *raison d'être* and passes into the normal operations of knowledge.

Abstraction.

β. Abstraction, again, affords an example worth considering. Abstraction in general is the necessary consequence of definite thought, and indeed of all definite activity. All activity has its restrictions and limitations, selects and omits, and is so far abstract. But though all thought is abstract, yet all thought need not be abstraction as a special process. Abstraction in this sense is a methodic activity guided by a special reflective idea, the idea of obtaining the part out of the whole by omission of other parts. The whole is theoretically always, and practically often, more knowable than the part. It is easier to say that $99 \times 5 =$ five hundreds *minus* five units, i.e. 495, than to multiply out ninety-nine by five. Subtraction may be regarded as the specific term for abstraction when the latter deals with the parts of a homogeneous or

[1] Cf. Sigwart, i. p. 85; E. Trans. i. p. 69.

quantitative whole. The hydrostatic explanation of the cup which retains the juice in a fruit-tart is an example of abstraction [1] which obtains knowledge of one aspect of a heterogeneous whole by omitting all the rest. But the examinee who added that for the atmosphere to sustain the liquid within the cup it was necessary that the cup should not be more than thirty feet high had passed from mere abstraction within the given whole to independent consideration of the hydrostatic relation involved in the example.

Abstraction, then, like Comparison, when considered as a method *par excellence*, is one of the processes by which Reason, armed with reflective ideas, breaks into concrete data in search of the unity of the universal. The reflective idea which guides it is the equivalent in general knowledge of the mathematical axiom that if equals are taken from equals the remainders are equal. Withdraw a known relation from a known system of relations, and the relations which remain are known. It is plain that if the whole and its internal relations are really known so as to justify such a process, the withdrawal is a mere intellectual or ideal distinction. This is so even in mathematics. To know the difference between two quantities is the same as to know the greater as the sum of the lesser and the difference. An algebraical sum treats subtraction and addition as on a level. Abstraction would thus seem primarily to restrict itself to instances where, as in mere numerical conceptions, the withdrawal of a part leaves the other parts unaffected. But as this is never within any real whole theoretically the case, although by compensation or in loose-knit wholes it may seem to be so, the instances envisaged by abstraction occupy in truth no separate region from those which form the matter of all definite knowledge. Thus the guiding idea of abstraction is only a provisional idea. It amounts to no more than this, that within known wholes

[1] In saying this, I do not mean that the system of laws which an investigation, beginning with such an abstraction, ultimately brings to light, must be more abstract than the example which is the datum. The semi-logical and almost arbitrary character of these methodic processes as popularly limited is illustrated by the fact that abstraction, as in the case before us, so easily slides into systematic construction which leaves the example behind.

known changes may appear to leave remainders known *as unchanged*. For to say, as we said above, simply 'known remainders', really lets in all that positive knowledge can tell us of the positive effects produced by the change on what remains. In this we go beyond abstraction. The supposed unchanged remainder, then, is predicated of the whole as modified by the withdrawal of some parts.

But really of course the abstraction is not what operates. Neither real nor ideal abstraction can help except by conferring or illustrating knowledge of the real whole in question. 'The Parnellites are chief men in Ireland, and were Ireland separated from England would be chief men still.' But *would* they? The abstraction puts the question, but does not answer it. The answer depends on our knowledge of Ireland. 'He has lost his wife and yet goes on much as before, therefore her loss has made no great change in him.' But perhaps in removing one motive to his habitual acts the loss supplied another. The inference even from this *actual* abstraction is utterly baseless except as a conclusion from our knowledge of the whole man, to which of course the new fact created by the actual abstraction must contribute. But had we had such knowledge before, we could have gone to the conclusion without the actual abstraction; and apart from such knowledge we cannot go to the conclusion on the basis of the actual abstraction.

From the difficulty of bearing in mind the necessity, often extremely obscure, of this circuitous route through the nature of the whole, and the inapplicability of mere subtraction in the complicated relations of non-mathematical reality, abstraction is perhaps the most fruitful in mistakes of all methods of knowledge. Knowledge in fact is one, and any method which consists in the exaggeration of a mere characteristic of knowledge is *ipso facto* hazardous.

Recognition.

γ. *Recognition*[1] is another of these curiously limited pro-

[1] I restrict recognition to the elementary meaning of knowing *again*. The 'recognition' of a right or a principle, i.e. the admission of it, has interesting connections with the former case both in Logic and in Philology, and illustrates the ease with which these 'processes' pass beyond their normal sphere into knowledge in general. But it is truer to usage to regard this latter import as metaphorical.

cesses. In its complete form it appears to be reflective reproduction under the influence of an idea of identity, followed by comparison and identification of the content reproducing with the content reproduced. Recognition differs from Perception and from Inference as such both by dealing with a reproduced content, and by always ending in a direct comparison of contents. We do not speak of recognition either where there is no reproductive process, or where the process, though it may establish identity, does not end in direct comparison. When we meet a friend whom we see every day, there is no *process* of reproduction; the extension of the sensations is given along with them and the apprehension of his identity is a datum of perception. For true recognition to take place, it would be necessary that the first datum should create a second, on which two data the further process would operate. But in Inference the two data may just as well be given; and this is also the case of course with mere Comparison. On the other hand, if I ask for a tune of which I know the name, but fail to recognise it when it is played, then I have inferential identification without recognition. For of course I know, supposing that I am confident in my recollection of the name and in the pianist's knowledge, that it *is* the same tune which I asked for; but, when played, it fails to reproduce the desired effect in my mind, and either there is nothing to compare, or if I compare the tune I hear with my idea of the tune I wanted, the result is distinction and not identification. Thus recognition is absent, though *inferential* identification is present. Inferential identification, however, though ever so circuitous, *may* set up a direct comparison ending in identification, and if so, then we have recognition. This is too common an experience to need illustration.

The reflective influence of the idea of identity may be active in recognition to very different degrees, and the idea itself may be suggested in very various ways. Probably these ways may all be included under imperfect reproduction. An interest in identification is necessary to make the idea work; but an interest can only operate in logical thought by attaching to a suggested content. Our interest in recollecting a man's name operates through the natural but unsuccessful efforts at

reproduction, in which a prominent syllable of the name, or the like, occurs to us. And like the rest of these methodic processes, recognition loses its differentia when the abstract relation between the special contents in question ceases to interest. It is recognition to say 'That is the man who was with me in the train yesterday'. It may or may not be recognition to say 'That is Professor Huxley', for this is a matter of fact which I may infer otherwise than by direct comparison, and which may not at all be meant to indicate an identity with a special content reproduced in my mind. And when I go deeper into knowledge and say 'Professor Huxley is one of the leaders of scientific thought in Europe' I have altogether got beyond recognition pure and simple, because the interest is no longer that of mere identification but of concrete description.

Discrimination, &c.

δ. Discrimination and Identification, and many other methods or processes, might be analysed in the same way. All of them are in one sense characteristics of Inference or Judgment as such, and therefore enter into each other and into the various processes which have just been described. But each of them may also be regarded as a special though transitional method, guided by a more or less reflective idea of the result to be obtained, and subsuming under this reflective idea all matters in the content which are favourable to its purpose. Discrimination or Distinction is present in all judgment, in all inference, in all comparison, and in all recognition. But it would be pedantry to deny that we constantly set to work upon a presented content or two contents as yet unexamined, with the clearly envisaged purpose of making out a contrast or difference which we expect to find between them. Two Acts of Parliament on the same subject ought to deal with different aspects of it, and we may fairly set ourselves to distinguish the purpose and provisions of the one from the purpose and provisions of the other. What we have to keep clearly in mind is that the name Distinction is a title drawn from a merely dominant and not exclusive characteristic, that it therefore is not a desirable basis of logical discussion; and that the process of Distinction itself is transitory, because it can only continue as such so long as the result is abstract, and

so long as our interest attaches rather to this abstraction than to concrete and material content.

Inference in above processes.

ϵ. There are thus two principles which limit the inferential and non-inferential character of the practical processes which we have been considering. As processes guided by reflective ideas, they must necessarily involve grounded selection [1] resting either on presupposed subsumption [2] or on general connection of content. And when we have grounded selection, we have, as we saw, the essentials of inference—we have at least a suggested distinction between direct and indirect reference to Reality. On the other hand, the abstract and therefore accidental character of the controlling ideas renders it impossible that explicit inference should form the essence of these processes. The moment we really found our argument on an explicit ground going deep into the nature of the subject we get a conclusion that must go beyond mere identity, likeness, or distinctness, which with one modification or another, but always in more or less abstract form, are the guiding ideas and interests of these subordinate methods of knowledge.

Comparative Science.

ζ. If the above processes, including Comparison, are arbitrary and vanishing phases of knowledge, how do we come to speak of Comparative science?

The Comparative sciences are the sciences of organic and intellectual evolution through its varied series and ramifications. Their data are thus, in the first place, *actual*, independently of the operations of the science, and in the second place are essentially types relative to definite functions, and

[1] For the guiding idea operates through a selection within the content.

[2] When I recall a man's name on seeing him, this recognition is not based on a necessary connection of content. But the accepted identification or subsumption of the man under his name in which I rest when the name is reproduced is as good *ad hoc* as such a connection. The reflective idea of identity guides me to select characteristic marks in the presented content, which I subsume under that idea. 'That gait, voice, gesture, is surely a help to his identity.' Then if I succeed in reproducing anything not present, this reproduced content goes up to fill up the idea of identity.

> 'That face of his I do remember well;
> But when I saw it last it was besmeared
> As black as Vulcan in the smoke of war,'—

and then a whole history comes up and mere identity gives place to description of character.

so not as a rule capable of being illustrated by the results of *direct*[1] interference. Hence it follows that the sciences in question (i) begin with cross-references between their actual data—the method of ordinary comparison—and (ii) retain their data untransformed in these cross-references—a leading peculiarity of ordinary comparison.

On the other hand, the abstract ideas of identity, difference, &c. which guide ordinary comparison could not form the content of any science; and the comparative sciences go beyond 'comparison' by seeking for definite concrete principles of evolution and affiliation between the types with which they deal.

All science, of course, compares; but chemistry, for example, is not 'comparative' in the above sense. It does not begin by cross-references of mercury to carbon and of carbon to gold, as philology does with Latin and Greek, and Greek and Sanskrit. Chemistry has to create its regular series of phenomena by experiment before it can lay down principles that connect them, and each series at first concerns the nature of a single group of substances only. The data, as data of science, are not actual. And chemistry does not in its generalisations retain its data untransformed. The underlying principle, the molecular or atomic hypothesis, is the essence, the element of rationality and of interest. In its results, as at its starting-point, it would be sheer distortion to call chemistry a comparative science of elements and their compounds. It is an analytic enquiry into the fabric and behaviour of matter. The elements and their compounds have no individual or characteristic value like that of a language, or a polity, or a group of myths. In short, in the sciences which are analytic *par excellence* the rationality and interest are on the side of the underlying principle, while in comparative science the underlying principle serves rather to connect and illustrate realities which have independent functional importance. Science is one, and these distinctions are matters of degree. But even should chemistry ever succeed in representing its data as evolutionary products of an intelligible process and

[1] Variations of animals under domestication are hardly for this purpose to be set down to *direct* interference.

so as thenceforward challenging comparison *ab initio*, still this will be an ultimate achievement and not a method pursued throughout. Geometry, as we saw in treating of the quasi-generic judgment, mimics evolutionary procedure with some success. But its data in their pure form are really made, not given as realities of independent significance.

Species of Inference which have been treated as its principle.

4. I will now attempt to exhibit in their true light some species of Inference, each of which has in turn been erroneously identified with its principle.

From particulars to particulars.

i. Induction in Mill's sense of the term, i.e. Induction by incomplete enumeration, or inference from particulars to particulars, is obviously to be identified with the species of inference in which a confused or implicit universal, indicated by a common name, is the ground in mediate assertion respecting concrete things or events. I do not mean to examine here the case of Induction by complete enumeration, which has in fact been sufficiently illustrated by the analysis of enumeration in Book I.[1] It is enough to remark that if this Induction really relies on the completeness of its enumeration, it ceases *ex hypothesi* to be Inference. If, again, it relies on some discovery made during the enumeration, then the *completeness* of the process is without influence on the result.

In the Induction by incomplete enumeration, or inference from particulars to particulars, in which Mill finds the fundamental process of inference as such, there is apt to be at first sight nothing at all which binds these particulars together. The pervading identity or universal, which we affirm to be the operative power in inference, often appears in popular practice as in Mill's theory, to be simply non-existent. That is to say, it either creeps in under the shelter of a mere common name, or may even be absolutely ignored in the expression of our inference, because the common name which would express it is presupposed, or perhaps is not known or does not occur to us. 'Why do you think A likely to be a good scholar?' 'Well, because B and C and D are good scholars.' Here it is plain that something known to both speakers is presupposed and not expressed; perhaps for example the fact that A, B, C, and D were educated at the

[1] See Bk. I. chap. iv.

same school. But often the operative identity is left unexpressed not because it is clearly understood, but because we do not *think* it definitely at all. 'Why do you think that picture is by Mantegna?' 'Because it reminds me of some pictures of his in the National Gallery.' Here the words 'reminds me' appeal to a merely psychical fact,[a] and express in doing so my inability to produce a distinct formulation of the ground on which I have gone.

Thus we are presented with something like an antinomy. Identity is necessary to Inference, but some Inference takes place without Identity.

The explanation of this contradiction, as distinguished from the logical justification of Inference from particulars to particulars, is afforded by what has been said about the ultimate nature of Inference. The 'particulars' are not particulars, but differences in a universal. The universal, however, which in elementary reproduction operates unconsciously, may in elementary inference be very far from explicit in thought; or, and this is by far the commoner case, there may be an obvious deep-seated identity in the nature of the concrete instances, which is not in its entirety relevant to the attribute about which we draw our conclusion. Then, in accordance with the principle of analogy, we follow the dominating identity, and come to a result the *precise* or relevant ground of which we are unable to ascertain. The conception of inference from particulars to particulars is thus an illusion arising from the activity in inference of presupposed, superficial, or unanalysed universals.

Subsumption.

ii. Subsumption is the complement of inference from particulars to particulars. I speak here as above of the natural and normal process, and not of the process by completed enumeration, which is devoid of inferential character. Subsumption is based on the conjunction of attributes in the actual concrete nature of a subject or subjects. The identity of nature which is implicit in inference 'from particulars to particulars' is here made explicit in the content of an individual or indi-

[a] I suppose it may be either a psychical fact or an indefinite meaning —either a mood of mind, or a something in the actual painting which I see but cannot express in words.

viduality. But this identity, though seldom wholly destitute of inferential significance, is in respect of the conjunction of attributes within it a confused and not a scientific concrete. The connection of the attributes is proved by it not as a principle but only as a fact. Of course, however, an inference which is really matter of principle may borrow the shape of subsumption, and in doing so may or may not continue to imply a principle that really goes beyond subsumption. The relation between inference from particulars to particulars and its complement subsumption is thoroughly illustrated by Mill's discussion of the subsumptive syllogism. Putting aside the notion of a *petitio principii*, which only applies when the major premise in Barbara is regarded as a complete enumeration, we find that the major premise consists in an explicit enunciation of the common nature which really warrants the conclusion. Mill regards this enunciation only in the light of a summary of particulars, and as we have seen, the facts of rudimentary reproduction and even of elementary inference bear him out in the view that it is not indispensable. The point however is, that though the enunciation itself is not indispensable, yet the operation of that identity which the enunciation formulates is indispensable. It is this which, in the form of an ideal content considered as a subject qualified by attributes, is the point of union in subsumptive inference. Here again the nature of the active universal determines the inferential form.

Calculation and Equation.

iii. Calculation is a divergent form of subsumption, in which, by passing through the stage of complete enumeration, the universal operative in the inference has been transformed from an ideal content existing *in* individuals to a totality where parts are units. The concrete individuality, i. e. the common generic nature of the individuals, has faded away by abstraction into a mere denomination of units, and the attributes which were conjoined within the generic content have also become denominations of the numerical wholes. These numerical wholes which have arisen out of the 'extension' of the ideal content by means of enumeration are related to each other as measurable parts and wholes in the system of number. Thus the subsumptive syllogism, 'All Englishmen

are Europeans, all Londoners are Englishmen, therefore all Londoners are Europeans,' may be seriously taken in the aspect of extension, which through the affinity between the individual and the unit is always closely allied to the aspect of number. But to carry this aspect to a genuine result we must not simply say 'Englishmen = English Europeans', &c. &c., for the insertion of 'English' in the predicate makes the sign =, which implies restriction to the aspect of number, superfluous and meaningless. And if we do not use =, but retain the copula 'are', then the repetition in the predicate goes a long way to destroy the meaning of the judgment by reducing it to a tautology.

Calculation proper.

a. If we seriously intend to draw a conclusion from the relation of individuals as units, i. e. apart from their content except in so far as it distinguishes them into groups, we must first constitute each of our wholes into a numerical whole by complete enumeration, and then refer these wholes to one another in respect of their *measurable* identity or want of identity, i. e. equality or inequality, which latter, as we saw above, being assignable as an exact difference, involves the former. Then we should get something like Englishmen = $\frac{1}{20}$ Europeans, Londoners = $\frac{1}{4}$ Englishmen. That is to say, Londoners, *numerically considered*, are a part that repeats itself four times in the numerical whole of Englishmen, and Englishmen numerically considered are a part that repeats itself twenty times in the numerical whole of Europeans. Thus the same numerical whole presents itself as thoroughly identical with itself in its differences or different relations, whether as the number of Englishmen, obtained by simple enumeration, or as four times the number of Londoners, a relation obtained by comparison of enumerations and analysis of a sum into its parts, or as a twentieth part of the number of Europeans, a relation obtained in the same way as the last mentioned. The quantitative universal, which is the same in kind throughout all its different aspects—not distinguishable as a subject controlling attributes and as attributes that severally do not exhaust the subject—is thus an embodiment of the rule, 'Things which are equal to the same thing are equal to each other.' Calculation is mediate judgment, in

which, from the nature of the whole that operates, there is no distinction between subject and predicate.

It is obvious therefore that Calculation cannot be applied to wholes that consist of heterogeneous or non-quantitative parts, or at least, if so applied, can only deal with them in their aspect, probably a subordinate one, of homogeneity. If the number of lines in Macbeth is $\frac{1}{30}$th of the number of lines contained in all Shakespeare's plays together, what then? The relation of Macbeth to the other works of Shakespeare's mind must be expressed by other universals than this. There have always been logicians whose gaze has been fascinated by the simplicity and certainty of calculative processes; but it is idle to place the ideal of argument in a type which depends on the relations of identical units. The tendency to acquiesce in this ideal has no doubt been strengthened by the absolute reciprocity of the equational judgment, which has been explained above. This reciprocity anticipates, though at a long interval, a prominent attribute of notional definition or of any complete and concrete knowledge; and this anticipation of a characteristic which is rightly ascribed to the logical ideal has increased the attractiveness of computative or quasi-computative processes as types of logical method.

Equational Logic.

β. The importance of the Equational logic is so great that I will return for a moment to its principle, which has been cursorily alluded to on the previous page. The point of logical interest in regard to it is that it is not at first hand a calculus at all, though it is a calculus, and a very effective one, at second hand. In this respect it is of the same grade as the calculus of chances, with which it is closely allied. By saying that the logical calculus is not a calculus at first hand, I mean that the judgments with which is deals are not judgments that embody numerical or quantitative relations as such, and therefore, as was shown above, have no fair claim to the sign = as copula. This is absolutely clear of the judgments which Jevons calls Partial Identities, in which the employment of the sign = is not in accordance with usage. It is not intelligible to say[1] that Iron = a metal, or that

[1] Principles of Science, p. 40.

Diatomaceae = a class of plants, or that Mammalia = a class of vertebrates. These judgments are obviously subsumptive judgments, intended to express the conjunction of certain attributes in certain individuals, or else the identity of certain sets of individuals under certain different aspects or descriptions. But the sign = does not express this conjunction of attributes or identity of individuals, except as the attributes or identity of a quantitative whole, and as on the other hand the judgment suggests no obvious quantitative aspect, weight or number or value, in which identity can be asserted, it follows that the form of the judgment simply contradicts its content, i.e. the judgment is not intelligible.

With Simple Identities the case is somewhat different. It is not indeed intelligible to say that 'Lord Salisbury = the Prime Minister of England', or that 'St. Mary's Church at Oxford = the University Church'.[1] But it is intelligible —I now take Jevons' examples of simple identities—that 'The smell of a rotten egg = that of hydrogen sulphide;' and that 'The colour of the Pacific Ocean = the colour of the Atlantic Ocean'. And the reason why it is intelligible is this. It is possible to interpret these judgments as establishing identity of degree [2] in a quality capable of variations; i.e. quantitative identity or an equation of colours or of smells. And by a metaphorical usage based on this fact identical *conceptions*, though not strictly quantitative, are sometimes said to be *equivalent*, and this equivalence is rudely symbolised by the sign of equality. But the point to note is that equivalence cannot be affirmed on the ground of individual identity. It means equal amount and kind *of intension*, and does not

[1] Unless we meant to affirm that Lord Salisbury when Prime Minister retains, for example, his normal height and weight; or that St. Mary's when considered as the University Church suffers no diminution of size. It might be urged that this is worth considering, for of Merton Chapel, if I remember right, a parallel assertion would be untrue, the choir being a college chapel, and the church as a whole a parish church.

[2] Jevons does not in the least distinguish true intensive equation, as in a colour match, from identification of individuals or classes of things in a sense quite beyond quantity. He fails to distinguish Quality from Kind or Individuality. Hence 'Deal = Landing-place of Caesar' is to him a 'simple Identity', no less than 'Colour of Pacific Ocean = Colour of Atlantic Ocean'.

lean identity of component individuals. Thus it is simply lse that 'Exogens = Dicotyledons', for the meanings are ot equivalent, though the individuals designated by the ames are, *exceptis excipiendis*, the same.

In the first instance, therefore, the judgment as formulated y the Equational logic is not an equation, because it does ot restrict itself to a quantitative aspect, but predicates ndividual identity. Although you say that Diatomaceae = a lass of plants, you may not go on to say that this class of lants = another class x (meaning that the two are equal in umber), and that therefore the Diatomaceae = the class x. he original judgment might indeed *happen* to justify this alculation, but in passing through it would have entirely ost its peculiar import.

The office of computation in the Calculus is not to compare uantitative attributes of objects, but to secure complete numeration of possible judgments. In this office of secondary nport it somewhat resembles the translation of a material isjunctive judgment into a numerical statement of chances. But the statement of chances gives a numerical result, whereas he logical calculus, after protecting itself by a computation f combinations, returns to a result in the shape of identifica- ion or identifications. Working as it does solely by the dentification of individuals under different aspects, i.e. as con- oining in themselves different attributes, the equational logic s obviously a species of subsumption, and rests ultimately on he subsumptive principle that attributes conjoined in the ame individual are conjoined with each other. Thus in regard o the nature of the universal which is operative in inference hrough the calculus, there is little to say beyond what has lready been said in dealing with subsumption. The only eculiarity of this species of subsumption is that in it the ndefined capacities of subsumption as such for conveying onnections of principles are cut down to the most abstract xpression of individual unity, without being allowed to levelope in the direction which such abstract unity naturally uggests, viz. that of participation in a numerical whole.

iv. 'Construction' [a] is a term frequently applied to a method

[a] Cp. ii. 319 note below on the relation of this passage to vol. i, p. 42 ff.

Construction. Physical. or element of inference. *a*. It primarily indicates an auxiliary process employed in geometrical or mechanical reasoning. This process consists in making accessible to perception a geometrical or mechanical complex of relations which embodies a problem or theorem that is under consideration. The actual physical construction—a diagram on paper or a model or experimental machine [1]—though not ideal, but an object of sense, is nevertheless abstract in its sensuousness, being purposely cleared of the irrelevancies which encumber our ordinary perceptions. And further, the nature of space is so closely related to sense-perception, that ideal spatial relations can be adequately symbolised by actual figures presented to perception, although the ideal relation underlying a theorem is always both *more* and *less* than the visible or tangible lines and points. 'More,' because the visible lines can be but a case of the ideal relation; 'less,' because the perceptible lines, though reduced to black on white, still include errors and irrelevancies which the mind in working with them disregards. The case of a working model or machine made to experiment with is at first sight different from that of a mere diagram. But the difference is only in degree. Both the diagram and the machine are really *in pari materia* with that which they represent to the mind; the diagram with ordinary perception, the machine with ordinary physical causation. But it is harder to say where the line is to be drawn between fact and representative of fact in the case of the machine, which shades off gradually into the ordinary operations of nature. Such a thing however as a working model [2] that illustrates the lever action of the limbs shows how the machine as such stands between natural process and abstract mechanics. It is the abstract *physical* expression for

[1] An excellent example of construction in this sense, the solution of a problem in actual physical embodiment, is the machine for drawing sound curves of any shape by actual pendular oscillations. There is such a machine, I think, with actual pendulums, which thus does not merely *mimic* the curves (as the machine with cog-wheels may be said to do), but actually constructs them in terms of the theory.

[2] A complete model of the ear or eye may seem not to be abstract, but only magnified; it is however abstract by its isolation from other parts, its fixity, and its capability of being taken to pieces.

a natural activity, and paves the way for its abstract ideal expression.

Construction in this first and simplest sense is not even a case or species of Inference. The production of a visible material figure or object does not even, strictly speaking, *enter into* the essence of the inferential process. It is however a peculiar auxiliary method which depends upon and throws into relief the characteristic nature of the universal—the abstraction of sense—with which Inference is concerned in Geometry or abstract mechanics. The lines drawn on paper, though peculiarly adequate symbols, are nevertheless only symbols of the lines with which geometry actually works. And of course we do not draw the lines on paper at random, and they would be of no use if we did. We only draw them in accordance with the requirements of the universal operative in the inference, so far as these requirements are already known and can guide us from moment to moment. The aim is to aid intellectual reflection in fixing and following connections which suggest themselves within that universal; and as we have seen, the material lines or even cords, pulleys, levers, &c. *represent* an intellectual work already partly accomplished in the exclusion of irrelevant elements. But the material or physical construction *is* not the active element in the accomplishment of this work. This construction in the sense of actual drawing or model-making is a process *characteristic* of geometrical or mechanical inference, but not identical therewith.

Imaginative.

β. But this brings us to a secondary sense of construction —secondary not in logical value, but, as I think, in usage and the growth of meaning. Of course actual lines on paper are not essential to simple geometrical inference in which we can carry the figure in our heads', and if so, the visible external figure cannot in theory be essential to *any* such inference. Professor Clifford, it would appear, was almost independent of external aids to realisation in considering geometrical or physical problems. But when we work with ideas of lines, and combine spatial elements *in our imagination*, and not on paper, is not this still construction, and yet is it not now of the essence of inference?

I fear that at this point a further refinement cannot be

avoided. It seems to me obvious that the imaginative experiment is a different thing from the intellectual perception of unity. The imaginative experiment may be misdirected and void of result, as a line drawn on paper in addition to an actual diagram may be irrelevant and meaningless. The imaginary line projected on imaginary paper, though necessary perhaps to the intellectual apprehension, is it seems to me purely on a level with the external line perceived through sense. But when any line either given on paper or suggested in imagination has been intellectually grasped as symbolic of a relation relevant to the universal which we are developing, then it is taken up into the inference and has passed from a step in physical or imaginative construction to an element in necessary apprehension. In looking for that point in an ellipse in which the sun had to be placed in order that the ellipse might represent a planetary orbit according to the theory of gravitation it is easy either in imagination or on paper to select the middle point of the longer axis. The question as to the nature of the process is not whether I draw or only imagine, but whether in doing either one or the other I am guided by insight into the connection of the data and into the conditions of the problem. If I seem to myself to have such an insight, but am, as in the case above-mentioned, mistaken in the connection which I fancy that I detect, then I infer, but wrongly. If however, or in as far as, I put the sun in the wrong place or in the right place by an isolated act of sensuous fancy, then I may be constructing, but I am not inferring.

Intellectual, in Geometry and Mechanics.

γ. The organised or articulated intellectual perception itself, in contrast with the physical or imaginative experiment—or rather taken as including this experiment, for the sensuous ideas cannot be dispensed with—affords a third meaning which may be put upon construction. Of course this perception has the effect of a synthesis, of a putting together as well as of a distinguishing. And especially when the relations thus put together as having their unity in one universal are spatial relations, readily symbolised by imaginative pictures, there is a plausibility in translating the Greek term ' synthesis ', which in technical logic expresses the unity of differences inherent in all intelligible judgment, into the

term of Latin origin 'construction', which may be held to express this same idea with the additional implication of *intentional* operation *in time*, by which elements of intellectual perception are put together like the parts of a machine.

Construction in this third sense, a sense largely insisted on by Kant, is a hybrid idea. I cannot doubt that it designates a true species of inference—inference dealing with the abstractions of sense—by a title actually drawn from and implying an accident of inference, viz. *intentional* combination, successive in time, of visible or imagined forms. Now the *intention*, except in as far as it is a general intention to infer correctly, falls outside inference. In inference nothing can guide us but inferential necessity; and a special intention, such as that of drawing a line on a slate or on paper, or of constructing a model of a joint, arises in some motive external to the inference proper. And as with the intention, so with the fact of material construction. It is a mere accident of inference. Therefore the intentional combination of perceptible or imaginable elements falls outside inference proper except in so far as it is guided by inferential grounds. But it is true that, especially wherever we have novelty or discovery in inference,[1] imaginative or perceptive construction is an indispensable auxiliary to thought.

Intellectual, without limitation to Geometry, &c.

δ. And finally, by insisting on the ideas of synthesis, of intention, and of the value of imagination in inference, we arrive at a fourth meaning of Construction,[2] in which it is alleged to be an essential element or even the essence of *all* inference, as an *intellectual* combinative process, *not* confined to the region of geometrical or mechanical abstractions. Thus understood, Construction becomes a convenient expression for the distinct realisation in inference even of universals which are not numerical or geometrical, if they are more than subsumptive. Transferring a spatial metaphor to such universals, it appears to explain the definite necessity which unites their differences, by reference to the precise and unambiguous coherence which belongs to geometrical relations. But we have seen that even as applied to geometrical inferences

[1] See p. 8, supra.

[2] Bradley's Principles of Logic, p. 235, and passim.

construction is to a great extent a metaphor drawn from an accident of those inferences, and when we deal with universals which are not at all sensuous the simplicity of the expression becomes actually deceptive. It is easy to say, for example, that we intellectually 'construct' such a whole as the British Constitution out of isolated facts, principles, and accepted ideas, and then proceed to perceive its nature. But it is plain that anything valuable in the 'construction' is coincident with and guided by the growing insight into the nature of the content before us which constitutes the inference itself. We must distinguish from this usage that by which we speak of constructing a Utopia. Here of course we are ostensibly not inferring, though we have really to use inference. We are playing, employing the imagination according to arbitrary interests and motives, and not under intellectual guidance, until we begin to draw consequences from what we have said. And the root of the whole usage which we have examined is that in all inference, so far as it has novelty or is a process modifying itself in time, there is an arbitrary and external element which supplies guidance to the attention until the true principle and the relevant details have been disentangled, and operates throughout the inference by the side of the true principle which gradually displaces and finally ousts it. This arbitrary element may indeed be regarded as the universal itself in an imperfect form, but for this very reason it contains much in the way of suggestion or experiment [1]—much tentative synthesis—that has to be dropped and erased before the inference can assume its true and final form. And the name construction depends largely on the elements which, having been intentionally and therefore tentatively inserted, are ultimately dropped.

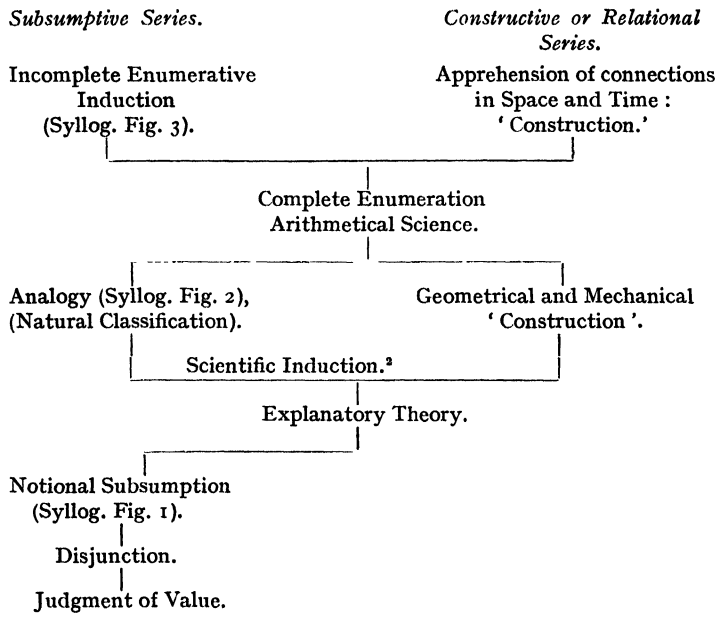
The outcome of our account of Construction then is this. Construction is a term drawn from moral, physical, and psychological adjuncts of inference. In the case of geometrical and mechanical inference these adjuncts are so far akin to the matter of the universal, that the term 'Construction' drawn from them may be held a fair designation of such

[1] Cp. the case above cited in which the focus of the ellipse was the point required, but the middle of the longer axis was the first point selected.

inferential processes, e. g. of Kant's account of matter on the basis of attraction and repulsion. In the case of other and less sensuous universals this is not so, and Construction as applied to them is a mere metaphor and not even a case of Inference. Thus Construction should never be assigned as the essence or as an essential element of Inferential activity.

The above account of four main cases[1] of Inference may serve as an anticipatory sketch of the course which our discussion will pursue in the following chapters. (See scheme annexed.)

SCHEME ILLUSTRATING AFFILIATION OF ARGUMENTS AS DESCRIBED IN BOOK II.



[1] Or five, counting among them the process which Construction in its fourth sense is abusively applied to designate.

[2] Scientific Induction is treated as a transition by which Explanatory Theory may be reached from the side of Analogy. The scheme is intended to represent each type of inference as a combination of that vertically above it with that with which it is connected by a horizontal line. This does not apply to the relation between Explanatory Theory and Complete Enumeration, which stand where they do merely as being intermediate forms.

APPENDIX TO CHAPTER I

On the Relation of Symbolic Logic to the Theory of the Present Work.

I CANNOT pretend to give an adequate account of Symbolic Logic in its present development. But there is a matter connected with it which readers of this work may rightly demand some attempt to explain; and on which, moreover, the co-operation of students working from the side of philosophy (or, if this is held a question-begging phrase, from the side of a monistic philosophy) and from the side of Formal Logic respectively is highly desirable. I mean the ascertainment of the precise point of divergence at which Formal Logic, construed as including pure Mathematics, parts company from the sort of Philosophical Logic that is aimed at by the present work, attempting to follow the tradition that is one on the whole with that of Aristotle and Plato.

The problem thus arising in the first place (1) on a certain point puts the theory of the present work on its defence, while in the second place (2) as it involves the conditions under which the divergence comes to pass, the answer to it would determine the reservation or no-reservation subject to which Formal Logic can be held from the monistic point of view to be true.

Formal dist. Philosophic Logic.

1. I will first say something about the theory of the present work as it concerns the point of divergence of Formal Logic (in Mr. Russell's sense indicating Symbolic Logic and pure Mathematics) from Philosophical Logic in my sense of the term.

Point of divergence implied in ed. 1.

a. The point of divergence in question, according to my account given above, is where quality passes into quantity by the transformation of the judgment into the equation. Here begins, according to that account, the transformation of the wide and plastic logical idea of system and members,[1] into the narrow and rigid idea of quantitative whole and parts, passing through which it reaches the last abstraction in the shape of denomination and numerical units. The denomination appeared to be a last abstraction of the whole or system,

[1] Not yet explicit at the point in question—becoming in fact explicit by contrast with the formal framework then brought to light.

the units, of the parts or members. The numerical series seemed to be an ideal scheme of the relations of members within systems [a] from a certain limited point of view ; that is, when distinguished only by a logical order of progression assigning every unit a place in relation to every other.[b]

Mathematics, then, seemed to be especially connected with quantity, and to be characterised accordingly by the homogeneousness of the wholes—space, time, and number—with which especially it appeared to deal, their actual characteristics being idealised to a point which made the nexus of their relations a matter for almost purely hypothetical judgments. Absolutely pure hypothetical judgment, an assertion of implications following upon a supposition which is in no way attached to an underlying real system, I do not believe to have a meaning.[c]

The Logic which had the same origin as Mathematics when thus conceived, was then familiar as Equational Logic, founded upon the same transformation of the Judgment which gave rise to Mathematics itself. This transformation, when applied to Logic in general, was open to serious criticism because of the inadequacy of the equational form, which ought to indicate a purely quantitative relation, to the meaning of a true logical judgment. It seemed to be neither Logic nor Mathematics.[d]

[a] e.g. I. 168.

[b] I think I am entitled to repudiate any suggestion (if really directed against my doctrine ; see Russell, Principles, 114) that my view was satisfied with the psychological conception of counting the acts of counting. Number was for me always a relation of ordered series, which we became aware of by counting. Cp. I. 168, 170. And I should be wanting in courage were I not to admit, in spite of the authority against me, that though every class has a number, yet the connotation of every number seems to me to be determined by relations to a whole independent of the class which has the number.

[c] See Russell, Principles, p. 14. This observation affects, I should suppose, Mr. Russell's extreme use of the hypothetical proposition in illustrating the meaning of implications. You cannot say, I should urge, ' If a donkey is Plato, it is a great philosopher.' The hypothesis scatters your underlying reality to the winds, and what I should call the basis of implication is gone. In a real system, S qualifies P as well as P, S.

[d] Cp. Bradley's Logic, p. 24 ff. with Mr. Keynes's defence and reinterpretation of the equational form, pp. 189-90.

Point of divergence on Mr. Russell's view.

β. The conception of pure Mathematics has now, as I understand, freed itself from all special relation to quantity, and the view is affirmed that the science to which it applies consists wholly in logical deduction from logical principles. Thus its point of divergence from what is here treated as Philosophical Logic is not that assigned in the account that was summarised in the previous paragraph, but is rather that to which my description finally traced the abstraction. It deals, I gather, not at all with existents, actual space, actual time, or actual characters of totalities represented by number, but with the formal essence of propositions—not with facts, but with the mutual implications of propositions, and these propositions containing none but logical constants. It is, in strict principle, to be defined as one with Symbolic Logic, which again is one with Formal Logic.[a]

The path which its conception traverses in attaining this point may be illustrated by a quotation from Mr. Russell.[b]

'*Whenever two sets of terms have mutual relations of the same type, the same forms of deduction will apply to both.*[c] For example, the mutual relations of points in a Euclidean plane are of the same type as those of the complex numbers; hence plane geometry, considered as a type of pure mathematics, ought not to decide whether its variables are points or complex numbers or some other set of entities having the same type of mutual relations. Speaking generally, we ought to deal, in every branch of mathematics, with any class of entities whose mutual relations are of a specified type; thus the class, as well as the particular term considered, becomes a variable, and the only true constants are the types of relations and what they involve. Now a *type*[d] of relations *is to mean*,[e] in this discussion, *a class of relations characterised by the above formal identity of the deductions*[e] possible in regard to the various members of the class; and hence a type of relations, as will appear more fully hereafter, if not already evident, is always a class definable in terms of logical constants.[f] We may therefore define a type of relations as a class of relations defined by some property definable in terms of logical relations alone.'

[a] Russell, Principles, p. 9. [b] Ibid., pp. 7-8. [c] My italics.
[d] Mr. Russell's italics. [e] My italics.
[f] [Mr. Russell's note]. 'One-one, many-one, transitive, symmetrical, are instances of types of relations with which we shall be often concerned'.

Am I presumptuous in observing that we see here the progress towards homogeneousness of the subject-matter and pure logical implication much as it was set out in the account to which the previous paragraph referred? If two sets of terms have mutual relations of the same type, the same forms of deduction will apply to both; but to be of the same type, if I understand the passages rightly, has no other meaning than to be such that the same forms of deduction will apply. So, am I wrong in suggesting that very great and serious differences between two sets of terms may be neglected (such as differences between points in a Euclidean plane and complex numbers) if only a common set of formal deductions can be found which apply to them? This is the course that was described above, in pointing out the increasing homogeneousness of the subject-matter of Mathematics as the characteristic differences e. g. of space and time come to be neglected. The science has a right, I should say, to define the same type of relations as it finds convenient. But in its claim to truth the amount of difference which it has omitted will have to be taken into consideration.

I gather, then, that any reference to quantity or to any form of actual existence is now to be taken as excluded, and that pure Mathematics is to consist, as we said, in logical deductions from logical principles. And the province of Symbolic Logic is practically the same. It claims, as I understand, to have thrown off the limitation which offended us in the Equational Logic, and is now prepared to deal with any type of relation whatever, in no way implying a preference for statements framed in quantitative form. And it is noticeable that the Symbolic shape is treated as accidental and unessential. This is more important than it seems. For the idea of a perfectly and purely Formal Logic is necessarily, I presume, as we see in the simple case of conversion, to deal with its terms as if they were units unmodifiable except in position, expressions to be combined or transposed as wholes, and without intrinsic modification.[a] But the present symbolism is in itself more

[a] I am aware that in the most formal logic, when expressed in ordinary language, grammar will hardly permit this rule to be carried out. But there is no doubt, I think, that purely formal procedure

adaptable, as is shown for instance by its admitting a difference of 'sense'[a] between a relation and its converse; and also, as we saw, the symbolism as a whole, which must always be a check on the change induced in terms by change of combination and inter-connection,[b] is considered unessential. Therefore the intrinsic modification of terms, demanded by a sound theory of inference, though discouraged, as I think, by the habitual use of a conventional symbolism, is not in principle excluded.

Thus the point of divergence between Symbolic Logic, including pure Mathematics, on the one hand, and what I call Philosophical Logic on the other, is, if the views just stated are to be held decisive, at the end and not at the beginning of the quantitative development of the judgment. The ultimate divergence would appear to take place at the point where the theory of the hypothetical judgment has been explicitly laid down, exhibiting for the first time an embodiment of implication as distinct from mere subsumptive conjunction.[c] And it would consist in isolating the relation of implication in such a judgment from the limitation imposed on it and the extensions ascribed to it owing to the doctrine that every hypothetical presupposes and depends upon a systematic whole taken to be real. Thus the limitation on illegitimate hypothesis, which forbids such an implication as 'if the number 2 were Socrates, it would be a great philosopher'[d] is swept away; and with it the suggestion that in a pure hypothetical the implication is reciprocal. I give this latter

becomes uncertain in so far as a term is modified by its place in a context. The preference for predication by 'is' with a noun, over a concrete verb, is a simple case. You cannot readily 'convert' a verbal predication.

[a] '*sens*', direction.

[b] Cp. my remarks, p. 202, on the changes inevitable within a systematic argument, where the meaning of the term develops. I therefore deny that 'the syllogism in all its figures belongs to Symbolic Logic' Principles, p. 10. In my view it contains a principle of life and growth which cannot be symbolically represented.

[c] In my scheme the meeting-point of abstract relation of Space, Time, and Number, with the pure Hypothetical Judgment, and the development of the latter as an expression of sheer relativity or implication. See vol. i, pp. 86 and 233–4.

[d] Principles, p. 14.

merely as an instance of a loss which seems to me to arise from a non-philosophical interpretation of the proposition in accordance with colloquial usage.[a]

This then is the acknowledged point of divergence; not the establishment of the quantitative judgment, but the admitted emergence of implication as a relation between propositions. If this view is to be taken as decisive, the account of quantitative judgment in the present work shows first the steps antecedent to the divergence, and next the full nature of the divergence, rather than traces the divergence forward from its critical point. To do this on the present basis would mean to give an account of Symbolic Logic, which I admit myself unable to offer.

The divergence restated.

2. In what, then, precisely does the divergence consist? Surely in this, that Symbolic Logic [b] is interested in the laws of mutual implication between propositions—the modes of formal Deduction—while Philosophical Logic is interested in the conditions of logical stability.[c]

Logical stability explained.

a. I will first say what I mean by this latter conception. I understand Truth to be that characteristic of a system of propositions which makes it free from self-contradiction and from contradiction with the rest of experience. This characteristic (which I take to be what Plato means by ἀλήθεια 'trueness') may be technically described as logical stability [d] (Plato's βεβαιότης). It involves the conception that every judgment is at once determined as to its meaning, and criticised as to its non-liability to contradiction, by its place

[a] Even if the proposition is taken as itself non-mental, the assignment of its import may be, and in Mr. Russell's case I think is, drawn from colloquial usage. See below, p. 48. I do not feel sure whether the statement that only judgment or belief, involving mind, can be true or false, is an abandonment of the above position, or a concession to popular phraseology. Cp. Principles, p. ix, and Philosophical Essays, pp. 172–3. I think the difference is unimportant for my point, which lies in the isolation of that, whatever it may be, which is true or false.

[b] I omit henceforward, for brevity's sake, to add 'and pure mathematics', which I understand to be implied throughout.

[c] The sharp ruling out of Inductive Inference from the subject-matter of Symbolic Logic is very significant (see Russell, Principles, p. 11) To me, for example, it means that the ultimate principles which underlie alike Formal and Informal Inferences, are ignored.

[d] See e.g. RED. V and VI and notes in my Companion.

in the whole system of judgments which represents our organised experience. Its degree of non-liability to contradiction, internal or external, is its degree of logical stability, and I take it to be the main interest of philosophical logic, as I indicated from the beginning,[a] to analyse the forms which are generated by the impulse towards such stability or satisfactoriness, with reference to the various degrees in which they embody its achievement. The rules of inference come in rather as the modes of passing from grade to grade of logical stability than as expressive of relations between this and that or these and those propositions. How and under what reservations premisses yield a conclusion, for example, is the study of the formation of a whole of relatively higher stability than its isolated data, not a mere playing a game under given rules.

Now this conception at once brings the consequence that there can be no unproved premisses or prior foundations[b] of knowledge. For the proof of every judgment is ultimately in the system as a whole; and there can be no indefinables nor colloquial interpretation of propositions in any sense of the latter term, for every proposition and every judgment takes its meaning as well as its certainty from the system. And there can be no implication as a relation between isolated propositions, for the only implication is that which at any point is necessary to the avoidance of contradiction in the system. If we intend to set out without reservations or presuppositions, and investigate what is meant by the presence of trueness or satisfactoriness in the forms of thought, this, I suggest, is the only way to go about it. We start, in this case, not from unproved premisses, but from minima of experience, which are found to lead both in truth and certainty beyond themselves, and possess, until they have so led, no more than a provisional meaning and certainty.

β. Symbolic Logic diverges from Logic as thus conceived by omitting the conception of logical stability. It takes the proposition primarily as an isolated unit—not mental—but recognises the mutual implication of propositions. Its interest lies in the study of the various general types of deduction, or 'the general rules by which inferences are

[a] Vol. i, p. 3. [b] Below, p. 266.

made'; that is, I presume, the rules by which you can assert or deny a proposition of one general type when assuming one or more propositions of the same or some other type. It is recognised that true and false propositions respectively have different relations of implication as regards all propositions; but I do not gather that these implications are capable of degree, so that a proposition could be more or less true because of being more or less supported by other propositions. Its truth or falsehood I understand to be self-contained, a private affair of its own, not lying in its coherence or incoherence with a system.[a]

In a word, the resulting difference is twofold. As the foundation of the science you get a number of indefinables and of unproved premisses, assumed really for reasons of convenience—that is to say, with a view to leading proofs from them in the simplest and neatest way.[b] And as the goal of the science you get an enormous command over the forms of deductions applicable to propositions which themselves, though always general, are unchangeable units. You have no such phenomenon as a system operating within propositions [c] so that their ideal shape and certainty is always ahead of their given form, and makes itself felt as an impulse to self-transformation and completion in other forms. On Mr. Russell's philosophy, I presume that a proposition would not be an entity capable of embodying such an impulse (not being in any way mental). But, as I admitted just now, I do not know whether Mr. Russell's philosophy is generally held essential to the logical doctrine which he shares with others.[d] In any case, whether the proposition is mental or not, and whether or no we subscribe to pluralism, the proposition for Formal Logic is a fixture, in relation with others,

[a] I regret that, owing to want of acquaintance with the general literature of Symbolic Logic, I am unable to say whether Mr. Russell's philosophy is accepted by the principal authorities who agree with him about Logic. His logic and his philosophy appear very precisely adapted to each other, and he thinks them essentially connected (p. viii). It is certainly not easy to discuss them apart. But I presume that his logical doctrine might be held on logical ground only, by way of abstraction and not as final truth.

[b] See e.g. Russell, Principles, p. 17.

[c] See p. 266 below.

[d] He holds that it is so. Principles, pp. viii and 24.

but alike in truth and in import[a] independent of them. Thus there is no idea of developing a system, or indeed anything whatever, from a single point. The logician takes, as it seems to me, whatever he wants in the way of first principles without considering their relation to any single system, and he makes usage and convenience, not systematic necessity, govern the interpretation of single propositions. For example, 'by help of the first nine principles out of ten axioms,[b] we can prove the law of contradiction.' And again, he does not raise, as a matter of principle, such questions, dependent for us on the ideal of judgment, as the reciprocity of the hypothetical or the exclusiveness of the disjunction, and he appears to me wholly to leave out of account the problem of a categorical basis for the hypothetical and the disjunctive.[c] In other words, he takes implication as a bare and ultimate fact, an indefinable.[d]

I am not arguing against all this. It seems to me to be natural, if we either deny, or choose to abstract from, the idea of systematic coherence, about which I shall argue below.[e] And I do not see why, if we find these assumptions work in a special science, we should not make use of them as a matter of 'taste and convenience' (I extend the application of Mr. Russell's phrase on p. 17 but I judge that it does represent what with him is a great influence in the shaping of his science)—whatever our doctrine of Reality may be.

Only, to those who hold a different philosophy, the assumption that you may go forward without the idea of system will always appear a reservation or special postulate, affecting the truth or ultimate logical stability of sciences which need it for their foundation.

This is the point at which controversy might arise. It would

[a] We must not say 'in meaning', for Mr. Russell's proposition does not have the meaning, but is it. [b] Principles, pp. 16–17.

[c] See above, p. 273, on illegitimate hypothesis.

[d] Principles, p. 14. Cp. Mr. Russell's explanation, Mind, 75, 375. My only point here is that implication is taken as a relation between two propositions, just as it is felt or found. We are not allowed, for instance, to argue, from the nature of the system involved, on the question whether if p really implies q, q must imply p. I think Mr. Russell would accept this statement. [e] Cp. c. ix.

be foolish and hopeless for an outsider to criticise the procedure of these sciences on their own ground. What he not only has a right to do, but is bound to do, is to attempt to indicate the difference of attitude and presuppositions between them and what he conceives to be Philosophical Logic. And this attempt, however modest, must in the end lead to a different opinion, or an opinion differently formulated, about the *truth* of Formal Logic in the large sense here in question.

I say, an opinion differently formulated. For though Mr. Russell holds that it is a merit of his philosophy to maintain the complete truth of mathematics, yet he is too widely experienced in all regions of culture not to admit the immense *prima facie* difference between the kind of truth aimed at by mathematics and that aimed at, say, by biology or by political philosophy[a] or the philosophy of religion. He must, I imagine, have his own account to give of the relation between a science which stretches so far as his general science of inference in one way, and sciences which include so very much more in another way. I should call it the difference between a very highly conditional system of propositions, dependent for their truth on enormous reservations, and systems of propositions which approximate very much more to categorical truth about reality. But however this may be, every student must see the problem, and it is not for me to conjecture the solution which other students may propose.

[a] I hope the reader will treat it as irrelevant that I have myself attempted to write about political philosophy. I am referring to the place of the science as such in a hierarchy of sciences like that sketched by Plato. Plato's reservations on the truth of mathematics are noteworthy.

CHAPTER II

Enumerative Induction and Mathematical Reasoning

In tracing the evolution and affiliation of the forms of explicit inference, we begin with a more developed phase of consciousness than that to which we went back in describing the rudiments of judgment. The judgment-form in which the universal first reveals itself as the simple unity of differences must have given place to the articulate perception of things, events, and relations, before we can grasp it as a system whose parts are in necessary connection. In other words, we have no longer to deal with the simplest judgments of perception—the impersonal and the elementary comparative judgment—but may go at once to the world of things with their characteristic identity, and to the abstract relations of number, space and time in which that world is constructed by the mind.

Enumerative Induction.

1. On the basis of a world of things and occurrences, which involves a language, i.e. a more or less systematised nomenclature,[1] the articulate universal presents itself in the form of individual objects having characteristic identity, in which identity general attributes coexist. Language forces such coexistence on our attention through its natural classifications, and the first suggestions of inductive enumeration issue from language—which has in fact gained its significance by the same process conducted naturally and without explicit intention. Such suggestions are operative, as we saw, in the so-called inference from Particulars to Particulars, of which Incomplete Enumerative Induction is a form that has been made superficially rational.

Syllogism in Fig. 3.

a. Throwing this inference into the shape naturally prescribed by the tendency of the concrete individual thing to

[1] Cp. Introduction, sect. 4.

become the subject in judgment,[1] and making use, as Aristotle also did, of the conjunctive judgment as representing a single step in inference, we obtain an inference analogous to the Aristotelian syllogism in the third figure :—

a, *b*, *c*, *d*, are rational ;
a, *b*, *c*, *d*, are men ;
∴ Are all men rational ? or, Men may be rational.

The ground of argument being the characteristic unity of the unanalysed individual object or event, naturally takes the place of the subject in judgment—of the concrete individual which is taken as real—and therefore gives rise to that syllogistic form in which the middle term is the subject of both premises.

Experience bears out the view that some such type as this represents the simplest operation of mediate inference. All that is said for example by Stuart Mill about inference from Particulars to Particulars must really be taken as applying to inference of this type ; for it is impossible to state an inference in a shape that will even appear to be convincing, unless we supply by a second premise the element of unity between the particulars, always operative in the mind, which is necessary to bind the particular differences into the differences *of* a universal. The use of symbolic letters brings to light this formal necessity, which significant names satisfy without acknowledging. From '*a*, *b*, *c*, *d* are good books' to '*e* is a good book' no sort or kind of inference holds or is in any way suggested. The gulf between mere *d* and mere *e* is beyond the leaping powers of the boldest conjecture. These symbols are true particulars, and we can see from them how far true particulars will carry us in inference. But from 'Ivanhoe, Waverley, and Rob Roy are good books' to 'Guy Mannering is a good book' there is a self-evident passage by means of the identity of authorship, which is too obvious to be expressed, but which would form a premise in any explicit statement of the inference. That this same ground would justify the conclusion 'The Surgeon's Daughter is a good book' is an illustration of Bacon's remark that enumerative Induction

[1] See on categorical and hypothetical elements in judging, Bk. I, chap. i.

'precarie concludit, et periculo exponitur ab instantia contradictoria'.

Speaking generally, the coincidence of several attributes in one or more objects, or of several relations in one or more events, is the usual starting-point of conscious conjecture and investigation. And this starting-point is all that the present form of inference embodies. Conjecture or pure 'discovery' differs only in degree from proof. Thus the conclusion may be fairly represented by a question or a modal affirmation: A, B, and C are great lawyers *and* had a classical education ∴ Has a classical education something to do with making great lawyers?[1] or 'A classical education may have something to do with making great lawyers.' In the case of events, which are designated more analytically, i.e. more with a view to an intended inference, than individuals can be, a single judgment is the natural form for elementary arguments of this kind. 'He killed his bird every shot,' i.e. 'Such and such times he fired; all those times he killed ∴ When he fires, he is likely to kill.' But in careful reasoning or experiment 'such and such' becomes an elaborate identification by marks.

Divergent Tendencies.

β. In this argument by incomplete Enumeration we find a union of divergent tendencies. Plainly, it has no major premise; but no less plainly, the principle on which it primarily relies is the principle of subsumption. Its conclusion is therefore particular or modal, and affirms that in instances or under conditions which we are not in a position to assign explicitly, the attributes x and y are or would be united. For the premises neither express precise conditions nor furnish the basis of a complete inference by subsumption. In order to assigning precise conditions, the form of subsumption, i.e. of identification in unanalysed subjects, must be surrendered. In order to furnish a complete subsumptive inference, the universal must appear in the form of Allness, i.e. in the form of a totality of examples enumerated up to a limit which its nature prescribes. Such an enumeration, or an allegation equivalent to such an enumeration—the allegation might be

[1] The disjunctive import of this question, as is natural with a rudimentary type of inference, is simply Yes or No.

of mediate origin—would be the major premise in a pure subsumptive syllogism. In the present argument as it stands we simply formulate the first impression made by this discovery of an articulate[1] identity in difference, and the first suggestion towards completing the articulation of the universal thus indicated. This suggestion is most naturally to be taken, in accordance with the type of the inference, as quite abstract and superficial, consisting as it does in a single pervading attribute, chosen, so far as we are told, at random.

Individual Judgment in induction.

γ. It is obvious that the study of inference must retraverse, in part at least, the path taken by the study of judgment. In the present form of inference the mind is at the same critical point at which it stands when in the Proportional Judgment it has become familiar with the identity of things beneath their attributes. Only in the study of Inference we see the actual process by which the judgment-forms pass into one another—in this case, in the sphere of enumeration, by the natural pressure of their own recurrence. Incomplete Enumerative Induction is an obvious result of recurrent individual Judgments, which accentuate the common distinguishable aspects prevalent in things and in their individualities—i. e. in their characteristic natures.

In Lotze's representation of an argument akin to this, he has set out the recurrent individual judgments as so many premises of the syllogism ;[2] and, rightly recognising that the number of *such* premises is not limited, he has thereby cut the knot of the question whether inference essentially proceeds through three terms. It is not worth while to dispute about a matter of symbolic representation. So I have only to explain the relation of his scheme of the argument to that here given, by pointing out that his *entire set* of premises corresponds to either *one* of the two which I lay down, while the

[1] See distinction between explicit and implicit inference, in last chapter.

[2] Lotze, Logik, Eng. Tr., p. 100: 'Now it often happens that the same predicate occurs or does not occur not only in two but very many different subjects, P, S, T, V, W, and the question is what consequence can be drawn from the premisses PM, SM, TM, VM, ... which belong in form to the second figure of Aristotle. .... Our conclusion runs as follows, "All Σ are M."'

relation of the individuals P, S, T, &c. to the common attribute Σ forms the other of the two premises essential to the inference. The use of a conjunctive judgment in inference of this type is in accordance with the principles laid down in Book I[1] as regards the unity of the judgment, and with Aristotle's practice in his Inductive Syllogism, though not in the ordinary Syllogism in figure 3 which I have treated as the inductive syllogism. By using the individuals, not in a conjunctive judgment, but as subjects to several premises, Lotze has forced his inference into the second instead of the third syllogistic figure, the only common term being the common *predicate*, which therefore must formally serve as middle term though it does not operate as such. His transition from P, S, T, to Σ is effected without an explicit judgment, and the whole process is more akin to the colligation of a conjunctive judgment into a singular or generic judgment as described in Book I,[2] than to a process of Mediate Inference. It is obviously more convenient to use the third syllogistic figure, in which a common *subject* is the middle term, for Induction, and to reserve the second, in which a common *predicate* is middle term, for Analogy. This was the scheme followed by Hegel, and I venture to think that the deviation from this scheme,[3] like other modifications which Lotze has introduced into a logic largely resting on Hegel's ideas, is far from being an improvement.

The critical point which is involved in the inference before us is the point of divergence between the concrete and the abstract forms of the universal. This is fundamentally one with the divergence between subsumptive inference and the inference which depends on the systematic necessity of abstract relations. That these two types of inference unite again in the systematic and definite concretes of the higher sciences and of philosophy is obvious from the interconnection of the hypothetical and the disjunctive judgment. But for the greater part of their evolution they are distinct, though not fundamentally discrepant.

[1] See Bk. I, chap. i, sect. 1. iii. [2] l. c.

[3] See Hegel's Wissenschaft der Logik, ii, pp. 131, 148-9. Hegel, following the order which he finds convenient, calls Aristotle's figure 3 'figure 2', and Aristotle's figure 2 'figure 3'. Is it possible that Lotze was misled by this?

The abstract universal operates in all systems or totalities that can be regarded as aggregates of homogeneous parts, although this very word homogeneous indicates that the whole has a nature which is also the nature of the parts. All strictly mechanical science—all science, that is, which regards its objects in the light of number, space, matter and motion, is due to the operation of the abstract universal. And in a certain sense, as we shall see, there is nothing which does not in some degree correspond to these abstract relations ; nothing, at all events, which in its analysis presents features discrepant with their abstract necessity.

The concrete universal follows the track of the individual totality, and displays itself, first, imperfectly, in analogical inference, and then in the teleological conceptions which govern the higher evolutionary sciences ; especially in those sciences which have for their object-matter the achievements and the intellect of man.

Mathematical Reasoning.

2. To assign the directions of this divergence in terms of traditional logic is not so easy as to describe their real nature. Logic has been compelled to adapt its types of inference to the false directions in which it has looked for them. Thus in diverging towards the abstract universal we are leaving the track of true subsumption, but yet we are following the path on which Formal and Quantifying Logic have taught us to seek the perfectly regular subsumptive syllogism. Whereas by following the fortunes of true subsumption we lose all hope of attaining the genuine syllogism of Allness, and yet we go forward through syllogistic types—the second and third figures—which we have been taught to regard as only demonstrable by reference to that syllogism.

Number and Analogy—Divergence.

i. The lines of advance *really* suggested by Incomplete Enumerative Induction lead to Analogy on the one hand and to complete Enumeration on the other. In the remainder of the present chapter I shall follow out the latter with its affiliated types of inference, and return in the following chapter with the discussion of Analogy to the central line of concrete inference which will take us to the end of our subject.

Complete Enumeration

a. It is unnecessary to repeat the analysis of the Enumerative process which was given in Book I. It is sufficient if

as false ideal.

we bear in mind that complete Enumeration is the establishment of the universal as a numerical totality or aggregate of homogeneous parts, and therefore necessarily depresses the pervading nature or identity of the universal into a *denomination*, and its differences into *units*. By an extreme of abstraction all connection between the parts, beyond the fact that they are units in an aggregate, is done away with, so far the numerical point of view prevails and the universal takes on the uniform attributes and modes of synthesis which belong to a numerical totality as such. It has been said by Mr. Ruskin [1] that two and two do not in fact necessarily make four, but more often make five. So of course they often may and do, but not by the process of enumeration, nor by calculation, which is a mere abridgment of enumeration. Nearly all fallacies and paradoxes depend upon a confusion of categories. It is well to be reminded by a man of genius that there are other spheres of knowledge besides calculation; but it would be wrong to take the paradox for a truth, and to impute to the system of number what is a simple omission of our own. Calculation is quite equal to the task of equating $2+2$ with 5, if it is allowed to indicate the generation of an additional unit somewhere among the 2 and 2.

Complete Enumeration has been operative as a false ideal both in the doctrine of Induction and in the doctrine of the syllogism. Incomplete Enumeration naturally suggests an extension of itself up to Complete Enumeration. It is readily seen indeed that in dealing inductively with the ordinary objects of perception completeness of the process can never be attained, because the universal nature of an object is not comparable with nor reducible to an enumeration of individuals. Therefore such enumeration must fall into the Infinite series. And it is no less plain that if we interpret the universality of the syllogistic major premise in Barbara as depending on a complete enumeration, the inference is at once reduced to a *petitio principii* by the direct affirmation of the conclusion in the major premise. Yet though both these shortcomings are obvious, still the mere aggregation of instances always

[1] I quote from memory, merely for the sake of illustration. I have no serious quarrel with the statement.

tends to obtrude itself as a feature of certainty in Induction; and syllogistic reasoning always tends to assume the shape in which mere extension, i.e. mere identity of individual units, is the bond of union between the predicated attributes. Instances of this tendency are to be found in the diagrammatic representations of inferences whether by circles included within larger circles, or by straight lines of varying thickness,[1] in the quantification of the predicate, in De Morgan's numerically definite syllogism, and in the logical calculus. All of these treatments are founded on a view of reasoning which diverges from concrete determination by attributes, but stops short —except in the case of the numerically definite syllogism, which is simply calculation—of arithmetical inference by true numerical relations. All of these processes work well up to a certain point, being, technically, examples of quasi-subsumption—subsumption introduced into a sphere in which its concreteness is lost. All of them, finally, are cases of the tendency, so fatal in popular science, to accentuate at the expense of everything else any aspect of any content which affords the slightest prospect of reduction to a mechanical, i.e. to a calculative procedure. For calculation goes by fixed rules and according to regular series, and is *in that sense*[2] an easy process, whereas concrete enquiry into actual and material conditions or connections is inventive and creative —the very travail of the mind.

The real ground on which number of instances may be a source of certainty in Induction will appear when we treat of that process in its scientific aspect. No doubt the influence of Complete Enumeration as an ideal has operated in part through association with the Calculus of Probabilities. This calculus however is not the true warrant of Induction, and indeed

[1] See Sir William Hamilton's Lectures on Logic, vol. ii, Appendix.

[2] I am not so silly as to maintain that abstruse calculation is easy in the ordinary sense of the word. But I take it that its difficulties, though insuperable to untrained minds, are not of the same order as those presented by original investigation of actual conditions, in which the intellect is thrown entirely on its own guidance, and can gain but little aid from general rules. And it is not merely the logician but also the physicist who may complain of calculation from assumptions being substituted for investigation into them.

in the case of an infinite series, which for the above-mentioned reason must always be the ultimate nature of mere enumeration of instances, the calculus can have no application.

Enumeration as Arithmetical computation.

β. But Complete Enumeration in its strict and proper sense leads up to Arithmetical Computation, and in due course to the generalised or symbolic forms of computation which are founded upon arithmetic. The judgment which corresponds to this form of argument is, as we saw in Book I,[1] the equation ; a type of judgment in which the predominance of the whole as determining the parts relatively to itself is no longer visible, conformably to the fact that we have left the field of subsumption, and are now dealing with combinations of connections devoid of subsumptive character. The nature of inference, which is common to such combinations and to subsumptive reasoning, has been explained in general terms in discussing the Essence of Inference, and will be more particularly examined when we have looked carefully at the type of Inference now before us.

In addition to what was said in the last chapter on the nature of Calculation, some more special remarks may be added here. Though Calculation may take the most varied forms, yet it must always depend in the last resort on the conception of a whole which is the sum of its parts. Enumeration is the synthesis of this sum out of, or its analysis into, the homogeneous parts or units themselves, through the correlative and all but identical processes of addition and subtraction. It is represented by such an equation as $3 = 1 + 1 + 1$. The changes of sides and signs in an equation exhibit the true relation of addition and subtraction. Multiplication and division are similarly correlative, and represent synthesis or analysis not by help of the ordinary unit, but by help of an artificial unit. The equation $100 = 10 \times 10$ represents multiplication and division alike, being simply an analysis or synthesis by means of a compound unit. Thus multiplication and division are more powerful than addition and subtraction, but less widely applicable, because the compound unit must be uniform. If you have ninety fives, the numerical system gives you the total in a moment

[1] Bk. I, chap. iv.

as 450 ; but if you have such a succession of figures as 4, 5, 3, 7, 9, you have no identical compound unit, and must therefore proceed by the simple one, i.e. by addition.

In multiplying and dividing powers by help of their indices, the procedure (which governs I presume the use of logarithms) reverts to the form of addition and subtraction, that is, to the *apparent* enumeration of simple units instead of compound units. Thus the relation of 8 to 32 comes to be represented not by the *ratio* 1 : 4 (eight taken once compared with eight taken four times), but by the *difference* between 2^3 and 2^5. Multiplication proper was the construction of a quantity out of or its analysis into an identical compound unit repeated so many times. Involution is the construction of a quantity out of, or its analysis into, a simple enumeration of the employments of a certain compound unit in multiplication by itself ; that is to say in repetition of itself, or of a quantity generated by repetition of itself (the given compound unit), its own number of times. It is plain that as each step enumerated is a multiplication, or an employment of a factor in multiplication,[1] in order to multiply or unmultiply (divide) one power by another we do not multiply or divide index by index, but simply count on or count off the number of acts of multiplication designated by one of the indices. Thus in dividing 2^6 by 2^3 we do not take 2^2 as the result, but 2^3—the *difference* of the two indices. In dropping from 2^6 to 2^3 we have counted off three multiplications by 2, and have thus reduced 64 successively to 32, 16, and 8. So far we are dealing with simple enumeration applied to a complex process.

It is possible of course to trace the same development further, and did the author's knowledge admit of his attempting the task, an interesting scheme of continuity in calculative processes might be obtained. When we come to powers of powers and roots of powers we are dealing with complex enumeration applied to steps consisting of complex

[1] To say ' each step is a multiplication ' would *prima facie* mean that 4 should = 2^1 instead of 2^2. But yet it is not wholly false, for of course the difference between, say, 2^5 and 2^7 consists of *two* acts of multiplication by two, not of only one. In short, multiplication involves two factors, and would not be represented by enumerating only one to start with. In every further step the previous result is one factor in the process.

processes. If the index of 2^6 is divided by the index of 2^3, the result 2^2 is obviously the cube root of 2^6; and if the index of 2^6 is multiplied by the index of 2^3, the product 2^{18} is obviously the cube of 2^6. Here we are constructing by multiplication (complex enumeration) a quantity (18), the compound units 6 and 3 employed in the multiplication being themselves representative of simple enumerations of repeated processes of multiplication (complex enumeration).

Simple enumeration may of course itself be represented as the chronicle of a process, i.e. as consisting of units equal in number to the number of times the process has been repeated. Only in it, in arithmetical progression, the process, though applied to its own results, does not obtain the power of creating a progressive difference.

Calculation compared with argument.

γ. All arithmetical calculation, and therefore in the last resort all calculation whatever, may thus be reduced, I imagine, to enumeration, or, in some form, to enumeration of enumerations. And thus the entire method rests on the conception of the whole which is the sum of its parts—the universal whose differences, though distinguishable, are taken as equal and homogeneous. From the nature of this universal, in which the whole does not present itself as a concrete system, it is almost futile to enquire into the types and shapes which it assumes in inference. Is an Equation correlative to Judgment or to explicit inference? Is a combination of Equations necessary to explicit calculation, as a combination of Judgments is necessary to explicit Inference?

The equation, it must be remembered, is a comparison of numerable relations in the *abstract*, and therefore corresponds not to any form of Singular or Perceptive Judgment, which are correlative to the simple Judgments of Enumeration, but only to a universal Judgment, and more especially to the pure Hypothetical. This is enough to show that the Equation is essentially of a synthetic or inferential character. And there is also a special reason why this character is more emphatically marked in an Equation than in a generic or hypothetical judgment. Every *judgment*—using the expression in the narrower sense in which it excludes equation—is liable if driven home to be accused of a fallacy *a dicto secundum*

quid ad dictum simpliciter, for the concrete significance of the subject dwarfs and renders trivial the conditions under which alone the attribute can really attach, and some at least of these conditions are habitually omitted, or, if we prefer to say so, presupposed. But in the equation the whole content is homogeneous, and no one part can dwarf any other. We may not say that 99,999 = 100,000. We must put in the condition, however trivial in real life, represented by + 1 on the left of this equation, or − 1 on the right. Therefore every equation, even the simplest, is not only hypothetical, but it is hypothetical on the basis of an explicit intellectual process or synthesis of differences. There is in this sphere no such thing as massing facts together, and leaving you to choose how you infer, or whether you really and conscientiously infer at all. To simply equate the whole with itself as a whole, as true Judgment, dealing with differences of attributes, may appear to do, must give tautology, and so nonsense, in Equation. Being debarred from even the appearance of such judgments as 'All Exogens are Dicotyledons', the equation must always have on the one side or on the other an explicit synthesis of differences. It is therefore in itself a step nearer to explicit inference than the hypothetical judgment.

The Equation then exhibits an inferential connection more clearly than an ordinary hypothetical judgment. In respect however of not being a categorical assertion it is on the same level with that judgment, and only qualifies reality in virtue of the real element which underlies its hypothesis; i.e. pure arithmetical computation qualifies reality in as far as it expresses the properties of the system of number. $7+5=12$ means *If* five is added to seven we get twelve, and is categorical in as far as it involves the assertion, 'The system of number is such that "if five is added to seven", &c.' And as all prerogatives of a subject are absent (as is also the case with *pure* hypothetical judgments) no difference is more especially referred to Reality than the others. All are referred indirectly (i.e. through the system of number), and without priority.

The combination of equations bears the same relation to the single equation as the combination of judgments in

explicit inference to the single judgment. In each case it is impossible to draw the line between the single act and the combination. An equation may be taken as involving any number of equational steps, just as a judgment may be taken as involving any number of intermediate judgments. In short, an equation, like a judgment, is the form of conclusion as well as the form of premise, and in ultimate analysis always partakes of both characters. But for this very reason there is no difference of principle between the single form and the combination, and it is sufficient in discussing inference to treat of the latter which has the advantage of being explicit. It may here be pointed out that as the equation is non-subsumptive, so the varieties and peculiarities of syllogistic figure disappear in the combination of equations. In every equated term or expression the whole is present in its entirety, and no form of it has any such peculiarity as we understand by the Universal, Particular, or Individual, —the subjects and predicates of the syllogism. This indifference corresponds to the nature of the numerical whole and renders arrangement and, apparently, number, of terms, in calculation a mere matter of practical convenience. But in every system of equations, if *bona fide* treated as a single inference, the three terms may be detected. Our insight develops along the chain of equation, and does not simply drop one term out and replace it by another.

Applications of calculation.

ii. Lotze has treated of equational inference, i.e. of calculation, under the titles of substitutive and proportional inference, and of inference from the constitutive equation. I will comment briefly on the first of these forms at present, and will return to the others when something has been said of the matter to which they apply.

Substitutive Inference.

a. The point of substitutive inference—which is described as a species of syllogism and as possessed of a major premise —consists in substituting in the conclusion for the middle term M the developed content of M as assigned in the major premise, under the operation of a condition *s* representing the peculiar modification attaching to the minor term S. The argument is thus written in symbolic form [1]—

[1] Lotze, Logik, E. Tr., sect. 109.

Major Premise $M = a \pm bx \pm cx^2 \ldots$
Minor Premise $S = s\ M$.
Conclusion $S = s\ (a \pm bx \pm cx^2 \ldots)$.

This argument, in which *a*, *b*, *c* &c. represent any marks within a concept, becomes efficient, as Lotze observes, only when reducible to quantitative terms, because in other cases the particular change effected by *s* in *a* or *b* is simply taken from experience and is not really drawn from the form of the argument, which might therefore just as well have been thrown into an ordinary syllogism. But on the other hand it is worth observing that if, in constructing such an inference, we remain within the sphere of the *quantitative* universal, then the relation of subsumption and the prerogative of the major premise necessarily disappear. We have then simply two equational connections, related to an identical whole, and therefore capable of giving rise to a further connection. But M is not in that case generic, nor is S specific, nor is the connection of S with *s* ($a \pm bx$ &c.) known through their conjunction in and subordination to a concrete individuality M. M is no doubt here the assigned meeting-point of the relations, a form of the quantitative universal which pervades the equational connection before us, but S is no more a case of M than M of S. And indeed, having once been led to observe the connection of S with its development *s* (*a* &c.), we no longer judge this true on the mere ground of conjunction in M, but on the ground of a systematic necessity revealed through M. S or *s* M, if it is or has a true quantitative relation to M, cannot be *bona fide* a *case under* M, an element in a concrete individuality or case of a generic nature M, and with this relation the whole idea of subsumption vanishes.

And the favourite and catching phrase 'substitution' must be similarly treated. Substitution is a consequence and not a principle of inferential relation. It arises from the identity of the whole with itself in all its forms, the discernment of which identity is the task of calculation. We may infer, to take a very elementary example, from $24 = 12 \times 2$, and $8 = \frac{24}{3}$, that $8 = \frac{12 \times 2}{3}$. We here 'substitute' 12×2 for 24, because we possess the connection which tells us that the former is a

synthesis identical with the whole 24. To 'substitute' is simply to treat a whole as identical with itself.

This 'substitutive' inference then, in its mathematical shape, has no syllogistic character, no major premise, and no real dependence on a principle of substitution. It might fairly be spoken of as an inference by equational identification. It must include, so far as I can see, the entire range of strictly arithmetical computation, whether in algebraical or in arithmetical form, as contrasted with computation applied to geometry, mechanics, and physics. It establishes a ratio, for, logically at least, ratio is a genus of which equality is a species, but it does not ostensibly compare ratios, and therefore does not explicitly challenge problems in concurrent but heterogeneous series. But we must remember that *any* calculation which does not merely develop the properties of number depends for its meaning on *some* differences of real aspect correlative to the differences of numerical aspect. 'The shelf-space M of this shelf = the shelf-space required by thirty octavos.' 'I can have shelf-space which = 100 M, ∴ I can have shelf-space which = the space needed by 100 × 30 octavos.' Here no doubt we are dealing with homogeneous quantity—feet and inches—all through; but the wholes which are compared are differently motived, and these differences of motive—books compared with shelves, and one shelf with a library—are what give the inference its point. The next step is that these differences of motive affect the actual denominations of the units themselves. We come to deal in short not with simple equality—identity of number of the same units—but with equality of ratios, i. e. with *identity of the ratio* between the several quantities of a set, with that between the several quantities of another set or other sets. The unit of enumeration, in this case, must not be identical.

Connections in Space and Time.

β. We must now break off somewhat abruptly to consider the apprehension of Connections in space and time, which must be treated for our present purpose as an independent root of knowledge, and must be investigated before we can proceed further with the analysis of calculation. Primarily no doubt the apprehension of these connections is an offshoot

of the rudimentary judgment, which as we saw in Book I[1] must construct its world of Things largely under the influence of growing spatial and temporal discrimination. But starting as we have done in explicit inference with the developed concrete perception of the world of things, we have no choice but to assume also the developed abstract perception of relations in space and time. We reason from these relations or connections before we have subjected their elements to accurate enumeration or measurement, and it is the nature or non-numerical inferences from such relations that I now propose to consider.[2] 'A is to the right of B, B is to the right of C, ∴ A is to the right of C;' 'A is prior to B in time, and B to C, therefore A to C.' In such inferences as these, Mr. Bradley has told us, we first construct, and then perceive. I have expressed at length in another work, and briefly in the preceding chapter, my objections to employing the term construction as if it were a self-explaining account of an intellectual process. But I have conceded that when restricted to the sense of intellectual construction, neither imaginative nor physical, it affords an apt description of the peculiar work of inferential apprehension in the field of space, time, and motion.[a] At all events we must, I think, agree with Mr. Bradley that in examples like those just given there is no *bonâ fide* major premise, and therefore no syllogism. The form 'A is to right of B, B to right of C, ∴ A to right of C' is so obviously the natural shape of the inference thus expressed, that we may be surprised at being reminded that, *qua* syllogism, it has the defect of four terms. To fulfil the syllogistic requirements we must set down as a major premise 'What is to the right of B is to the right of C', or even 'What is to the right of B is to the right of that which B is to the right of'. In the latter case the entire content of the argument recurs in the minor premise 'A is to the right of B and B to the right of C'. Plainly this minor premise would carry the conclusion without a major.

It was the author's experience, when engaged in teaching

[1] Bk. I, chap. ii.

[2] See Bradley's Principles of Logic, p. 225 ff., which on this point I have followed very closely.

[a] See p. 33 above, note a.

elementary logic, that pupils had an invincible tendency to construct 'syllogisms' in one of these two types, the former of which is defective as a syllogism, and the latter unreal and ineffectual. In using the former, 'A to right of B, B to right of C, therefore &c.,' their instinct was just, so far as the argument to be expressed was not truly subsumptive. An extension of this just practice to subsumptive inference in which it becomes erroneous was no doubt the cause of Dr. Thomas Brown's remarkable view as described by Mill in an interesting passage.[1] The complementary error, to which also pupils are prone, is, in constructing a syllogism, to surrender the whole task of articulating the steps of the argument by simply putting as the major premise some syllogistic canon, in analogical argument some principle of analogy, or in 'constructive' argument such a general principle of construction as 'Whatever is to the right of B is to the right of that which B is to the right of'. It thus becomes necessary to mass the whole content of the particular inference in hand within the minor premise. Wherever a syllogistic canon is taken as the ultimate major premise of inference, this error is committed. The error consists in taking out the active form of the inference —the intellectual function which the syllogistic or constructive arrangement expresses—and making this a mere portion of the content from which the inference is drawn. In drawing the inference the intellectual function is inevitably active, and the principle expressed in the major is no justification of the activity of this function, but merely a content on which it operates as it would on any other content, so that the explicit major really adds nothing to the argument.[2] *This* case, of subsumption under the principle of subsumption, needs itself to be subsumed under the same principle or another, and so on ad infinitum. Take 'A mark of a mark is a mark of the thing marked, growth is a mark of organic nature which is a mark of life, ∴ growth is a mark of life'. Here we have an act of subsumption under a principle of subsumption, which

[1] Brown thought the major premise *always* superfluous. See Mill's Logic, i, p. 225, sixth edition.

[2] See Bradley's Principles of Logic, p. 475; Hegel, Wiss. der Logik, ii, p. 151; and the Author's Knowledge and Reality, p. 275.

act itself falls outside the principle itself and needs justification in a prior syllogism, if the minor premise and conclusion needed justification in this.

On the other hand, subsumption does not allow the subject to be merely treated as a point of attachment, as is the case with abstract series in space or in time. If we tried to infer thus in concrete matter we should get something like Jevons' Added Determinants, which is an excellent example of inference that is almost necessarily fallacious, owing to the disproportioned effect of the same added determinant on two concrete conceptions. 'A child is a human being, A. B. is a big child, ∴ A. B. is a big human being;' 'Pericles rules Athens, Aspasia rules Pericles, ∴ Aspasia rules Athens.' The concrete subject in subsumption takes up the determinants into itself and transforms them in a way which we cannot predict. A woman's rule over her lover is not *in pari materia* with a statesman's rule over a commonwealth, and a big child may be a very small human being. We must not try to read off conclusions from series in subsumptive matter as we can in space, time or number. Construction or abstract connection, on the other hand, deals with relations which bear on each other with systematic necessity, and which are not affected, or are assumed to be affected only within known limits, by the idiosyncrasies of the points of attachment. In 'A to right' &c. we take A to be a point or body in space; if not, the inference is unmeaning. Therefore in this sphere no premise has a prerogative, and the reciprocal modification of relations is constructed in the argument and not presupposed in the nature of the Subject. This characteristic of 'construction' applies to number, space and time, and to the mechanics of abstract matter.

The apprehension of relations in time needs no separate treatment in logic from that of relations in space. Apart from measurement, connections in time are not capable of any great complexity, seeing that they contain nothing that corresponds to a curve or angle in space. Mere succession is the relation of one set of changes to a permanent subject; but in this there is implicit from the first the idea of duration, which involves the elementary comparison by the permanent subject of two

distinguishable sets of changes, each of which is *primâ facie* the measure of the other. There is no science of time in the sense in which geometry is the science of space. From this point of view it has been said that time is one degree more ideal than space; i.e. its essential character of successiveness falls outside the actual contact of events with sensation and exists for the most part in the ideal medium of memory. It is true however that the present has duration, and does not exclude succession. But in thus possessing duration, in spite of the fugitive character of actual sensation, the present of course displays an ideal nature which makes it continuous with temporal succession, a succession which pervades even the present itself.

The intelligence in bringing order into the feelings begins by apprehending space or time and constructing its perceived world in these forms. By developing them, however, into scientific characteristics of this material world, it further proceeds to idealise them into laws and proportions, and thus to take away their immediate and perceived character. The first step in this idealisation is the conception of absolute, standard, or uniform space and time, a conception which guides the process of measurement, but which is strictly speaking, in its common-sense form, an abstraction to which no real thing nor process corresponds. Constancy of ratio throughout the perceptible world is, as we saw,[1] all that measurement can give us, and is what we really mean to assume. Uniform space or time, as embodied in a single series and not in a comparison, is a contradiction in terms.

Calculation applied to Geometrical Reasoning.

γ. The apprehension of connections—even of explicitly mediate connections—in space and time does not necessarily involve the enumeration of parts with a view to precise measurement. Such apprehension begins, as we saw in Book I,[2] with the perceptions indicated by 'Here' and 'There', 'right' and 'left', 'nearer' and 'further', 'now' and 'then', 'future' and 'past'.

But all these expressions involve a continuous series, and such a series is the beginning of measurement. The spatial elements however, the straight line, angle and arc, are not

[1] Bk. I, chap. iv.

[2] See Bk. I, chap. i.

constructed by measurement but are given spatial relations, although the discovery of their properties cannot be effected apart from the comparison of quantities. I am not prepared to say that the identification of corresponding geometrical relations might not (in spite of the etymology of the word 'geometry') be prior to intentional quantitative comparison. Vertical angles, or right angles, or the triangles into which a rectangle is divided by the diagonal,[1] might be seen to be *the same*, before numerical comparison was applied to sides, angular distances, and areas.

Apart however from definite history, nothing can tell us when an implicit character becomes explicit. It is certain that all developed consciousness of spatial and temporal connection must operate through quantitative comparison.

Geometrical and strictly mechanical reasoning is the endowment of the quantitative universal with control over the combination of homogeneous parts in space, or in space and time together. In this type of reasoning, though essentially 'constructive', we are often reminded of subsumption by the peculiar working of the quasi-generic judgment.

The square and the cube are elementary and striking instances of the power of enumeration, i.e. of arithmetical ideas, to represent or to describe generically a purely geometrical relation. The 'square' of a number *is* not a square surface, nor does it, so far as I can see, display in itself the difference between the superficial and the linear unit. But such a number, or rather such a numerical relation, does indicate definite combinations of parts by which a square surface may be recognised or constructed, and therefore the numerical relation may for many purposes be regarded as equivalent to the surface. The *purely* homogeneous universal, *qua* homogeneous, already at this stage fails to grasp the nature of the content as such, whose structure is to be represented by the differences of the

[1] In elementary schools it is now the practice to familiarise young children with such relations as this, e.g. by folding square pieces of paper, first along a line dividing them into equal rectangles, and then along the diagonal, thus exhibiting the equality of a right-angled triangle to a rectangle of the same height and half the base, both being halves of the same square. This is an equation and so a measurement, but rudimentary in as far as unanalysed.

universal, but succeeds in a way unknown outside mathematics in presenting an adequate key to this nature.

I presume that the marvellous processes by which curves of all types have been subjected to the dominion of the equation must ultimately be regarded by logic in the same light as the relation of the square upon a line to the square of a number. These processes do not, as I understand, exhaust the nature of the curves, but they exhaust a combination of directions and distances, referred to an assumed point, which can be given any required degree of accuracy in representing the curves. Hence, though numerical relations have not in themselves the aesthetic or mechanical attributes of the particular curves which correspond to them, yet the nature of space permits a curve to be adequately and unerringly constructed by putting together homogeneous parts, viz. distances, in accordance with these numerical relations. It is obvious therefore that by experience, if not otherwise, both aesthetic and mechanical attributes may come to appear as if directly legible in certain numerical relations considered as controlling spatial elements. In the case of curves these numerical relations or attributes are expressed in *constitutive equations*, and form by far the most striking examples of a transition from and through the homogeneous to the heterogeneous. But strictly speaking all the simple proportions which characterise e.g. the triangle or the square are examples of the same principle.

We spoke in Book I of this whole class of truths as ' quasi-generic judgments ', and insisted on the peculiar reversion which they display towards the type of concrete or organic totality. Never again in knowledge do we meet with such simple abstract and mechanical construction so unerringly analysing an individual and characteristic content. For this reason we are tempted to take the constitutive equation as the ideal of knowledge, and indeed *exceptis excipiendis* we are right in doing so. But the *excipienda* are serious. When we pass from abstractions like space, time and matter to the concrete evolution of the real world, to organisms, to political societies, and to human intelligences, not only is mechanical construction infinitely more difficult, but it is infinitely less adequate. A curve after all is a line in space, though it is not a straight

line ; so that it can be no such enormous leap to constitute a curve out of spatial elements. But a plant is hardly in the strict sense a phenomenon in space at all, and although a mechanical view of it, in a sense to be explained below, must certainly be aimed at by science, yet there will remain in it much to be *understood* which cannot be *constructed*—not a part of its actions, but the whole result.

If the constitutive equation is the type of quasi-generic judgment, it follows that Inference from the constitutive equation is the type of quasi-subsumptive inference. Such inference has two aspects. On the one hand it is pure calculation or combination of connections, like any mediate equation which has no meaning beyond the numerical system. It combines with a proportion between two changing quantities some particular values of these quantities, and follows out the modifications which result from this combination. This process is in itself, though more complex, yet not a whit more subsumptive or less purely calculative than to equate $2a$ with $3x$, and supplying any number as the value of a to fill in the number demanded by the proportion as the value of x. In such an expression a and x are merely generalised numbers, or numerical relations, or, if we like, names for a problem. There is no true major premise, but in its place there is the generalised description of an identical numerical whole in the two cases of being constructed with a factor 2 and with a factor 3, and the inference consists in exhibiting the construction of any such whole on the basis of these factors respectively.

If a and x represent distances in space defined by some further relations (e. g. perpendicular to each other or the like), and the whole expression has the effect of characterising a definite figure in space, then we have the germ of what I have called quasi-subsumption. The inference is still constructive in the narrow sense ; it proceeds by enumeration of indifferent parts as in the case first considered. But it combines with this aspect another and a different one. It exhibits a particular portion of a particular curve in the light of a characteristic modification of a generic type. The curve may be closed or open, quick or slow, symmetrical or unsymmetrical. And these attributes, although they result from the construction, are not

given within the construction. The spatial nature of the type of curve in question is the quasi-generic content through which the subsumption is made. It is not *pure* subsumption ; for the construction would suffice in theory to draw out the *particular* curve before us and discover its properties, without ever giving it a generic name or observing that we are analysing the properties of something like a natural kind. And in fact, I presume, this is the usual order of procedure. Observations are obtained, upon which as data the curve is constructed, and its general nature is found only by means of this construction. But on the other hand, the mere fact that we know how to pass from an equational combination of numbers to a spatial figure shows that we are proceeding on a principle involved in the characteristic nature of such figures. The scheme of the argument is—

A spatial figure constructed on such proportions has such and such an outline ;

This is a spatial figure constructed on *this* case of the above proportions ;

∴ This has *this* particular outline.

The element of subsumption consists in the impossibility of passing from the ratio, which is only a generalised relation of numbers, to the markedly individual figure in space, except by identifying the subject in which the numerical relation and the characteristic curve-properties are conjoined as the nature of space, or, more closely, of a curve in space.

It only remains to mention that when we take in the unit of time, and thereby are able to represent motion as a length, and when we further erect the abstractions force and mass as correlative points of view from which motion is regarded as affecting bodies, we have all the *organa* of what may be called pure mechanism, or abstract constructive science—a complex and elaborate system, founded ultimately on the combination of three abstractions, space, time, and number. This abstract mode of consideration is true in so far as it applies to the characteristics of real things, but its application is obviously limited. The human body, for instance, is of course a case in which the geometrical and mechanical laws of space and

laws in their purely abstract form have nothing to say. I proceed to discuss how and in what sense mechanism, and mediately, even *pure* mechanism, has a wider application.

Calculation applicable to Disparates.

δ. Lotze has spoken of inference from proportion as a limit of knowledge, and as assuming a type which from his description appears to be subsumptive, although he does not give it this name.

Proportion. Homogeneous Terms.

(1) I am unable to see that we have in proportion either subsumptive inference or a limit of knowledge, so long as the four terms of the proportion are either of the nature of abstract number, or are *in pari materiâ*, i.e. of the same denomination with one another. Numbers by themselves, it may be said, prove nothing, and computation in the abstract is not inference. But it seems obvious that the properties of the numerical system as such are worth establishing for their own sake. $2 : 4 :: 3 : x \therefore x = 6$ is not a worthless *type* of inference, although the example is one which has no interest. It depends on a relation within the numerical system, and is in itself, apart from its elementary character, as well worth establishing as any other consequence of an isolated abstract relation.

Or again, if we want to make a picture-frame of the same proportions with one that we have, but of different size, then all the numbers represent lengths, and we have, say, $16^{\text{in.}} : 24^{\text{in.}} :: x : y$; $x = 32^{\text{in.}}$; $\therefore y = 48$. In this example, however, the limit of which Lotze speaks is just beginning to make itself felt. All the numbers do no doubt in one sense stand for lengths in space; but they are lengths peculiarly related, in a way which falls outside the statement of proportion. *In the object to be constructed*—this is the very reason for which we compare them—the one spatial length is to be at right angles to the other; or, in popular language, they are respectively length and breadth. Thus 16 and 24, and their correlatives x and y, are in one sense of one denomination, but in another sense of different denominations; and it is because they are of different denominations—or dimensions—that we have an interest in comparing them. Here moreover, as in geometrical reasoning, we come upon a trace of subsumption, because the essential identity which is the foundation of the inference consists in the nature of an object which has length and breadth,

under which generic nature, as characterised by a certain ratio, we subsume a specific case of the same nature and of the same ratio. The meeting-point of the relations is a concrete and not an abstract, and this is the differentia of subsumption.

It would be easy to fill up many gradations of the appearance of heterogeneity in the terms of a proportion. First, the two *sets* compared cease to be measurable by any identical unit—whereas in the last examples both sides of the proportion *are* measurable as distances in space. Such are the proportions of times to distances and to areas, or of force to distance or to mass. And secondly, the several terms, either *in one set* or in both, cease to be strictly measurable by identical units. While this is the case with one side only, some sort of proportion may be supposed to exist, especially as the other side may present variations of a quantitative character, though not exhaustible by repetition of an identical unit. But when neither side presents a true ratio, i. e. when on neither side are the several terms measurable by an identical unit, then proportion is gone, and we are referred back or across to Analogy or Subsumption.

'*a* and *a* series.'

(2) Leaving the intermediate portion of these gradations for the reader to fill up, I pass at once to a class of proportions which prevail in a certain sense throughout the entire world of knowledge. I speak of related series of contents which might appropriately be designated '*a* and *a*' series. The examples which spring at once into the mind are the perceptions or sensations of light and sound, with their respective physical stimuli. It is true that in the connection of such series as these we come upon a 'limit of knowledge'; but it admits of question how far even in the most favourable instances of them we can be said to have proportional inference.[1] Perhaps

[1] I suppose that 'irrational' in mathematical language designates a relation which cannot be expressed as a ratio, viz. as a relation between two numbers. It would seem then that 'incommensurable ratios' must be a contradiction in terms. The convenience of the expression in mathematics would not necessarily be interfered with by its self-contradictory character. Many conceptions which involve a more or less latent contradiction are employed in special sciences—quantitative infinity,[a] or involuntary contracts, are well-known instances. It is interesting to notice that the reason of one science may be the unreason of another. Hegel complains that mathematicians call everything

[a] See 1. 163.

the relation of angle to arc, which Lotze gives as an example, is about the extreme instance of true quantitative proportion which, although quantitative, includes heterogeneous matter.

When we look at the relation of musical sound to stimulus we find an ascertained parallelism between changes in the rapidity of periodic vibrations that reach the ear, and changes in pitch of the musical note which they generate in consciousness. And further, the changes in pitch are a continuous variation of a pervading quality and therefore are quantitative; and these are commonly measured by certain intervals of change taken to be equal in the sense of sharing certain attributes and capacities which remain the same for corresponding intervals in all parts of the scale. If we attempt to make out a proportional statement of these relations we may get some such result as a vibrations in second : 2 a vibrations in second :: note a : its octave a_1; a relation which admits of the quasi-subsumptive inference $a = 16\frac{1}{2}$ ∴ a = a certain note x, and a_1 a certain note y.

But this inference is by no means purely mathematical or quantitative.

First, we must notice the presupposed limitations, which do not exist in any purely mechanical or purely geometrical law. The vibrations must affect a hearing ear, and to affect a hearing ear they must be within certain limitations both of rapidity and amplitude, which from a mathematical point of view are wholly arbitrary.

Secondly, we must observe that not only, as in true cases of proportion such as that between the angle and the arc, are the two sets of terms incommensurable with one another, but also it is very doubtful whether the two terms represented by a and a_1 can be strictly called commensurable. In a sense no doubt the tones of the scale are units and serve as measures. But if we ask which note is 'twice' another, we are perplexed between the octave, which corresponds to twice the stimulus of the octave below, and the note, whatever it may be, which

irrational in which reason begins to intrude—i. e. in which systematic heterogeneity begins to appear, e. g. in the relation between straight line and curve. Ratio is the reason of mathematics, and other systematic relations may be irrational *in this sphere*; just as ratio may be an irrational relation outside mathematics, e. g. in political science.

is next above the lowest audible note. For two of any identical unit ought to be twice one. But just as the zero of the common thermometer is not a zero of heat,[1] so there is no sense in making the lowest pitch, or the point where pitch passes into separate sounds, a zero of pitch from which all its grades can be constructed by mere multiplication or superimposition. We may say, if we like, that the quantity is intensive, i. e. that the grades by which the greater is separated from the lesser amount do not persist in a distinguishable form beside or within the greater amount when it is attained. This, however, is only to say in other words that we are passing beyond a true quantitative relation. All true measurable quantity is extensive. In as far as it is *merely* intensive it is unanalysed, not referred to parts, and so not quantitative. Here we are between the two; we have *degrees* which are not parts, and of which the whole is in no strict sense a multiple, but which not only exhibit an advance in themselves but *correspond* to parts of which *their* whole *is* a true multiple.

Then, thirdly, we are confronted here with something like a genuine subsumption. The correspondence of 33 vibration per second to a note x rests on a concrete relation, which we find but cannot construct, between an impact on the living person through the ear and a reaction in the soul of that person. It is by subsumption under this characteristic individuality that we justify the conjunction, not otherwise necessary, of periodic vibration and musical sound.

It should be noticed, too, as bearing on the concreteness of the operation which we are now considering, that loudness is a quantitative attribute of musical sound, and corresponds to a distinct feature of the sonorous vibrations, viz. to their amplitude, which I presume must on the whole diminish with increasing pitch. This ratio, and other analysable characteristics, fall within the same series of contents as that to which the correspondence between pitch and rapidity applies. We are thus in such a case far from being able to obtain a simple proportion between contents as wholes.

[1] The idea of an absolute zero of heat does not matter for the present purpose, which is merely to illustrate the nature of a series which is not in a true ratio. See Mill's Logic, i, pp. 441 and 446.

When we come to the colour-sensations, the individuality or disparateness of the a terms increases, and the quantitative relation, still traceable in sound, heat or pressure, becomes much more obscure if it does not disappear. Not to speak of the dark heat rays and the dark chemical rays, which mark differences in the action of the ether corresponding to no *saltus* in the ratio of vibrations, the transitions from colour to colour defy all attempt at quantitative expression. No one could mean anything by saying that central violet is twice or three times or five times central red, except in so far as colours may be characterised by an intensity of illumination which is a different thing from the peculiarity of their hue. It is needless to go into detail on this head. It is plain that while the variations in the mechanical stimulus, the a series, are still strictly numerable, the terms of the a series are altogether ceasing to present commensurable and therefore numerable differences in respect of their distinctive individuality, although various numerable differences may be traceable within their content. Then proportion in the strict sense wholly ceases to apply, because there is a ratio on one side only, and not on the other; and there cannot be equality of ratios unless we have two sets of matters with a ratio between the members of each set.

Nevertheless, there is in the colour series a uniform relation of a proportional character. 'Wave-length x : wave-length y : : violet : red' means not that red is such and such a multiple of violet, but yet that *in a series in which* wave-length x gives violet we can be sure that wave-length y will give red. And though these colours are not producible as multiples of one another, yet they are identifiable, on the assumption of correspondence to stimuli, by the process of colour-equation. Given the means for producing true spectral red, a problematic red colour can be equated with it, and the difference between the two stated in terms of the stimulus.

Proportion, Analogy, and Hypothetical Judgment.

ϵ. We have here, it might be said, passed from Proportion to Analogy, which abandoning its original meaning of proportion has come to signify an inexact comparison of relations. But Analogy in the logical sense is not really an inexact form of proportion, but depends on other than quantitative con-

siderations, as we shall see in the next chapter. And though we are now passing out of the region where equality of ratios would grasp and penetrate the whole essence of the subject-matter, yet there is no need to leave behind us either precision in the designation of relations, or such numerical attributes as accompany though without exhausting the individuality of contents. For these reasons it is better not to consider that we are here returning to Analogy, but rather that we are approaching, from the side of exact science, the hypothetical judgment, which forms the meeting-point between the concrete and abstract forms of inference. And the hypothetical judgment, especially when retaining a partially quantitative content, represents what may be called the wider or the philosophical sense in which mechanism prevails throughout the knowable world. In many regions it is not much that this view of things gives us ; but it is always something.

It is needless to pursue this hypothetical judgment through all the gradations in which it embodies the idea of proportion throughout the sciences. Everywhere we have in the background the strictly numerable relations of space, time and mass. The exhibition of connected groups of contents as a and a series, in both of which the terms are as nearly as possible commensurable, is the ideal of natural science, or of *physical* science in the strict sense. How far in detail chemistry or biology may be reducible in this sense—for there is no other sense in which they can be—to molecular physics, is a question of fact and practice. At present it must often seem as if instead of a and a series we had rather a and x series, i. e. correspondences in which even the more quantitative series has hardly a true ratio between its terms, while the less quantitative series has no ratio at all. I have in my mind such correspondences as those between changes of temperature and allotropic phenomena in chemical agents, or again between changes of temperature and degrees of irritability in organic beings. But the changes of temperature themselves, considered as an a series, have behind them as a true a series their mechanical equivalents in the way of mass and motion (footpounds), and thus the whole phenomena, even those of allotropism, have ultimately a true correspondence with a genuine a series. Such

a correspondence would form the content of a hypothetical judgment, under which quasi-subsumptive inference would be possible.

ζ. It is under this modification of '*a* and *a* series' that we ought to consiuer such a question as the relation of the physical changes in the human organism to the activities of consciousness. I am not now dealing with the sheer question of fact, whether in the human or other organism, considered as a machine, the production of work can be experimentally proved to be limited by the supply of mechanical energy. We know too well from daily experience that the output of work has gradations and a limit—a limit related at any rate *inter alia* to the supply of food. That this limit is prescribed by conditions precisely analogous to those which are embodied in the working of every machine, viz. by the constancy of energy, seems to be the natural assumption so long as no other principle of gradation and of limit is convincingly demonstrated. Consciousness and Conservation of Energy.

But we now come upon a second difficulty. We assume that molecular change and muscular contractions in the organism must be taken as theoretically subject to the constancy of energy, i. e. that life or the soul so far as operative in or through the organism cannot create energy out of nothing.[1] These changes and contractions either are, or are reducible to, mechanical equivalents in motion and mass, and between them and the supply of energy a true *a* and *a* proportion might, if our knowledge permitted, be established.

But between either these organic changes or the expenditure of energy, on the one hand, and the states of consciousness which sometimes attend these changes on the other, no possible proportion could hold good. Here we have then a pair of series *a* and *x* (organic changes and consciousness) on the basis of a pair *a* and *a* (expenditure of energy and organic changes).

[1] I cannot think that Wundt, Logik, ii, p. 507, really means to deny this, though his expressions are bewildering; 'Hier (in the spiritual development) gilt vielmehr (as against the law of constancy of energy) ein Gesetz unbegrenzter Neuschöpfung geistiger Energie.' To judge from the Physiologische Psych. ii. pp. 461–3, he thinks that 'Geist' is operative throughout nature, and its 'creation of energy' must be a question merely of new *forms* of action. But I cannot thoroughly understand his view.

It does not matter for our purpose here whether consciousness is independent work performed by the organism, or is an unaccountable attendant upon such work which is not represented in its cost, or lastly, a consequence, or 'effect' if we like, of certain peculiar organic work, represented in the mechanical cost of such work, and inseparable from such work except by an utterly unmotived abstraction. In all of these cases we have, whether directly or through organic activities known to accompany consciousness, what may be called an a and a relation, or more truly an a and x relation mediated through a, between mechanical work and consciousness. But on the side of consciousness of course no ratio can be established, and therefore there is no proportion. We cannot safely say that to learn twenty lines of Virgil demands twice the expenditure of work that is needed to learn ten. We cannot say that to write the same letter requires the same exertion on one day and on another. We must however be on guard here. Interruption, a different state of memory, obstacles in the content, impair the reliability of what might seem a unit of mental work. But mere weariness of the organism which may lengthen the time taken and the apparent exertion demanded, seems only to affect the proportional and not the absolute work needed. What we have under such circumstances is merely a case of a weak machine doing slowly what a strong one does at one blow. The weak machine may however be destroyed by application to work too heavy for it, and in this sense even an identical unit of work has not always the same total effect.

If a unit cannot be obtained for the x or a series, what can our would-be proportion do for us? It enables us to say generally, though not precisely, that amount of even intellectual activity varies as expenditure of mechanical energy and is limited by the sources from which that energy is drawn; and further, to say precisely, though only as a hypothetical judgment of which the condition can never be entirely fulfilled, that if we could equate two amounts of intellectual activity, or if we could have the same intellectual activity repeated under the same conditions, we should find it had absorbed or had been accompanied by the same amount of mechanical work. There is, that is to say, a formal and constant correspondence

between amount of mechanical energy and amount of intellectual work; but mechanical equivalence is so subordinate an aspect of such work that this constant relation tells us nothing by way of calculation, and only embodies in an abstract principle what we knew before—if he does not eat, neither can he think.

It may be objected that intellectual activity apart from molecular change, which latter is not intellectual, absorbs no work at all. But when any one can show us thought apart from an organism it will be time enough to speak of thought as an activity not dependent upon organic changes. *Prima facie* the complex molecular changes which accompany thought have thought for their natural outcome and consequence, and owe their high mechanical cost to this characteristic. That no mechanical expenditure goes directly to thought, but all goes to molecular change which is in some cases accompanied by thought, is only what we should naturally expect supposing thought to be conditioned by the activity of a physical organism. In any other case, i.e. supposing a contingent of energy to disappear into the thought-process and be unaccounted for in the balance-sheet of the body, we should have a proportionate amount of thought unaccompanied by material change, which is unknown in our entire experience and contrary to the whole analogy of that experience. All that we can say is that the *thinking being*, as we know him, is thus and thus conditioned. We cannot safely separate in theory what can never, to our experience, be separated in fact.

The Mechanical aspect of Knowledge.

iii. Mechanism in the widest or ultimate sense is thus compatible with the disappearance of the ratio in both of the corresponding series. The principle of 'mechanism' is by this curtailment reduced to the law of Sufficient Reason, and simply expresses the point of view from which the scientific understanding necessarily and inevitably regards the world. This point of view is not a tyranny to be avoided, but a claim which must be satisfied. The Understanding is a necessary moment in the Reason. Instead of precise proportion, enabling us to construct or to predict by a formal process, we have in mechanical determination thus understood a conception which confronts us with a material problem. A man's character

deteriorates, or the prosperity of a nation decays. The conception of mechanism or of sufficient reason entitles us to treat these phenomena as problems demanding explanation. They must not be miraculous, i. e. not isolated, ' cut off with an axe ' from the system of knowledge. We express this demand by saying that every change—or more generally, every modification—has its reason. It is only our tendency to illustrate the universal by the plural that makes us state the principle as if it necessarily applied to a number of examples in which the same ground has the same consequence. What we really mean is that every content is a consequent, and that every consequent has a ground. That the connection of ground and consequent is necessary, and therefore *if* the one is repeated without modifying circumstances *then* the other is repeated without modifying circumstances, is involved in the point of view from which we speak of ground and consequent at all. But what we primarily mean is objectivity, not uniformity.

Some uniformity, however, is for us a corollary from objectivity. The ultimate fact of knowledge, on which the objective relation of ground and consequent depends, is the existence of *systematic* connections. Now a system is a whole, a universal, an identity in difference. From the very beginning this is what we meant by something objective, something by which intelligence could agree with itself in the world of meanings. But such a system or identity, however heterogeneous the parts that enter into it, of course pervades all these parts as a common character. As we saw in the last chapter, if *a*, *b*, *c* are mere particulars, there is no bridge from the one to the other. A connecting quality there must be, although it need by no means take the shape of an immediate and simple quality. Thus in highly complicated matters we go back again to an earlier function of knowledge, and substitute equational comparison for exact enumeration. But the comparison is not here the ground of inference ; the contents have the partly quantitative relation, which admits of such comparison, as a consequence of their systematic connection, but the grounds of inference lie in the systematic connection itself. Let the α series be the phases of the artistic individuality of a painter, and let the a series be a chronologically arranged series of

pictures in which these phases display their effects. In such series we shall always have, among other processes of judgment and inference, a comparison by way of equation applied to pervading qualities as between phase and phase, and between picture and picture. No one would doubt that Turner's water-colour picture of Durham painted in 1836 has more of certain striking qualities commonly associated with Turner's art than that painted in 1802. But of course there would be no sense in saying that the one is twice or three times as 'Turneresque' as the other.

In series like these we have subsumption or abstract hypothesis—which latter is the bridge from mechanical construction to concrete systematic inference—according to the nature of the subject-matter. In tracing the phases of an artist's genius we have properly subsumption, the unity which operates being concrete and self-contained. But yet as regarded in the light of causal ideas the phase of mind may be distinguished from the picture produced, and the one regarded as the cause or ground from which, on the latent basis of a real individuality, the other necessarily issues. From this relative point of view the connection would be expressed by abstract hypothesis, 'If a_2, then a_2.' In this aspect everything in the universe may be referred to conditions outside itself, and nothing is free, complete, or self-contained. For to regard things thus is simply a phase or moment of knowledge, the phase which consists in determining every x in terms of some correlated y. Cause and condition, reason and ground, are only species of the generic idea which presides over thought of this type. But in ground we have as we saw [1] a conception in which the correlated terms tend to fall together, and to pass from being parts related within a system to being the system itself. The whole conception which we are discussing—the conception of 'sufficient reason'—is simply a corollary of or aspect in the ultimate nature of the universal, which is in other words the ultimate nature of thought itself. We have constantly reiterated that every universal is an identity in difference; and it is only the converse of this to say that every difference has a distinct and assignable place among the differences of a universal.

[1] Cp. Book I, chap. vi.

The statement of the principle of sufficient reason which was laid down above, 'There is no difference[1] without its reason,' may be illustrated by the formula in which Lotze[2] embodies it, A + B = C. This formula is intended to mean that a real subject A can only pass into a specific phase C under an assignable condition B. The 'proof' or analysis of the principle must be reserved for a later chapter. Here I am only dealing with its import. And we see its import reduced to the most abstract type when we are in a stage beyond proportion and yet have not returned to true subsumption, i.e. when we are dealing with the pure hypothetical judgment. For we have at this stage a *de facto* correspondence of which the ultimate ground is more or less latent, between the terms a and α, b and β, and so forth. What then do we mean by correspondence? We could not say that a and α correspond if a and α were respectively isolated occurrences of their kind. For what could possibly justify us in picking them out of the myriad complications of reality and attaching them together to the exclusion of other events and relations? Correspondence involves the recognition of a universal which fixes the relations of the terms that correspond. If the series a, b, c is to *correspond* to the series α, β, γ, then both series, simply in order to the possibility of selecting them, must be capable of being regarded as a_a, a_b, a_c and α_α, α_β, α_γ. If in a combination of musical sounds a slight harshness a is raised to a discord b, then the consequent feeling of pleasurable excitement α passes into a feeling of pain β. In virtue of being phases of the same combination the two sounds may be represented as a_a and a_b respectively; and the two phases of emotion, in virtue at any rate of relation to the same series of sounds, may be represented by α_α and α_β respectively. But neither sounds nor feelings, of course, are terms between which a ratio subsists. What we can infer is, by a process which is half-subsumption and half-hypothetical judgment, 'In a pair of series where the sound a_a causes the feeling α_α, the sound a_b will

[1] p. 82, above. It is commonly worded 'there is no *change*', &c., but I have attempted to show in Book I, chap. i, that change is simply a case of difference and needs no separate logical treatment.

[2] Logik, sect. 63.

cause the feeling $\alpha\beta$.' When we develope any such doctrine as that the source of pain is intermittent irritation of sense, of which musical discord is a species, we pass into subsumption of the higher kind, which has absorbed into itself what can be done by mechanical construction.

The point of view which we have been considering—that of reflection and relativity—is the point of view which has been distinguished by Kant and Hegel as the standpoint of the understanding. It is not separable in kind from the mode of consideration which the same thinkers have designated by the term Reason. Nor is it an intelligible contention, even if favoured by the language of Kant in dealing with practical philosophy, that Reason could be actual and operative otherwise than as completing and containing the understanding. That the understanding must have its rights is one of the cardinal principles of Hegel, which Lotze has but laboriously and ingeniously illustrated in his analysis of the pervading mechanical aspect of the world. The real prophet of the understanding, however, was Schopenhauer. His treatment of the principle of sufficient reason as at once the fundamental axiom of human science and the innate source of its illusions, forms an ultimate and irreversible criticism on the aspect of intelligence which consists, to sum up its nature in a popular but not inaccurate phrase, in explaining everything by something else—a process which taken by itself is necessarily unending and unsatisfying.

In returning from the consideration of abstract necessary relations to that of concrete real totalities, we must remark that ideally speaking every concrete real totality can be analysed into a complex of abstract necessary relations. Were this not so, as it is Wundt's and Lotze's great achievement to have shown in detail, teleology itself would vanish. For adaptation disappears if the end can dispense with means, and a universe which had no necessary connections between its parts could have no definite or significant structure as a whole. In the remainder of the present Book I shall attempt to put these relations in a clearer light.

CHAPTER III

Analogy

We now take up the thread from the end of sect. 1 of the last chapter, and returning into the track of concrete inference, we have to ask ourselves how we go forward in inference from a simple enumerative Induction when we do *not* accept the task of completing the enumeration. In this case we no longer count the examples, but we weigh them. We turn the focus of attention upon the concrete content which as subject of both premises, as a real thing or things, formed the middle term of Induction, and endeavour to deepen it by observation, and to define its relations by analysis. The first effect of this procedure is to transform the content in question from a subject into a predicate, as no longer a qualification tacitly presupposed of reality, but as an attribute explicitly referred to it and under process of definition and extension.

nalogy id Enu- erative iduc- on.

1. As regards the relation between Analogy and Enumerative Induction, we have to remember that Induction only gave us a problem or suggestion; and consequently we cannot arrange the two types of inference in a simple concatenation by taking the Inductive conclusion as the analogical premise. Rather we have in Analogy to go back upon the suggestive process of Induction, and repeat it with the requisite difference. Suppose that the Inductive Inference or grounded conjecture has been—

The poor people *a b c d* are pauperised *x*;

The poor people *a b c d* are constantly cared for by charitable persons *y*;

∴ Being cared for by charitable persons *y* may have to do with their being pauperised *x*.

If now we desire, as we ought, further to examine this suggestion on the basis of the direct experience which generated it, we shall still make this experience—the cases *a, b, c, d*

—the middle term or ground of inference, but we shall divert our attention from the number of the examples to their nature, and shall therefore put their nature as an attribute in the place of a predicate common to both judgments. Thus we obtain an argument having a form akin to that of the Aristotelian second figure. And the premises are now no longer conjunctive individual judgments, but are passing into generic judgments.

In the pauperised type x, what strikes us on further examining the cases is the loss of independence (A as common content of $a\ b\ c\ d$);

In the charitably-cared-for type y, what strikes us on further examining the cases is the loss of independence (A as common content of $a\ b\ c\ d$);

$\therefore$ The type y has a fundamental feature A akin to the type x and the two are thus closely coherent.

We are apt to think that in analogy we must conclude from old instances to new instances. But analogy is essentially an argument about the significance of a type, or of what in botany are called characters. Of course however this inference, like all others, has the aspect of discovery as well as the aspect of proof. The deeper theoretical need is to find the link and limit of connection between the characters x and y sometimes observed in conjunction, i. e. to *prove* the one of the other. But the reality of the distinction between x and y which gives interest to the inference makes it practically certain that in some examples we shall be first struck by y and in some first by x, and that we shall often need to make the circuit through the identical nature A before we can even detect or have ground to believe in the remaining character x or y. This is the aspect of discovery. Proof overcomes logical disconnection, discovery overcomes apparent presented disconnection. Thus our account of Analogy can really satisfy the popular idea that inference is, here as in Induction, from particulars to particulars.

I subjoin one or two simple examples, in order to illustrate the connection of proof and discovery, and the working of the process.

Enumerative Induction (*or* observation in single instance).

Almost all animals have some power of self-movement ;
Almost all animals have some degree of sentience ;
∴ Sentience may be intimately connected with self-movement.

Analogical Enquiry.

Self-moving creatures are creatures in need of special nourishment and protection (*qua* living creatures) ;
Sentient creatures are in need of special nourishment and protection (*qua* living creatures) ;
∴ Sentience is connected (by the requirements of animal life) with self-movement.

I may give another instance which shows the transition from Induction to Analogy just *not* made. Newton guessed [1] that a diamond was combustible, because of its high refractive index relatively to its density, a feature which he had observed in many combustible bodies.

Enumerative Induction.

Oil, Canada balsam, &c. are combustible ;
Oil, Canada balsam, &c. have a high refractive index relatively to density ;
∴ High refractive index may be connected with combustibility.

In the case of the diamond the combustibility had not been observed, so that when applied to it the conclusion was a prediction or discovery. But the essential import of the conclusion would have been just the same if no new case had been in question.

The next step would have been to say—

'Combustibility has to do with such and such attributes of oil, Canada balsam, &c.
High refractive index has to do with these same attributes.
∴ High refractive index is fundamentally connected with combustibility.'

But this step, which would have constituted an analogical inference, has not, as I understand from the passage in Mill, been taken.

[1] See Mill's Logic, ii, p. 88. I write merely on the faith of the place in Mill. The instances by which I illustrate Newton's guess are therefore of my own invention.

We may now look at an instance drawn from the relation of natural kinds.

Enumerative Induction.

The exotic Pelargonia have a peculiar herring-bone structure in the petals;

The exotic Pelargonia have the same kind of seed-vessels as our wild geraniums;

∴ In flowers with the peculiar seed-vessels of our wild geraniums it is worth while to look for the herring-bone structure in the petals.

Analogy.

The herring-bone structure is conjoined in the Pelargonia with the characters of Geranieae;

The flowers with such seed-vessels as our wild geraniums have the characters of Geranieae;

∴ That these flowers, e.g. our wild geraniums, should have the peculiar herring-bone structure [1] is exceedingly probable.

Botanical classification might almost be said to rest wholly on analogy. The above guess, like a thousand and one such guesses which every field botanist is continually making, is verified in fact. The eye that can detect the dominant habit of a natural *genus* or order in an unfamiliar species is constantly inferring in analogical form, on the ground of generic identity, to hundreds of details, which as a rule confirm its diagnosis on more minute inspection. And the term diagnosis, logically applicable, but not customarily applied, to botanical science, reminds us of another great province of knowledge in which analogical inference is our guide and counsellor. As in the normal so in the abnormal activities—the diseases—of the organic world, it is analogy that is the chief clue to what is taking place and to what we must anticipate. | Diagnosis is to symptoms what classification is to characters. And finally we may here mention the class of examples to which we shall shortly return as throwing the

[1] As a matter of fact, all the Geranieae which I have examined possess this structure. I might have mentioned this verification immediately after the Induction; but this would really take us into mere enumeration of instances. It is the coherence with the properties of a natural kind that alone gives any help towards a general conclusion.

strongest light upon the true *rationale* of analogy, although or because they tend ultimately to pass beyond its province. I mean our judgment of the actual use or even of the intentional object of mechanical adaptations of every kind, whether in nature or in the work of man. Thus we may infer by Analogy,

Cutting-tools have edges, and places for handles ;
These flints have edges and places for handles ;
∴ These flints are cutting tools.

Here we go at once to analogy, without passing through the observation of conjunctions *as a first suggestion*. It is not simply from seeing handles and edges conjoined in knives or chisels that we know a cutting-tool must have a handle and an edge. We know this from extraneous considerations, especially from the texture and use of the human hand. But nevertheless we might never have discussed the coherence of these attributes if we had never seen them in conjunction ; and further, in the new instance of the flints, we have had to go through a process of observation which told us that here too there were both edges and handles or places for handles. Thus the present example illustrates at once the true nature of analogy, and the ground and degree of its dependence on Induction. The observation ' Flint tools have edges, flint tools have handles ', does not linger in the stage of induction, simply because we are not dependent on the nature of flint tools to tell us the connection in use between a handle and an edge. We leap at once to this notion of cutting-tools, and compare the flints with them in respect of the conjoined attributes which we try to deepen and define.

Logical criticism of analogy.

2. The logical nature of analogy may be analysed as follows.

Undistributed middle in fig. 2.

i. As a formal syllogism in the second figure, having an affirmative conclusion, the analogical argument has the fallacy of undistributed middle. We need not indeed trouble ourselves at this stage with questions of distribution involving the extension of the judgment. Nevertheless a fault in the extensional relations of an argument infallibly indicates something which is *prima facie* a fault in its connection of content. In the present case the fault is this—that what is materially the ground of Knowledge, the content which

underlies and links together the two matters which demand explanation, is, *qua* predicate or characteristic, in its wrong place, the place of a *consequent*. Now according to the ordinary interpretation of the judgment, of which we have frequently spoken and which holds good for our present level,[1] the same consequent may have any number of independent grounds. There is therefore no formal necessity whatever for the two grounds or antecedents which in this case possess the same consequent to have any connection with each other beyond the fact that they do possess it.

But on the same ordinary interpretation of the judgment if we deny the formal consequent of either of the grounds while affirming it of the other, we can then deny that the two grounds in question are connected through the universal suggested in the premises before us. Thus the negative argument escapes the formal defect which attaches to the affirmative. About any further or other connection that they may or may not have the denial tells us nothing, and therefore it is really a denial not of all or any connection, but of a particular connection through a particular middle term. The customary omission in the conclusion to specify the excluded connection is a fallacy *a dicto secundum quid ad dictum simpliciter*. It may be said that the denial takes on the absoluteness of the assertion on which it rests. 'Every Tory is a good man; He is not a good man; ∴ He is not a Tory.' If the major is true without reserve the conclusion is true without reserve, and in logic we are to suppose our premises true. But still we must consider what the judgment means, i.e. what it really is. And no judgment is absolutely meant. The conclusion does not really represent the inference as a concrete thought unless we repeat in the conclusion, 'He is not a Tory, so far as his not being a good man prevents his being one.' This refinement has no exclusive relation to analogical argument or to fig. 2, for the negative argument falls into fig. 1 as readily as into fig. 2, the ground and consequent in negation being reciprocal. In order to give the criticism a peculiar relation to analogy we must say, 'He is

[1] For the judgment is not purged of irrelevancy till it has passed through *scientific* induction.

not a Tory, so far as the peculiar way in which he is not a good man prevents his being one.' This positive way is variable.

Except then for the purpose of negative inference, which is not purely analogical, the form of analogical argument in fig. 2 is at variance with its matter, and represents no inferential necessity at all. Inferential necessity is either subsumptive or constructive. In order to obtain subsumptive necessity one of the premises would have to be converted and become a major premise. And this conversion would have to be material, not merely formal; for a formal conversion of an affirmative generic judgment would destroy its generic character and make it incapable of standing as a major premise. The Analogical inference as it stands shares with enumerative Induction the peculiarity of being a subsumptive inference without a major premise—an argument from a concrete content without the assertion that this content is absolutely dominant for the purpose of the argument. Again, in order to obtain constructive or abstract necessity the relations of the contents must be reduced into abstract and mechanical relations akin to the universals embodied in the pure hypothetical judgment or in the equation. The formal defect of analogy as it stands is expressed by the 'probably' inserted in the conclusion, which indicates a coherence under conditions not precisely known.

Real value of Analogical Argument.

ii. Seeing that the form of analogical argument is *prima facie* inconclusive, on what does its value really depend? It represents, we said, the phase of thought in which we no longer count but weigh the examples. It might be said therefore that analogy is a material and not a formal inference. This is so far true that the value of analogy depends not on a formal conjunction of attributes in a subject, but on the material governing power or essentiality of a predicate. Everything turns on the 'importance' of the character which forms the common predicate, and this 'importance' is closely bound up with completeness of definition. I will return directly to the question of the importance of characters; but it is necessary first to point out that an inference without assignable form is no inference at all, and that therefore it is

not correct to say that analogy is a material and not a formal inference. Every inference has a form, in the sense of a definite relation between the differences of the universal which the inference exhibits. I do not however mean to say that such a form can be laid down antecedently for every inference. It is this relation, as we have seen, which varies with the nature of the universal, and which by its variations dictates the main types both of judgment and of inference. We need not here take refuge in the form of complete subsumption through the conversion of one judgment. When that is possible—and no doubt analogy is on the road to it—we are already beyond analogy. But the form of analogical argument is to be found in the neglected aspect of the ordinary judgment, its strong *implication* of a value in the predicate. If all judgments were taken as reciprocal, analogy would be *ipso facto* an argument from ground to consequent, *besides* being as it is now from consequent to ground. 'Two grounds that have the same consequent *ought* to cohere,' is the form as it stands. 'Two grounds that have the same consequent are consequents of the same ground, therefore *must* cohere,' is the *implied* form, or, as we said above, the matter of the inference. This form might be identified with fig. 3, and so take us back to Enumerative Induction. But the content being changed from instances into their defined nature, we are rather taken forward into the hypothetical judgment as used in constructive inference, *or* to complete subsumption in fig. 1. With reciprocal judgments the syllogistic form becomes indifferent; and the premises of analogy are implicitly reciprocal.[1] That their reciprocity is implicit and not explicit is in accordance with the nature of analogy, which is as we have agreed only a method of problematic conclusion, not a method of absolute and precise determination.

[1] The explicit form is A is B; C is B; ∴ C is A. The implicit form is B is A; B is C; ∴ C is A.

But the implicit form deals not with mere instances as in Induction, but with *that* B which was found to be essential in A and C. Therefore the whole implied argument is—

If B, then A (which is also a sign of B);
If B, then C (which is also a sign of B);
∴ If C, then B and therefore A.

I now return to the question of the material 'importance' of characters, the attribute on which the implicit form of analogical inference depends. It is possible, and is verified in daily experience, that a character or group of characters from which the remaining properties of an object cannot at present be derived by mechanical analysis may either amount for inferential purposes to a ground, or at least may serve as an unerring index of the qualities of the object. Such a character or group of characters, and I may add such a symptom or group of symptoms, has logical 'importance'.

I will commit myself at once to the opinion that this importance rests in every case on a presumption drawn from what I may call morphology, or from teleology; these two ideas being regarded as secondary and primary forms of the same conception. In all objects or institutions made for a purpose by man, at least while their nature corresponds to the intention embodied in their structure, there is true teleology. In all organisms, parts of organisms, objects or structures that live a life or have in any way a being that is to our eyes individual and distinctive, there is morphology or *de facto* teleology. I am aware that a *de facto* teleology is a contradiction in terms. Purpose implies more than actual result. But as a description of a result in language borrowed from a result of another class—from human operation—the phrase though contradictory may pass; and it is in this sense alone that I employ it. If there is a peculiar principle underneath this ambiguous class of results, it is at least not, within our knowledge, a principle of intentional adaptation by a foreseeing consciousness. But I repeat that every universal, every persistent identity in difference, just because it is a synthesis of differences in a universal, may be regarded as a concentration of means in a distinguishable result. How far such a view is 'subjective' or in what sense it renders a real aspect of the nature of things is a question to which I shall return.

It is on this characteristic of all universals that anticipation by analogy rests. Where we have a constitutive equation, i. e. an absolute rule for the synthesis of the differences, we can construct without teleology and without analogy. If,

again, according to Bacon's dream, science could arrive at 'forms' or underlying qualities, capable of doing the work of constitutive equations for every natural attribute and every natural object, then in presence of such a form we should not need analogy. Or where complete concrete subsumption prevails, where we have actual conscious teleology, e.g. in the philosophical analysis of laws, institutions, opinions, logical activities, we should never need analogy but for the all-important fact that all these contents are determined by growth and history in a way of which those who make and use them are not aware, and which they cannot control. Hence all such matters have an organic and almost a mechanical side, and can be treated by comparative science—analogy, as well as by philosophy—analysis. No actual law or institution or idea has its form exclusively determined by its explicit purpose. All of them are loaded with inherited matter which may in part be an incumbrance, but in large part serves purposes wider and not less essential than the purpose which consciousness is able to recognise. And in human affairs there is a bridge between the unconscious and the conscious function; for the latent purpose—which as latent is not a purpose at all—is actually one side of the explicit purpose and is continually emerging into explicit consciousness, so that the *de facto* operation of human energy in one stage *characterises* the explicit purpose of that stage itself and *enters into* the explicit purpose of the next. Thus philosophy can deal with even latent or unconscious significance partly as an aspect and partly as a condition precedent of conscious significance. The history of religion or of any achievement of man's intelligence is inexhaustible in illustrations of this principle. Precise knowledge, however, whether affirmative or negative, whether constructive or subsumptive, excludes anticipation by analogy, for analogy is a stage on the road to precise knowledge.[1] This condition satisfies the popular requirement [2] that in Analogy we must know neither necessary connection nor necessary exclusion.

To explain the connection of Analogy with Teleology, I will at once take the strongest class of examples.

[1] Compare however p. 217, supra. [2] Mill's Logic, ii, p. 88.

We are on the border between analogy and a higher form of inference when we argue from a presumed genuine teleology to the conjunction of qualities in the content that it governs. We are so far already outside analogy that the argument must consist largely of judgments upon actual mechanical adaptations, the *de facto* use of which is a matter of precise knowledge and not of presumption. We are not wholly outside analogy, because the *de facto* nature of these adaptations is not enough, in the case supposed, to carry our conclusion, which needs the actual and intentional purpose. This, in inferences of the type supposed, can only rest upon presumption. If we find, near a known seat of stone-age inhabitants, some flints of peculiar shape and make, it is a mere judgment on a matter of fact to say whether they *are* adapted for use as knives or as hatchets; but to say what they *were* meant for, and so actually used for, and therefore whether we may expect to find near them chips of wood or bones of animals, is a question for analogical inference based on the nature of the country, on the known or supposed habits of the people, and on any convergent indications in the adaptations of the flint tools themselves. Any character in such a connected group of characters, that gives the key to the pervading purpose of the whole content under examination, is an 'important' character. 'Importance' is relation to the purpose or pervading nature, the 'import', of any system. If both qualities to whose coherence we conclude are directly derivable from the presumed purpose, then we are so far beyond analogy, but the element of presumption which consists in ascribing true intention or purpose is still analogical. If one or both of the qualities to whose coherence we conclude are not derivable from the pervading purpose, then we are more completely or quite completely in the region of analogy, and the inference will simply be that identity of purpose is probably both a ground and also a consequent of uniform structure.

In the former case, both properties being derivable, we have:—

The flint knives *are* adapted for cutting wood;

Cut logs and chips *are* connected with cutting wood;

∴ Cut logs and chips[1] will probably be found near the knives (i.e. *if* the adaptation which we observe in the knives is a true index of the use for which they were really made, and to which—a further presumption—they were actually put.

Or again :—

A telescope with the eye-piece at one side of the tube is probably a reflector ;

Lord Rosse's telescope is a reflector ;

∴ Lord Rosse's telescope probably has the eye-piece at one side of the tube.

In the latter case we have, one or both properties being not directly derivable from the presumed purpose,—

A clock with a watch-movement is a carriage-clock ;

A clock with plate-glass sides is a carriage-clock.

∴ A clock with plate-glass sides is probably a clock with a watch-movement.

There are pendulum clocks with plate-glass sides, so the analogy is not made out. There is a reason why a clock with a watch-movement should be a carriage clock, viz. that it is a mechanism which the motion of the carriage will not disturb. But there is no reason that I know of for the second premise, which rests on mere custom and turns out to be a precarious basis of argument.

Or again :—

A horseshoe-stand is a common shape of French microscope-stands ;

A very simple stage is common in French microscope-stands ;

∴ With a very simple stage one may expect a horseshoe-stand.

The horseshoe shape is not the best for securing steadiness, so that there is no direct connection between the two properties of which the conclusion alleges the conjunction, and the purpose indicated by the name microscope-stand. And I have purposely introduced a limitation referring to the character of the conditions under which the purpose is carried

[1] I omit, merely for brevity, to say anything about the possibility of the chips &c. having been removed.

out, '*French* microscope-stand,' in order to illustrate the boundary-line between genuine conscious teleology and mere characteristic individuality. Probably in this example the two join hands; French makers must have, or have had, an idea that the horseshoe shape and the simple stage best secured the purposes of the microscope.

The former set of examples, with both properties derivable from the purpose, illustrate the general type of analogical inference affecting attributes connected with self-preservation in the organic world—chief or fundamental attributes. The latter, with one property or neither derivable, gives the general type of analogical inference affecting attributes which are not vital, but which have in heredity or otherwise their own degree of constancy. But these examples, though illustrative of organic relations, are by their connection with conscious teleology upon a higher level than those relations.

A further class of inferences, to which the last example prepared a transition, is intermediate between conscious and merely organic teleology. I allude to the enormous class of daily inferences relating to time or locality of origin or to authorship, in the case of literary, artistic, or mechanical productions. Obviously the conception of the presumed period, place, or person, as significant of peculiar characteristics, may itself be the presumed ground of inference in virtue of which the coherence of certain properties is analogically expected; or the individual characteristics stated explicitly may be the ground, and the name may be inferred by analogy. Supposing a single conjunction (Inductive in its nature) to have furnished the suggestion 'This design which is beautiful is by A. B,'[1] then analogical enquiry will infer in the form 'The beauty of this design is drawn from nature yet original and full of thought; A. B.'s designs are drawn from nature yet original and full of thought; ∴ The beauty of this design is probably the beauty of one of A. B.'s designs.' The reader can construct further variations of this very common type of argument for himself.

The common analogical inferences which run throughout our treatment of organic and even of inorganic nature rest

[1] In the form: 'This design is beautiful. This design is by A. B.'

practically on the existence of natural kinds, that is to say, on morphology or on *de facto* teleology. I may explain the distinction of degree which I attach to the two expressions by reference to the general conception of self-maintenance or self-preservation. Where self-maintenance means simply any reaction of a distinguishable agent against or upon an influence approaching it from without, I should speak of the distinguishable individuality of that agent as morphological, i.e. as consisting simply of a formal or recognisable self whose unity is charged with no especial interest. Where on the contrary there is a self maintained or preserved which exhibits the attributes of life, or, however partially, of consciousness, I should say that the facts, and not our own choice, demand that we should apply the paradoxical idea of an *actual purpose*, or *de facto* teleology. It is obvious that the conception is one varying in degree and not limited by any despotic necessity to the range of the organic world. After all, it is a plain fact that elements combine in processes; and the moment we single out part of a process as a result [a] we introduce the conception of *de facto* co-operation on the part of means towards an end. Every distinguishable persistent content may thus formally be regarded as an end, without, of course, any implication whatever of an aim pre-existing in a foreseeing consciousness. That from a purely mechanical or analytic point of view such constituent relations are absolutely indifferent to the whole which they co-operate in constituting is a necessary consequence of regarding such relations in their isolation. But without the further aspect supplied by an interest in the whole as such, not merely ethical and aesthetic judgment, but scientific judgment itself, loses all power of discrimination, and therefore all objectivity. Even to name, as we saw in the Introduction, is to select and to identify.

Analogy then rests on the 'importance' or significance of attributes, an idea well illustrated by systems of true conscious

[a] This singling out a part as the 'end' is essential to teleology, but must ultimately be determined by the nature of the 'whole'. Thus teleology strictly speaking is a partial conception, and less ultimate than the idea of the whole. See e.g. McTaggart's Commentary on Hegel's Logic, sect. 255. I hope to deal more fully with this point in a forthcoming work.

teleology which happen to be but partially known to us, but really dominant throughout the various grades of actual self-maintenance and individuality presented by the organic and inorganic world. Analogy is never demonstration. A thorough mechanical nexus and a subordination to a conscious purpose in an intelligent being or rational system both *pro tanto* exclude it.

No ratio of Identities to Differences.

iii. The obvious truth that *ceteris paribus* the predicate with more meaning has a deeper grasp of the import of the reality which it qualifies, and so is the safer ground of inference respecting that reality, has introduced the fatal fascination of the ratio into the doctrine of analogy. I quote from Mill[1] a complete account of the idea so generated: 'Since the value of an analogical argument inferring one resemblance from other resemblances without any antecedent evidence of a connection between them depends on the extent of ascertained resemblance, compared first with the amount of ascertained difference and next with the extent of the unexplored region of unascertained properties; it follows that where the resemblance is very great, the ascertained difference very small, and our knowledge of the subject-matter tolerably extensive, the argument from analogy may approach in strength very near to a valid induction. If, after much observation of B, we find that it agrees with A in nine out of ten of its known properties, we may conclude with a probability of nine to one that it will possess any given derivative property of A. If we discover, for example, an unknown animal or plant, resembling closely some known one in the greater number of the properties we observe in it, but differing in some few, we may reasonably expect to find in the unobserved remainder of its properties a general agreement with those of the former; but also a difference corresponding proportionately to the amount of observed diversity.'

This passage gives us the valuable suggestion of negative analogy, to which I shall return below. But as to the idea of ratio, we must be faithful to our principle that in analogy the examples—or the properties, it matters not which—are to be weighed and not to be counted. Mill's idea is in fact

[1] Mill's Logic, ii, p. 90.

that by counting the properties you weigh the examples. And every one must be struck by the verisimilitude of the view which the above passage propounds. But on pressing the matter home we see that at least the form which it gives to the right idea of insisting on the depth of the common predicate is a wholly unreal form, and takes us into the wrong track. There is no ratio without a unit; and, to begin with, a 'resemblance' (a point of identity) is not as such a content that can be employed as a unit. It is impossible to say what is a point of identity and what amounts to many such points. Identity is systematic through and through, and its 'points' derive their value from their relation to a system. It is impossible to break up such a system into numerable parts and points without prejudging the very question—the question of their respective values as index-qualities—which the enumeration is supposed to be a straightforward method of solving.

It is worth while to illustrate this point. Suppose that we are asked to compare two given plants of different species in order to determine their botanical affinity on analogical evidence—on the evidence of observed resemblances or points of identity matched against observed differences. In order to meet the retort that affinity in botany is what we like to make it, by the arbitrary value which we attach to the characters, I will assign to affinity the definite meaning of relationship by descent as indicated through the accepted natural classification. Thus the actual fact to be discovered by analogy, put at its lowest value, is how the plants in question are classified in the accepted natural classification, and put at its highest value is how the two are related by descent. Let one of these two given plants be a shrub six feet high, with branches and stalked leaves, with its inflorescence in branching masses, without any 'bract' or small leaf at the base of each mass, with white flowers, with nearly black fruit, and when young having its leaves covered with silky hairs. Let the other plant be herbaceous, six inches high, not branched, with no stalks to its leaves, its flowers in heads which do not branch, but which have four conspicuous yellowish 'bracts' at the base; the flowers are purple, the

fruit red, and the leaves have only a few hairs on them. Add to these differences that the general look and habit of the plants are very different. Now set against the above differences such points of identity as number of parts of the flower, structure of the flower (polypetalous with inferior ovary and epigynous stamens and petals), the structure of the fruit, the partly identical growth of the head of flowers (an ' umbel ' in the small plant, and a ' cyme ' in the large one), and certain peculiarities of the leaf surface, such hairs as there are being closely appressed, and the nerves having a peculiar prominence. Perhaps it is rather easier to make out a long list of identities between the two plants than to make out a long list of differences. But we might really lengthen either list to infinity by subdividing in detail characters which have been mentioned in the abstract. I have little doubt however that in microscopic structure of petals, pollen-grains, &c. there would be some striking identities, hardly compensated by differences. Still we can see at once that no ratio between number of identities and number of differences can be constructed which will tell us anything—the number on each side is *almost* purely arbitrary. The *value* or *importance* is what we have to consider.

In what does the value of characters consist as a basis of natural classification or as a proof of common descent? Largely no doubt in their connection with the number and general arrangement of parts. Evolution only accounts for essential changes and their consequences, and though it may modify the number of parts and their arrangement, at first superficially and in course of generations more profoundly, yet an older general arrangement survives long beneath the modification and can as a rule be traced there.[1] The arrangement of those four or five whorls of leaves on a shortened stalk, which we call the flower, is thus one dominant feature in the analogical estimate of a plant's affinities. Its inferential value is the same whether we call it one point of

[1] See Darwin's beautiful verification of the modifications of the orchid-blossom by following the spiral vessels which indicate the position of the original petals in the modified corolla; Fertilisation of Orchids, p. 289 ff. Homology is an analogical conception in the logical sense.

identity, or five, or twenty. It will be observed that in considering a plant in the light of evolution we have a combination of the higher and lower forms of teleology, related negatively to each other. Just as in the example employed above of the 'French microscope-stand', we have here within the basis of analogy *both* a definite purpose suggesting definite means, *and* the mere tendency of individual or racial characteristics to perpetuate themselves. The local manufacturers' custom is *gradually* modified towards the better mechanical adaptation, as the organism is *gradually* modified towards the better mechanical adaptation. At any moment a manufacture or an organism is a compound of recent useful change, and of survival, some of which survival is obsolete, and some, the major part probably, has never ceased to be useful.

Thus, in the establishment of common descent, there is a special value in what recent evolutionary modification is likely to have spared This would include both underlying arrangements which evolution would take very long to touch, and trifling details which it would have no reason for touching.

The account which I gave of the differences between the plants in question is the account of a common observer ; the account of their identities is the account of a botanist. This, it may be said, is enough to vitiate the argument against a ratio, for of course knowledge and judgment are to be used in making the enumerations. But the idea of enumeration gives us no right to employ botanical knowledge. It is only the idea of a presumption resting negatively or positively on teleology that enables knowledge to operate in assigning value to index-characters. Thus in judging of the plants in question we have to distinguish the element of heredity, or self-maintenance in the lower sense including the deeper and also the more trivial survivals, from self-preservation in the higher sense (though even here not involving conscious intention) in the set of recent differentiations introduced by evolution. Even thus we omit much that is most interesting and important. Evolution can for example assimilate plants of different origin as well as differentiate plants of the same descent, and we ought properly to show that any identities on which we

rely cannot have been initiated by such assimilation.[1] We have so far anticipated this demand by requiring the identities to refer to matters with which evolution is not likely to have recently interfered.

The plants of which I have been speaking are *Cornus sanguinea*, common dogwood, and *Cornus suecica*, the Swedish or dwarf cornel. They are in fact species of the same genus. But the four yellowish bracts round the flower-heads of the dwarf cornel have the appearance of petals and form a striking superficial difference between the two plants, not to mention the enormous disparity in size. And now, possessing the names of the two plants, and having thus opened to us what is known of their local distribution, we can confirm our analogical estimate based on passive self-preservation or heredity, by a presumption drawn from the coherence of the modifications which that estimate ascribes to active self-preservation, i.e. to evolution since the divergence of the species. The smaller plant is sub-Alpine and Arctic ; the larger belongs to southern England and to temperate climates. This fact suggests that the smaller plant, whether driven northwards by a change of climate, or simply maintaining a portion of its old habitat, has been dwarfed or has not grown larger, and has compensated for its smallness by the brilliant simulated flower. Its distinctive leaf-growth and flower-growth may be summed up as a dwarfed or at least as a miniature growth, stalks and branchings having disappeared or not appeared. How the contrast between the inconspicuous small dark purple flower of the small plant and the larger white flower of the large plant is to be explained I am unable to suggest. But it is hard to suppose that the petal-like bracts of the small plant are not in some way a compensation for the inconspicuousness of its flower.

Concurrent Analogies. Negative Confirmation.

iv. Before reducing this example to regular form it is worth while to remark that, by assuming the two plants to be given us to compare, we presuppose the work of enumerative induction to be done to our hand. And in fact, where a subject-matter falls under an existing science, we are already in general

[1] Such identities are called in biological language ' homoplastic ', as opposed to ' homogenetic '. The daisy, for example, is a head of flowers that mimics the appearance of a single flower.

beyond the stage of Enumerative Induction, though it may of course operate in particular unfamiliar instances. But speaking generally, the abstract ideas which guide Comparison are active in every special science as precepts filled with a content capable of guiding elementary observations. We approach an element, or a plant, or a part of speech, just as the state approaches a taxpayer, with a schedule in which the heads of our requirements are already jotted down, forming an abstract analysis of the predicates with which, in the class of cases in question, we are concerned. But if, supposing ourselves unfurnished with such a schedule, we construct a conjunctive Induction for the case before us, it would run in some such fashion as this :—

These two plants [1] have similar berries ;

These two plants have similar leaf-nerves ;

∴ The conjunction of similar leaf-nerves and similar berries may not be an accident.[2]

Then the Analogical argument would fall into some such shape as—

Having similar berries is conjoined in these plants with a pervading identity of underlying (and so long inherited) structure ;

Having similar leaf-nerves is conjoined in these plants, &c., &c. ;

∴ Having these similar berries is connected by an underlying (and so long inherited) structure with having these leaf-nerves.

And, as we saw, two further analogies would confirm this :—

The resemblance in the berries is conjoined in these plants with trivial identities of structure (e.g. closely appressed hairs on the leaves) not likely to be modified by evolution ;

The resemblance in the leaf-nerves is conjoined in these plants with trivial identities, &c., &c. ;

[1] 'Plant' here = species. This equivalence itself rests on analogical argument, which however is presupposed in any highly developed language, though not for all classes of objects. See above on Individual Judgment, and Lotze, Logik, sect. 14, on 'first universals'.

[2] In strict form, 'Similar leaf-nerves perhaps are (involve) similar berries.'

These attributes are connected with each other by attributes probably hereditary.

And contra-positively, giving affirmative content to the negations, but leaving them their negative value in inference :—

What is not identical in the fruit-growth (e.g. the clustering and the isolation of the fruit) is not a property likely to be remotely hereditary (because obviously modified by alteration of length of the stalks, i.e. by dwarfing) ;

What is not identical in the flower-growth (e.g. the presence and absence of the four white bracts) is not a property likely to be remotely hereditary (because obviously related to the inconspicuous flower, i.e. to dwarfing) ;

. What is not identical in the flower-growth of these plants is united with what is not identical in the fruit-structure as parts in a set of properties not likely to be remotely hereditary.

The true relation of these arguments to each other would be that they should form a single analogical inference, in which each positive premise and the positive conclusion should be *materially* defined and limited by the corresponding negative judgment. When this reciprocal adjustment was completed, we should have analysed each of the plants into two related systems, in respect of one of which systems the two plants would coincide, and in respect of the other of which they would differ. The one system would point to the construction of a common ancestor ; the other would point to the evolutional history of the species since their divergence. As their boundaries would precisely fit each other we should, in arguing on the basis of either, be supported by the defining influence of the other ; that is to say, every judgment A is B would be supported by its converses Not-A is not-B, and Not-B is not-A. But though such negative relation of positive contents is valuable in analogy as elsewhere, yet to be fully effective it presupposes great accuracy and exhaustiveness of analysis, which is not usually to be obtained where analogy flourishes, and which, if obtained, takes us beyond analogy. By its negative aspect such inference leans over to Scientific Induction, while by its appeal to the coherent nature of a system it tends to pass into definite or philosophical subsumption.

v. Analogy, like Enumerative Induction, is a critical point from which two tracks of knowledge diverge. In assigning the coherence of attributes within a system we cannot but be confronted with negative relations, which are the conditions of all precise determination and of all causal or necessary inference. This feature of deepening analogical consideration points forward to scientific induction—the analysis of the teleological whole, or, *a fortiori*, of the unformed datum of perception, into its definite and necessary constituent relations. The goal of this path is the abstract Hypothetical judgment which forms, as we have seen, the point of transition between inference by combination of abstract relations and inference through the nature of concrete subjects. Divergent tendencies in analogy.

On the other hand, if we continue to regard the concrete subject from the point of view of its totality, which has begun to dawn upon us in analogical inference, our principle of inference tends to assume the shape of a concrete whole, understood as a synthesis of abstract relations. Such a subject combines within itself, in perfect equilibrium, the two aspects of the universal which have occupied us throughout—the aspect of concrete reality and that of abstract interconnection. Inference based upon contents of this nature may take the shape of the complete subsumptive syllogism in fig. I, or, when more adequately expressed, of inference under a disjunction, or finally of the *explicitly* teleological inference respecting beauty or goodness.

It is plain that to employ in inference such a subject notion as I have just indicated presupposes a detailed mastery of the abstract relations which enter into it, and therefore presupposes the advance, which was above described as a divergence taking the direction of the hypothetical judgment. The subject can be known as an embodied purpose only by inference based on its necessary constituent relations. Why then should we regard the abstract hypothetical judgment as belonging to a track that diverges from the direct high-road of concrete knowledge? The reason is simply that in the formation and combination of Hypothetical judgments we sacrifice reality for the sake of necessity, and lose an element which was present in Analogy. In other words, the Hypothetical judgment with

the combining inference that belongs to it is itself an apex or climax of one whole tendency of knowledge—of the mechanical view of the world which considers necessity apart from reality, and to which disease is as orderly a sequence as health. This is the view of the eye of *purely* physical science, which in a catastrophe that should extinguish life on the surface of the globe might see 'no more disorder than in the sabbatical peace of a summer sea'.[1] This aspect of knowledge has been sufficiently analysed and discussed in our treatment of mathematical inference which is its purest form. My excuse for constantly recurring to it must be that a thorough understanding of its range and consequences is the primary condition of any clear thinking on the subject of the reign of law, which, as thus isolated, is absolutely indifferent to the purposes and interests that give reality its relation to mankind. The apparently self-dependent completeness of this analytic view of the universe gives it a right to an independent development, although this right of independence which it claims may also be regarded as a limitation to which it submits. Science, professing to be purely physical, has, as we have partly seen and shall more fully see, in our own day at least occupied itself with ideas which fall outside the categories of abstract necessity. And this was hardly avoidable; for we have seen over and over again that necessity must rest upon reality, and that therefore the self-completeness of the mechanical view of things is in this ultimate instance merely apparent.

[1] Professor Huxley in Contemp. Review, Feb. 1887. For a further consideration of this point of view, see chap. vii, below.

CHAPTER IV

Scientific Induction by Analysis

The moment we begin to demand precise definition of relations and to attempt analysis, we are, as the development of analogy proved to us, face to face with inference from negations.

Negative Inference.

1. I will now speak shortly of the nature of this inference, and will then attempt to explain its function in inductive analysis.

Its general nature and conditions.

i. All inference depends on the relation of differences within a universal; and negative inference, in its fundamental nature, does not deviate from this principle. It may be laid down at once that the ideal of negative inference is to be looked for in Inference under Disjunction, as the ideal of negative Judgment is to be looked for in negation under Disjunction. Our discussion on the connection between bare negation and significant negation will have prepared us for this conception.

But negative inference in this sense is not a peculiar or separable form of reasoning. Negation and Affirmation in disjunctive or precise thinking are respectively double-edged; and though this character which thought acquires from being imbued with negation is pre-eminently distinctive of thought that has reached the stage in question, yet it does not admit of being ascribed to negation as contrasted in the abstract with affirmation. It is for this reason that in treating of calculation and of geometrical reasoning it has been unnecessary to devote special attention to negative inference. Negation appears no doubt in mathematical principles and theorems, e.g. in the definition of parallel straight lines, or in the theorem that if two circles cut one another they shall not have the same centre. But as a general rule—I will not venture to say universally—it is easy to substitute for a negative expression of this kind a definite though not thoroughly particularised positive expression, which possibility goes to show that the negative expression was adopted rather for some rhetorical convenience —e.g. for brevity—than because a positive expression was unattainable. Often, as in the second of the above examples,

the negative form of a conclusion arises from the employment of an indirect proof. And an indirect proof can only operate under a disjunction. True, in the present example the disjunction *seems* to be merely formal,—i.e. to consist simply in a positive judgment and bare negation; 'have the same centre,' 'have not the same centre.' But 'have not the same centre' in case of circles means 'have different centres', the relations of which are easily seen in general from the content of the indirect proof itself. In mathematical or pure mechanical reasoning there is no room for anything approximating to bare negation—the excluding motive must be definitely demonstrable, and contains the idea, though not necessarily the particulars, of an assignable quantitative difference between the excluding and the excluded content.[1] Incommensurable quantities are, *so far as incommensurable*, not quantities at all. Throughout this region of inference therefore negation and affirmation have as a rule their ideal complementary position, and no ground is given for a special and separate treatment of negative inference. For this same reason, however, *where* and *in as far as* negative inference formally occurs within this sphere, it *formally* falls outside the character required of combining inference, and must be technically referred, not indeed to subsumption, but to a special genus which also includes any negative reasoning that may arise within the limits proper to subsumption.

But when we turn from calculation with precise scales of difference to the traditional form of the subsumptive syllogism, the inherent paradox of negative inference immediately stands in our path. The syllogistic rules undoubtedly contemplate inference *from* bare negation, and also, so far as they are concerned, inference that has bare negation for its conclusion. But all inference, we have been insisting, rests on an identical nature or a pervading universal, which prescribes a relation, whether definite or indefinite, between its differences. How can a universal prescribe a relation between itself and a content which falls wholly outside it, and is absolutely disparate and alien to its nature?

[1] So that we need not say 'is' or 'is not', but 'differ by a yard', 'the same to a yard'.

We were met by this difficulty in the discussion of the negatively infinite judgment, and of the ultimate indemonstrability of the negative *as such*. Where there is absolutely no connection it is impossible for denial to be intelligible ; and what is not intelligible cannot convey a truth. Denials which though frivolous seem true have some shade of assignable meaning beneath them.[1] Therefore the only true meaning of an inference in Celarent is e.g.—

To be a man excludes being a monkey (in virtue of a certain universal nature which *including both* assigns an intelligible difference between the two) ;

Socrates is a man ;

∴ Socrates is not a monkey.

But the ordinary graphical representations of the extensive syllogism slur over this difference, and leave us to suppose that from an *utter* absence of connection together with an assignable connection we can infer an absence of connection, which is to introduce the infinite judgment into inference It is worth pointing out, however, that even the true reasoning in Celarent, considered as starting with its conclusion as a suggestion to be proved,[2] *begins* with something nearer a bare denial, and *ends* with an intelligibly motived exclusion. 'Socrates is not a monkey ;' 'Socrates having the nature of a man, cannot be a monkey.'

Thus in syllogistic negative inference we find (1) the erroneous idea that negation is utter disconnection, and that negation in this sense, bare negation, can be intelligibly asserted and inferred. And we have (2) the true idea that negation in order to be significant must fall within a controlling identity, although its ultimate shape is indemonstrable, and *qua* indemonstrable or irrational falls into a genus by itself, and outside both subsumption and construction. And as a testimony to the inevitable power of formalism in any symbolic scheme of inference, we may point out (3) that the accepted syllogistic

[1] For examples, see Book I, chap. vii.

[2] I am confident that this is as a rule the most instructive point of view from which to analyse inference, corresponding best to the vital process of thought. The essential question is, what difference is there in the conclusion as a judgment, before and after, or in and out of the inference.

rule that there can be no inference from two negative premises is really an offshoot of the idea of bare negation.

No conclusion from two negatives.

ii. If we have two bare negations or mere disconnections —negatively infinite judgments—nothing follows, because nothing is said. And as two negations will always present the external appearance of two mere disconnections, and will be ambiguous in interpretation, concealing their positive aspect, it is well to maintain this rule in a symbolic scheme of inference. Once at least in every inference, the rule says, you must show your hand, and develope your universal in terms of its positive content. Then, with one positive relation of content before us, we shall not be far out, it is implied, in interpreting the denial which is subjoined to it.

Nevertheless, it must be maintained that the negative syllogism acquires scientific value just in the degree in which this rule is disregarded and in which the syllogism is consequently informal. If negative inference has any value it is the establishment of exact and self-consistent boundaries between the species of any genus, or the modifications of any principle.

The rule that two negatives give no conclusion has been impeached by good authorities [1] in respect of the third figure—the figure which we followed in our account of Enumerative Induction. This figure is obviously adapted for the expression of a positive instance, or of an exception—of an instance which comes under the condition of a rule but of which the consequent annexed by the rule to its condition does not hold good.[2] Why should it not also express a true *negative instance*, i. e. a negation which does not conflict with but corroborates the rule by coming neither under the condition nor under the consequent? In insisting on such a principle as 'Whatever gravitates is matter' we may often find ourselves relying on such instances as 'Light is not matter; Light does not gravitate; ∴ Something which is not matter does not gravitate', or *vice versa*,

[1] Lotze, Logic, sect. 89; Bradley, Principles of Logic, p. 254, quoting Jevons.

[2] Or in case of a reciprocal judgment, also *vice versa*. Even in a rule which is not reciprocal, a great extension of the consequent beyond the condition is always suspicious.

making in favour of the contra-positive converse either of 'Whatever gravitates is matter' or of its reciprocal 'Whatever is matter gravitates'.

It has been objected against this case of a conclusion from two negations that either the argument has four terms or one of the premises is affirmative. If the two premises are mere denials, then neither of them can furnish the negative predicate required to be subject of the conclusion. For this subject must be a positive content merely determined in one aspect by a negation. A bare negation cannot be subject in any judgment. If on the contrary in one premise such a positive content negatively determined is the predicate, and the fallacy of four terms is thus avoided, then that premise is affirmative in form and the conclusion is not drawn from two negatives.

This objection is not only sound in form, but has substantial justification. It is well known that to attach the negative closely to the predicated content has a tendency to transform the idea so negated from an excluded content into a positive opposite. A form like 'not-moral' cannot maintain itself in living thought. It must advance to 'immoral' or fall back to 'what is not moral'. And if we admit that in the third syllogistic figure the same judgment can be both affirmative and negative—for accepting the above case of inference amounts to accepting this—it is hard to say why the same double character should not be adopted, and conclusions from two negatives introduced, in the remaining figures as well. In the second figure we should be tempted actually to take an affirmative conclusion from two negative premises; but as the ambiguous term is here the middle term, and not the subject of the conclusion, we cannot do this without treating both premises as affirmative (to secure an identical middle) and thereby reducing our conclusion to a problematic judgment,[1] thus,

Good workmen do not complain of their tools;
My pupils do not complain of their tools;
∴ My pupils are probably good workmen.

[1] Both premises must be taken in the same way, though both may be taken as either negative or affirmative. It is only the contrast of exclusion with assertion that can give a certain result in the figure.

Or again,

Not good workmen are not satisfied with their tools;
Not-my-pupils are not satisfied with their tools;
∴ Not-my-pupils are probably not good workmen.

Our treatment of analogy would also be illustrated by the case in which Not-A and Not-B join in a positive C. But as both premises would then be formally affirmative, the case does not come under the present head.

It is impossible to deny that arguments like the above may have material weight. Their value rests on the possibility of gathering up the phenomena just bordering on a system we are investigating into a system of their own, α, β, γ, limiting and limited by the former A, B, C at every point. We nearly achieved this—rudely of course—in our comparison of *Cornus sanguinea* and *Cornus suecica*. We then obtained two systems, A, B, C and α, β, γ, such that A, B, C were respectively not-α, not-β, and not-γ, while α, β, and γ were respectively not-A, not-B, and not-C. B and β, the two dominant or middle terms, stood, it will be remembered, for 'inherited from before divergence of the species' and 'modified by recent evolution' respectively; and the object was to attach all the peculiarities of the two plants systematically to one or other of these conceptions. Obviously in such a case it depends merely on our point of view whether we take as premises 'Not-A and Not-C are Not-B', or 'α and γ are Not-B', or 'Not-A and Not-C are β', which are the various forms suggested above.

In the same way it might be argued in fig. 1 that

No mere animal has language;
A deaf mute is no mere animal;
∴ A deaf mute has language.

Horrible as these arguments must appear to any one conversant with syllogistic rules, I do not see how they are to be kept out if the argument from two negations in fig. 3 is admitted.

There is however an indispensable condition on which alone any value can be ascribed to these inferences. This is that the negation of a content should in all cases be merely an aspect of a positive content[1] which is really in question, and

[1] There is a puzzling inconsistency in this identification, because the treatment of 'man is not-mortal' as an affirmative judgment, which

this we know to be the case in all significant negation, although not reckoned upon in the technical rules of the syllogism. Moreover, we have seen, that we are not bound to omit in the conclusion of inference any relevant matter given in the premises. But if not, we can in any case secure the positive significance of the denial of a content by supplying in the conclusion the middle term of which it is denied. Thus in one of the above examples we may conclude 'Light is something which does not gravitate, and is not material'.

The Negative Instance.

iii. We have now obtained the logical formulation of the Negative Instance. Like the Exception, it begins in Enumerative Induction, and is capable of development through Analogy. I shall assume throughout my examination of its working, in order to avoid uninstructive complications, that the rule or law suggested by Enumerative Induction, of which the negative instance is confirmatory, has come to begin with from affirmative instances, and is expressed in an affirmative judgment. Then we may formulate the cases supplied by mere Enumerative Induction, with their sequels in Analogy, as follows:—

AFFIRMATIVE INSTANCE suggesting	EXCEPTION against	NEGATIVE INSTANCE confirming	Symbolic scheme of Instances.
the *prima facie* rule that B is probably C.			
A is C; A is B; ∴ B is or may be C.	A is not C; A is B; ∴ B may not be C.	*a* is not C; *a* is not B; ∴ Not-B may be Not-C.	Enumerative Induction.
C is $x\ y\ z\ R^1$; B is $x\ y\ z\ R^1$; ∴ B is for good reasons likely to be C.	C is not $x\ y\ z\ R^1$ i.e. is $x_1\ y_1\ z_1\ R_1^2$); B is $x\ y\ z\ R1$; ∴ B is not exactly C.	Not-C is $x_1\ y_1\ z_1\ R_1^2$; Not-B is $x_1\ y_1\ z_1\ R_1^2$; ∴ Not-B is Not-C i.e. C is B).	Analogy.

I have regarded as making 'not-mortal' a positive or significant content, was historically, as reference to a *class* 'not-mortal', the origin of the 'infinite judgment' which is the very type of bare negation. The interpretation employed in the text regards 'not-mortal' not as a fictitious class but as a positive attribute excluding mortality.

[1] Analysis of A.

[2] The analysis of *a*, which is not-A, i.e. not $x\ y\ z$ R.

Example of Instances.	Affirmative Instance suggesting	Exception [1] against	Negative Instance confirming
	the flower-structure in these two plants probably is characteristic of a common descent shown also in the leaf-structure.		
Enumerative Induction.	In these two plants there is similar leaf-structure; In these two plants there is similar flower-structure; ∴ The flower-structure may be an element in an inherited group of qualities to which the leaf-structure also belongs (or, in brief, may be at bottom one with the leaf-structure).	In these two plants there is not wholly identical leaf-structure; In these two plants there is wholly identical flower-structure; ∴ Flower-structure seems not to be generically connected with leaf-structure.	In some aspects of these two plants there *is* a difference, e.g. of leaf-stalk; In some aspects of these two plants there *is* a difference, e.g. of flower-stalk (umbels v. cymes); ∴ The difference of leaf-stalk may be connected through those aspects of the two plants) with the difference of flower-stalk.
Analogy.	The leaf-structure in these two plants can be connected with a whole set of identical generic properties; The flower-structure in these two plants includes a whole set of identical generic properties; ∴ The flower-structure in these two plants probably is characteristic of a common descent shown also in the leaf-structure.	Leaves have not the same stalk-arrangement (i.e. are sessile in one case and stalked in the other); Flowers have the same stalk-arrangement in both plants (i.e. are stalked in both); ∴ Flower-structure does not follow variations of leaf-structure (in these two plants, i.e. species).	The difference of leaf-stalk belongs to a connected set of aspects [2] of these two plants *not* concerned with their remote hereditary properties; The difference of flower-stalk belongs to a connected set of aspects [2] of these two plants *not* concerned with their remote hereditary properties; ∴ The difference of leaf-stalk is connected with the difference of flower-stalk by a relation *not* concerned with their remote hereditary properties.

[1] The Exception of course cannot be made successful if the Negative Instance is to be so. I have therefore treated the Exception as a mistaken interpretation of the facts which the Negative Instance interprets rightly.

[2] Viz., the recent dwarfing of one plant.

2. The object of Scientific Induction is, ***given a suggested coherence,*** 'B may be (probably is) C,' which has become through analogy a hypothesis in germ represented by an 'importance' attached to the mediating content *x y z* R, to bring such a coherence into the form of one or many pure Hypothetical judgments. The outward and visible side of this process is to modify the rule, i.e. the contents B and C with their connecting content *x y z* R, so that there shall be no exceptions 'B is not quite C', and that the two contrapositive converses 'Not-C is not-B' and 'Not-B is not-C'[1] shall be true when filled up with positive contents precisely excluding B and C respectively. The inward and intellectual side of the process however simply consists in grasping a necessary relation based upon some fundamental reality. This essential activity of the scientific spirit can only be characterised beforehand in respect of its most general attributes, which are embodied in the external process to be described as Scientific Induction. We can affirm from the known nature of the logical universal that it must be purified by exceptions and finally limited by negations. But as all data presented to us are thoroughly concrete, it follows that there is an endless possibility of erroneous abstraction and construction in all adjustment of contents to one another, so that the outward and visible side of induction, though knowable in respect of certain essential phases, can never assume the character of a mechanical method or royal road to knowledge. In the same way the ultimate necessity of the law or principle at which we arrive can be guaranteed by no general considerations. It depends in general, we know, on the systematic necessity of the negations, which, representing its relation to the reality within which it falls, hedge it in on every side and exhibit it as no longer itself, but as transformed, whenever and in as far as their limits are passed. But the specific necessity of individual truths cannot be assigned by any general theory of science.

Scientific Induction.

i. Induction then in its most general sense consists in satisfying the principle of sufficient reason by an analysis of

Induction and other Inference.

[1] The contrapositive converse of C is B, which affirmative judgment, and therefore its contrapositive converse, must be true if B is C is to be a pure or reciprocal judgment.

experience, directed to revealing the true coherence of differences within universals. But as soon as this is stated, a difficulty arises in distinguishing Induction from Inference as such, which has precisely the same object. And this difficulty has, historically speaking, prevented the range of Induction from being consistently defined. As in Jevons' theory of Induction, the most recent and, so far as I know, the most thorough and appreciative account of the operation, so in Mill's famous analysis of the four methods of experimental enquiry, we are dealing with processes essentially deductive. On the other hand, if we try to confine ourselves to what has been termed 'Inference from particulars to particulars' we cannot meet the requirements of Scientific Induction. The name Scientific Induction is indeed something of a contradiction in terms. Induction *is meant to mean* the treatment of instances. In this meaning the idea of enumeration and even of the calculus of chances is confused with the idea of an analysis of observations—a confusion all the harder to disentangle, because number of observations does as a rule assist analysis and contribute to eliminating error. Scientific analysis as such, however, does not deal with instances, but only with contents. When we speak of a scientific treatment of instances, we mean a precise determination and skilful resolution *of their content.*

Therefore the distinction between Induction and other forms of Inference, erroneously described as the distinction between Induction and Deduction, is chiefly a distinction of *aspects*, largely based on a confused idea of Induction, but yet in some degree justified. I have just spoken of the confused idea in virtue of which Induction is regarded as a treatment of instances pure and simple. I need only add that a semi-numerical content may often have to be added to an inductive analysis of causes, where our knowledge of conditions falls short. Here we *really* fall back on number, on ratio of instances to instances. If a self-fertilised flower is fertilised 90 times in 100 cases, and an insect-fertilised flower only 20 times in 100 cases, then the number of cases strengthens the unlikelihood of any exceptional variety and relevancy of unknown conditions, and we take self-fertilisation to be the more effective

process, because there are fewer unknown conditions which stop it, or more which assist it. This helps the confusion which regards Induction in contrast to Deduction as an affair of number of instances.

Again, Induction does not exclude Deductive processes. All Induction whatever is guided by principles; and Induction as considered in Jevons' theory essentially consists in processes of mediate Inference, which he explicitly calls Deduction, and which operate by deriving data deductively from hypothetical premises. And usage bears him out. The verification of hypothesis has been considered from Bacon downward as an integral part of scientific induction. And nothing can be more deductive than the connection of a hypothesis with the consequences by which it is verified.

But the distinction, as one of aspects, is justified. It is nearly akin to, but not identical with, the distinction between discovery and proof. This distinction indeed we refused to recognise, because what is not proved is not really discovered. Nor does Induction coincide with discovery. For discovery may include as in mathematical science construction and proof, which no one would call inductive.[1]

But in a deeper form an analogous distinction to that meant to be drawn between discovery and proof does hold good between Induction and Deduction. We may take Induction as Inference viewed from the side of the differences, Deduction as Inference viewed from the side of the universal. In Induction *par excellence* the Real presents itself in concrete and more or less isolated data, in virtue of which the universal nature, or the system of further differences charged with the universal nature, is referred to reality. In Deduction *par excellence* the Real presents itself as qualified by an intelligible system—e. g. by mathematical attributes; and further differences are referred to reality as constructed by and out of this system. It may be doubted whether Newton's discovery of Gravitation was Inductive or Deductive. That in process it was largely

[1] There may be and indeed must be true induction in mathematical matter in so far as instances suggest underlying laws. The case of gravitation, to be discussed below, illustrates the degree in which this is possible.

deductive there is of course no doubt. The popular story however, about the falling apple,[1] would indicate, if true, an inductive aspect—that of a problem set by concrete data, and resolved by analysis and hypothesis. But we must not suppose Newton's mind to have been as empty of mathematical generalisations as our own. He probably brought a systematised qualification of Reality, drawn from elements in the researches of previous mathematicians, to meet the facts that demanded explanation. In this example the aspects of Induction and of Deduction are about equally balanced, and we see the whole principle involved in the distinction together with its merely transitory importance. The relation of the universal to its differences is not affected by the order in which they have presented themselves to us as qualifications of Reality. But it is this order alone which furnishes the differentia of Induction.

Regarded as relations within a system, i.e. in the light of the principle of Sufficient Reason, all inductive explanations point beyond themselves. They demand in the first instance the explicit statement of the system from which their necessity is derived, and thus they appeal as we have seen from the pure Hypothetical judgment to the Notional or Disjunctive judgment. But the underlying real systems themselves are in various degrees limited and incomplete, and in virtue of their finite nature, as we have seen to be the case with space and time, demand explanations which go further and further afield in accounting for the boundaries which persistently present themselves. The task of explanation imposed upon the mind by the principle of sufficient reason is therefore an endless task. The principle of sufficient reason, as Schopenhauer says, is not like a cab which you can send away when it has brought you to your destination. Nothing is isolated, but as the connections which debar isolation reach to infinity, nothing is complete, nor has what it requires in order to justify its existence. This is the standpoint of relativity, which applies in a degree to all known matters. How far we can escape from this standpoint, which has been called the stand-

[1] For comments on this and for an excellent criticism on popular notions of Induction, see De Morgan's Budget of Paradoxes, pp. 49, 81.

point of the Understanding, and which as thus stated is merely an abstraction of our own minds, will appear when we return to more concrete forms of thought.

Two observations may be made about the account here to be given of Scientific Induction. I shall not speak in it especially of Causation. I have attempted to show in Book I [1] that cause is a merely popular idea, indicating one or another ill-defined grade in the process of inductive explanation. The only distinctive peculiarity of Cause contrasted with Reason is that it refers to operation in time. I believe that all which has value in this idea will be elucidated by our account of inductive explanation, taken together with the analysis of the idea of Cause to which I have referred.

And I do not propose to give any account of inductive disproof. Disproof is for the theory of Inference only a form of correction or modification. If at any point we are unable to perform the processes necessary to correction, then we have *pro tanto* a disproof—if e.g. we fail in accommodating a suggested rule to actual exceptions, or actual exceptions to a suggested rule. But for theory such a failure is not a positive phenomenon. We must suppose that there is a true rule, which, if we could but hit upon it, would cover the facts and appear as a correction of our disproved rule. The failure to light upon a hypothetical rule fulfilling these conditions is a mere delay in making the required correction, of which theory need take no account. Bacon's complaint that the 'axioma distinctione aliquâ frivolâ salvatur' is, but for 'frivolâ' which is its sting, an account of the sole and inevitable process of knowledge.

In order to exhibit distinctly the variations which impede a clear definition of Induction, I propose to speak separately of Induction as perceptive analysis and of Induction as inferential explanation. These two varieties, together with Analogical Inference and Enumerative Induction, are all confused together in the popular idea of Induction as opposed to Deduction.[2]

[1] Chap. vi.

[2] Compare Mill, ii. 25 ff. He tries to separate Hypothesis from Induction, but really includes, though he denies doing so, much Hypothesis

Induction as perceptive analysis.

ii. Induction in the narrowest sense is perceptive analysis.

Symbolic expression of the problem.

a. We suppose ourselves to have obtained from any source whatever, all such sources being ultimately reducible to analogy, the problematic judgment that the attribute or occurrence B in virtue of a nature *a b c* R, has probably a necessary coherence with the attribute or event C. This is so far only a presumption arising from the value for cognition which we have been led to attach to the nature *a b c* R—a value depending, in all the higher and truer applications of analogy, on the ultimate identity of human purposes and necessities,[1] and in the lower walks of inference on the identification of self-maintenance or self-preservation with some such idea as that of purpose. I follow Lotze in employing an expression of the type *a b c* R in which *a*, *b*, *c* may be taken to stand respectively for definite attributes or relations and R for the residual nature of the concrete whole before us, considered as only contributing its normal support to the operations of *a b c* and not as actively interfering to modify them. It is worth mentioning that Mill's account of the Experimental methods, otherwise at least suggestive, is rendered terribly perplexing by his use of corresponding letters A and *a* to indicate from the first the several antecedents and consequents underlying concrete phenomena. The result is that his first statement of every problem presupposes in symbolic form its explicit solution. When the phenomenon can be resolved into antecedents A B C and consequents *a b c* the work is already done. Mill, no doubt, does not *mean* to have determined by his expression the fact that a particular element A of the given content is from the first known to correspond to another particular element *a*. He intends A and *a* to be empty forms, indicating the problem which our analysis has to solve. But the correspondences of the symbolic letters are undoubtedly misleading.

in Induction. His test seems to be that where you have a *vera causa* you have Induction, not Hypothesis. But he admits that in Induction the *vera causa* may not be known to be present in the case under investigation.

[1] The process of learning a foreign language, and ultimately of understanding language at all, is an excellent example of this. We are guided throughout by the assumption that identical aims and feelings underlie the different systems of expression.

I mention this question partly because it illustrates our present task. The *problem* is just to break up B into $a\ \beta\ \gamma$ R, so that we can say of each element in turn, 'If a R, then a R; and if a R, then a R.' In each case we must understand all the elements which we are not observing to fall back into the mass of R. This neglect of the other elements is capable of two interpretations. Either the other elements may be taken to retain their normal relation to the a under investigation, and are not especially and abnormally operative upon it under the conditions of the observation, or they are actually inoperative and might be removed. This latter interpretation can never be justified without special proof, which must address itself to a definite analysed R. For every conjunction of conditions whatever is *an* R, i.e. an inexhaustible concrete, even in the most precise experiment, and all that can ever be done in the way of isolation is to exclude some portion x of the whole concrete R, by substituting for it an element y which has the effect of turning R into R_1. We have then excluded x, but not R as such, i.e. we can only exclude R in as far as we can analyse it.

And to end the subject of symbolic expression, I may point out that for simplicity's sake I shall not consider the whole analogical suggestion 'B is probably connected with C, both being conjoined with $a\ b\ c$ R', but shall confine myself to one member at a time, as we should have to do in a practical investigation, e.g. to 'B is conjoined with, and probably coheres with, $a\ b\ c$ R'. This is not an inadequate treatment. It would be easy to add C as a character to $a\ b\ c$ R, indicating that their conjunction must be taken subject to unknown conditions; and in any case the investigation of B in relation to $a\ b\ c$ R is certain if pursued to the end to lay open the track of coherence between $a\ b\ c$ R and C. The defect of symbolic modes of expression in these higher forms of reasoning is that not only are all elements of the content most variously interconnected, and far from being on the same level in value, but also every element of the content is undergoing transformation from the beginning to the end of the whole process. Therefore, as Mill no doubt really intended, corresponding symbols like a and α represent a pair of series or a pair of continuous

developments within the inference rather than a pair of fixed contents.

Establishment of Ordinary Hypothetical Judgment.

β. I will begin by analysing at some length an example of perceptive analysis conducted *chiefly* through observation as opposed to experiment—though experiment was at times applied—and in respect of its content just on the borderland between analogy and scientific induction.

It might be suggested without doing violence to facts that the Linnaean classification in botany corresponds on the whole to the stage of enumerative or conjunctive Induction; the mere natural classification to Analogical Inference; and the analysis of plant-structure and evolution in the light of the Darwinian hypothesis to scientific induction—to perceptive induction where we deal with the visible adaptations of particular species, and to generalising or reflective induction when we lay down universal conditions as controlling the evolution of the organic world.

Let us suppose that Analogy, the habit of ascribing what I have ventured to call *de facto* purposes to adaptations in the organic world, has made it probable to us on inspecting the flower of the Bee Ophrys that it (B) is adapted for self-fertilisation (*a b c* R).

Here the expression 'adapted for', in consonance with the notion of *de facto* purpose, refers not merely to the mechanical adjustment of a contrivance, but to the fact of that contrivance actually achieving in normal use the purpose which it suggests. A case in which we cannot make out this additional element of meaning will be mentioned below, and in it the purpose will not rank as established by Induction.

I should observe, too, that the element C which we usually spoke of in analogy and which we mean to omit here for the sake of brevity may in the present example be identified with any peculiarity the conjunction of which with the general appearance B might have first attracted our attention to the flower B.

Of course my analysis is only rough and typical. I select two or three prominent characters out of a whole apparatus of converging contrivances.

The object is now to analyse the flower B in the light of *a b c* R. We may attempt this roughly as follows :—

(α) Caudicles (stalks of pollen-masses) are of the right length to (*a*) reach the stigma.

(β) Anther-cells open of themselves, and (*b*) let the pollen-masses fall to the level of the stigma.

(γ) Hanging pollen-masses oscillate in the wind till (*c*) they strike the stigma.

R in this example has the significance that the remaining parts of the flower and plant are necessary to give the process its value, and to make it possible for the contrivance to operate, by nourishing and mechanically supporting the flower. But all this is involved in the nature of a plant, and therefore assuming α, β, γ to be in a living plant, and that, of course, the right plant, R need not be further considered in the analysis *at present*; i.e. until it in some way interferes with the possibility or reality of the action we are investigating.

The very important relation of γ to *c* in the above analysis assumes the operation of an external cause, and requires a confirmation without which the whole analysis is futile; for as the pollen masses when liberated do not fall on the stigma, but only hang like a pendulum on the level of the stigma, it is incumbent on us to show how they can be and are brought in contact with it. There is a further interest at this point in affirming or denying the action of insects, which are usually necessary to cross-fertilisation, but the need for whose intervention would impair the certainty which is the purpose of self-fertilisation. Here we have recourse to the negative instance which, here as usual, contains an element of experiment. For the essence of the negative instance is to obtain a positive content equivalent *ad hoc* to an exclusion, and this can only be done by a disjunctive limitation of possibilities, and an exact ascertainment of the reality within the possibilities so limited. The limitation of possibilities consists, not in removing all R, which is impossible, but in securing an R analysed and believed to be passive; and artificial combinations give the best chance of obtaining this condition. And the exact ascertainment of reality consists in observing a positive or negative condition, or both, whose nature we can exhaustively analyse. Here again artificial production gives the best chance. To test the connection of γ (movement by

wind) with *c* (contact with stigma) Mr. Darwin put a spike of Bee Ophrys in water in a room. Thus he secured an R, residuary conditions, which he could ensure to be passive (absence of touching by animals or by any unknown cause of motion), and having thus limited the possibilities he was able to observe with certainty and with a high degree of exclusiveness *the absence of wind*, not-γ, which resulted in *absence of contact*, not-*c*, the pollen-masses continuing to hang freely in front of the stigma. Thus he obtained the confirmatory or true negative instance 'not-γ is not *c*', which is the contrapositive converse of '*c* is γ', i.e. 'contact arises from wind.' We have here left the ground of formal logic,[1] in which 'not-γ is not *c*' could only rest on the knowledge that '*c* is γ'. In the process now considered '*c* is γ' actually rests on the knowledge that 'not-γ is not *c*'. The corroborative power of the negative instance in induction depends on the fact that it has a positive content within the same *ultimate* system as *c* and γ, and, within that system, related by way of definite negation to them. Thus the negative instance is capable of *independent agreement* with the positive case. 'Not-γ is not *c*' = 'Free caudicles without wind give no contact'.

But it will be said that we have gone too fast. We read the 'free caudicles in a room give no contact' as 'not-γ is not *c*'. But it was probably also 'Not-G (no insects) is not *c*', 'where no *insects*, there no contact,' i.e. in searching R we have found a not-G, an absence of a condition, which, it is suggested, may not be, as R was meant to be, indifferent. We may treat this as a positive suggestion from analogy, 'G is probably *c*;' for in the absence of such a positive suggestion we should have no more cause to note the absence of insects G from the experimental R than to note the absence of direct sunlight L or extreme changes of temperature T, But there is plenty of analogy for insects fertilising plants; so 'G is probably *c*' demands attention.

Mr. Darwin provided against this suggestion by exposing some of the flowers under a net, which excluded insects but admitted wind. In the cases so treated contact was effected.

[1] See i. 305-7. What is true of the double negation is true of the contrapositive converse which implies double negation.

We may read this off as an *exception* in the form ' not-G is *c* ' against the suggested rule ' G is (probably) *c* ', or ' insects (probably) produce the contact ', and as at the same time a positive instance in favour of the suggested rule ' γ is *c* ', ' wind makes contact '. This double-edged character, proper to a negated content at this stage, is justified by the experiment above-mentioned which might be read off as ' R γ not-G is *c* ' ; R standing for the mass of conditions presumed to be indifferent, not-G for the exclusion of insects, γ for the presence of wind, and *c* for contact.

Establishment of Reciprocal Hypothetical Judgment.

γ. And this connection γ is *c* (wind acting on the pendent pollen-masses produces contact with the stigma) has been defined and confirmed—i.e. *re-inferred in a precise form* through the two conjunctions claiming to be connections, R-not-γ is not *c* (pendent pollinia without wind [1] do not touch the stigma) and R γ-not-G is *c*, i.e. pendent pollinia with wind and without insects [2] do touch the stigma. From not-γ is not *c* (R being disregarded as the common basis) we infer *c* is γ, i.e. ' contact comes from wind ', the reciprocal of ' wind produces contact '. And by ' γ-not-G is *c* ' we confirm this reciprocal ' contact comes from wind ' by overthrowing the suggestion that G may be the operative agent in *c*, and consequently that *either* wind *or* insects may be concerned in the contact.

It is true, however, that we have not obtained, against ' G may be *c*', the more fatal exception ' G is not *c* ' (in presence of insects no contact is effected) ; the exception which we obtained is strictly an exception against the reciprocal of this, viz. against *c* is G or contact comes from insects, i.e. against the suggestion that insects are the *only* agency in producing contact. Thus we have not strictly *proved*, as against insect agency the only suggested alternative, that wind is the *exclusive* agency in the self-fertilisation of this flower, for when wind was excluded, insects were probably (in the room) excluded with it. In fact the γ with which we began included G, and

[1] Experiment of the flower in a room.

[2] Experiment of flowers under a net in the open air. This experiment goes far to give the pure judgment ' *only* γ is *c* ', which no ordinary Judgment-form will express for Logic, except the clumsy equivalent ' All *c* is γ '. I have written it ' γ-not-G is *c* '.

was really 'wind-or-insects', and it is of *this* γ that the reciprocal 'c is γ' was proved by the experiment not-γ is not-ε. But we subsequently make it probable that this γ *ought* to mean wind only, by making it certain that it may mean wind only. This shows the transformation which a content undergoes in course of an inductive inference.

And for the kind of matter with which we are dealing this conclusion is perhaps sufficient. We are studying the use of an adaptation, which use any normal agency suitable to it will suffice to establish. We could not hope to prove that no insect, or that no human hand, has ever fertilised a Bee Ophrys by pushing the pendent pollen-masses. When we know that the wind can do it, and does it without other aid, and that wind is a common occurrence, and that in the absence of wind (though in the absence of other things at the same time) the adaptation fails, then we are justified in saying that here we have the only agency which is normal enough to account for the growth of a contrivance adapted to it. Logically, these considerations are represented by the claim of every judgment to become reciprocal, which formal claim has different values and interpretations in different kinds of matter. Here, for instance, we might make our judgment truly reciprocal—and purely truistic—by transforming the content of γ into simply 'a sufficient cause of motion'. This would suffice for a mechanical construction of our problem, but not for an organic explanation of it. An organic adaptation demands for its explanation a definite regular agency to which it is adapted; it *need* not exclude agencies of diverse origin; but it is pretty certain to shape itself on some one well-defined type of operation. Thus in speaking of agencies to which evolution has adapted structures, the claim of any actual and normal agency to be *the* exclusive agency is *prima facie* very strong. To make it absolute we should proceed by analysing c as we have analysed B itself, and showing that γ, wind agency, as $\xi\ v\ \zeta$, is the *only* agency corresponding to c as $x\ y\ z$. But this I at all events am unable to do, further than by pointing out that 'normal' and 'general' in γ correspond to 'gradual growth' and 'need of a reliable agent' in the contrivances concerned in c.

Thus far we are left with B as $a\ \beta\ \gamma$ R is $a\ b\ c$ R or S. The flower of the Bee Ophrys as having flexible caudicles of the right length and self-opening anther cells, and considered as acted upon by wind, is adapted for self-fertilisation by the pollinia falling to the level of the stigma and oscillating till they touch it.

Conversion or Generalisation.

δ. In formal logic the affirmation of one attribute can have no influence on the affirmation of another about the same subject unless an explicit contrariety between the two affirmations is within our knowledge. In short, difference does not justify negation. To say that a flower is self-fertilised does not formally warrant us in denying that it is cross-fertilised. But in science every content claims to be treated as a system, and every attribute must either quarrel with any other attribute suggested of the same subject, or must make peace with it on definite terms. Therefore the inductive conclusion B is S, 'The Bee Ophrys is self-fertilising,' which we have thus obtained, contains in its claim for reciprocity, i.e. for predominance or essentiality on the part of the attribute, a further suggestion to which in material or actual knowledge we are bound to pay attention. We cannot indeed expect to show that every self-fertilised plant is a Bee Ophrys; i.e. we cannot reduce self-fertilisation to mean solely the adaptations of the flower in question, nor can we extend our idea of the flower in question to include all adaptations that in any plant might ensure self-fertilisation. The attribute 'self-fertilisation' is not sufficiently concrete and specific to be identified in this way with the nature of a particular species of plant. But though we cannot reduce self-fertilisation as such to mean simply and solely the fertilising contrivances of *Ophrys apifera*, we are confronted by the reciprocal tendency of judgment with another problem which Darwin, with his usual exhaustiveness of apprehension, has frankly stated and discussed. We saw that B is S, or, to prepare for our present enquiry, B is b S, i.e. The flower in question is characterised by its own peculiar contrivances for self-fertilisation. Can we convert this judgment materially? Can we say 'Self-fertilisation S, not cross-fertilisation F, is *the* characteristic of this species', or in hypothetical form, 'If S pure and simple, then B?' This

suggestion might be embodied with more formal correctness in double negation or in contra-position, as 'B is not not-S', or, 'If any not-S, then not-B,' and the question would thus arise whether F (cross-fertilization) was not-S in the sense of being incompatible with S in B. But Simple Conversion without limitation (formally impossible) expresses the guiding idea more effectually, in demanding that an *essential* attribute of a subject shall be the *sole* attribute in the relation to which it belongs. Here however this suggested reciprocal is not true. The contrivances which have their meaning in subserving cross-fertilisation, the viscid discs, sinking caudicles, and elastic threads tying up the pollen-masses, are present in the Bee Ophrys without the least trace of becoming aborted, and therefore a strong *analogical* inference holds, to show that B being *d e f* is F, and so is not-S in as far as not-S is identified with F; in other words, that S, and not-S in the sense of F, are not contrary or incompatible in B, and so if we like that F is in this case not to count as not-S, or else that B is both S and not-S, to which, if not-S only means different from S, there is no objection.

A certain methodical gain is drawn from affirming this conjunction of S and not-S, although unintelligible to formal logic. Having failed in Conversion, we are driven to Generalisation. For though S and F form no logical contradiction, but are *prima facie* quite compatible with one another, yet ultimately and from the point of view of a harmonious theory there is a contradiction *until we reconcile them.* Difference without a reason,—i.e. difference in the same relation, or difference of means[1] to the same end *qua* the same,—*is* a contradiction. We express this problem justly by saying, 'The flower B is self-fertilised S, and apparently may also be cross-fertilised Not-S.' We are here in need of a further suggestion by which to generalise S and not-S into one conception. This suggestion cannot be mechanically obtained, but must be drawn by analogy from our general knowledge of the organic world. Combining what Darwin says in the place under discussion

[1] Apart from the insufficient amount of the one means, which therefore may need supplementing by another. If the one means is as easy to provide as the other, this reason falls away.

with his views in other works, we might give this suggestion the form, 'Σ (healthy preservation of the species) demands some F (cross-fertilisation) at least;' under which we may infer by analogy from 'B has besides S some F (not-S)' that 'B the special adaptations of the Bee Ophrys have for their all-embracing and determining nature the tendency to Σ the healthy self-preservation of the species, including both S and not-S'.

Beyond analogy, in this final inference, we cannot go, for cross-fertilisation is not, according to the passage upon which I rely, affirmed of Reality as a datum in the content of *Ophrys apifera*, but is itself only inferred from analogy; and therefore the general conclusion, though a suggestive concurrence of analogies, cannot be considered as a truth resting upon scientific induction. The operation of the contrivances by which the self-fertilisation of this flower is secured may on the other hand be regarded as made good by precise perceptive analysis at every point.

In establishing this positive attribute of self-fertilisation considered as significant of a *de facto* purpose, we have about reached the limits of perceptive analysis. In establishing the probability of cross-fertilisation we have in one sense gone beyond the limits of perceptive analysis into the region of hypothesis, if in another sense we have retrograded into mere analogy. Such a hypothesis as we have just recommended by analogy, if drawn out into a variety of precise details and supported by their precise verification as real data, would be the essence of reflective, mediate, or generalising Induction. We must however bear in mind that hypothesis was present in a germinal form throughout perceptive analysis, throughout analogy, and even throughout enumerative induction, where it was represented by the content of a common name; so that there is no *saltus* between these phases of inference. The fascination which attaches to the researches of the great masters lies just in their power of absorbing, by exhaustive analysis, the mass of perceived data into intelligible conceptions.

iii. In order to estimate the logical character—the position in the evolution of thought—of such a process as this which Logical character

of Perceptive Induction.

I have attempted to describe, three special points must be briefly treated. These are, α. What is the essence of the inferential process concerned? β. What is the purpose of the symbolic representation of it by letters? γ. What part in it is played by number of instances?

Its essence as Inference.

α. Ordinary mediate inference, either subsumptive or constructive, may be detected in every step of the process which we have examined, as in any complex judgment of perception. As we analyse, for example, the flower into its parts, and its parts into mechanical adaptations, we obtain the material for a three-term inference by which the adaptations in their mechanical aspect would be formally brought home to the flower. Or again, the contra-positive conversions and the ideal reciprocity of the judgment, to which we have so freely appealed, may be held to require explicit proof through syllogistic or disjunctive argument based on abstract principles. The mediate inference thus involved is of two kinds.

With regard to the mediate inference involved in every *complex* judgment of perception, and therefore in every *precise* one—this is *really* present in the Induction of which we are speaking, and may sometimes need to be explicitly drawn out in order to correct the results of an overhasty perceptive analysis. Especially this is the case when we are employing experimental apparatus which embodies whole chains of reasoning and concentrates on a single datum a multitude of precisely determined conditions. The observer e.g. with a microscope must always bear in mind what it is that his instrument does in virtue of the principles of its own construction, and in many classes of observations is liable to be thrown back on constructive optical inference, in order to determine the interpretation of the appearance presented to him,—whether it means a true line or an interference-line, whether an elevation or a depression, whether absence of structure or complete transparency of structure (in which latter case the use of polarised light will sometimes detect the illusion). Such mediate inference as this is really and genuinely present in the processes we have been considering, being concerned with material principles relevant to the special subject of the inferences. But yet such mediate inference does not belong to the

differentia of Induction, but is shared by all Inference whatever, being inherent in the nature of Judgment.

On the other hand, it appears to me that mediate inference from abstract principles of knowledge, such as principles of disjunction, of causation, or of sufficient reason, is not a genuine element of scientific Induction at all, although it may be the duty of the logician to point out a relation between inductive inference and such principles as these. The active form of thought, to which these principles belong, loses, as we have seen,[1] its active nature if it is made a mere content within an inference. The relation, for example, of the judgment that embodies a 'negative' instance to the affirmative judgment which it corroborates is a case of the active form of negation engaged in acquiring a definite content within a certain complex system. We should gain nothing in such a case by erecting an argument to the effect that What is not A is not-A. The problem is, given the forms A and not-A, the positive and its limit, to bring these two forms into material agreement in respect of the matter to be organised.

To reject abstract argument from principles of knowledge is however a different thing from the omission to exhibit the material of inference as permeated and articulated by the active forms of thought. Such an omission I hold to be unjustifiable. I have argued elsewhere that Mr. Bradley goes too far in holding that an inference *qua* inference is not bound to exhibit its principle or *rationale*.

The essence of induction in this, the perceptive stage—and beyond this stage it more and more transcends mere induction—is in the peculiar parallelism between the positive connection which suggests, the negative connection which defines in corroborating and corroborates in defining, and the 'exceptional' connection which modifies either itself or the affirmative connection. I have explained [2] why I do not take account of the sustained exception which overthrows. The logical peculiarity of the process is in the positive and consequently independent value of the negations, which are established without being derived from the affirmations, but operate on the latter through the formal interdependence of negation and

[1] Cp. chapter i of the present Book.

[2] p. 116, above.

affirmation. The process is of course not mechanical. Mechanical Induction is an idle dream. The reciprocal adjustment of the negations and affirmations consists in the revelation of intelligible systematic ideas which are thus inferred to be true of reality.

Theoretical purpose of representation by symbols.

β. The symbolic representation of these processes by letters may seem to have an external affinity with the processes of equational logic. But the two systems are to be regarded in precisely opposite aspects. In the above discussion not-a and not-a have been employed to designate contents which are positive, but have, towards a and a respectively, a boundary or negative side. The only object of such designations was to emphasise, for theoretical purposes, the negative relations subsisting between certain inter-connected positive contents. But for practical use the events or attributes in question must be taken in their concrete form, upon which everything turns. By manipulating them in the shape of abstract symbols no progress can be made in the task of Induction, which is a problem of material suggestion and adjustment. '*Just* where' and '*just in so far as* x fails to be a it fails to be a'; this is the meaning of the inductive 'not-a is not a'. And no handling of symbols[1] can express or can warrant this 'just' and 'in so far as' which are the whole essence of the process. What warrants these expressions of definite relation is and can be nothing less than a ground or real system containing parts which negatively determine each other. It is the business of Induction in the form of perceptive analysis to initiate the disentanglement and reciprocal determination of elements within such systems, in the light of ideas—germinal hypotheses—suggested by analogy. Analogy, in fact, does not cease to operate in Induction. Induction is Analogy fortified by negative and precise determination.

Part played by number of instances.

γ. Induction, we saw, is popularly identified with proof by instances, and owes its recognition as a distinct method of inference to this identification.

[1] Of course this remark does not extend to true calculation, which has been independently treated and does not fall within induction. The two processes have some common ground in statistics, as will appear from γ below.

(1) But scientific induction does not depend on or in any way deal with instances as such, i.e. particular occurrences or observations with reference to their particularity—their number or recurrence. Here we have an antinomy, to which at the present stage we need only draw attention, as it has really been solved by the distinction between Enumerative Induction and the subsequent diverging phases of the Inductive process. All that scientific Induction demands is a content referred to reality; in how many observations or cases or occurrences the content is presented is a matter of entire indifference to science. If, to put an extreme supposition, the entire content, positive and negative, employed in the above analysis of the Bee Ophrys, could be observable in a single flower, that single flower would, subject to one reservation to be mentioned presently, form a sufficient ground for all the conclusions that were then drawn. What characters can be and what cannot be united in a single or continuous observation is a question of the nature of the object concerned, and not of logical theory. The same flower cannot be both fertilised, and ultimately not fertilised at all. It can be both fertilised (later) and not-fertilised (up to a certain point of time). Or it can be both self-fertilised, and not-self-fertilised in the specific sense of being cross-fertilised. The first of these three comparisons requires two 'instances'; the two latter need only require one apiece, or indeed one between them. And then is an 'instance' a plant or a flower? If a plant, one instance would probably do all we should demand.

In perceptive anaylsis proper.

(2) There is, however, one case to be distinguished to which the above remarks do not apply. The self-fertilisation of the Bee Ophrys, Darwin says, is markedly 'successful'. The Bee Ophrys, which is self-fertilised, in many dozens of plants had a capsule (seed-vessel) for every flower.[1] The Fly Ophrys, cross-fertilised by insects, had only seven capsules in forty-nine flowers. This is again 'a is a', 'not-a tends to be not a.' And here number of instances is essential to the result, *because we are dealing with the operation of conditions not fully known.* This throws us back at once into enumeration of instances, statistical methods, or even the statement of chances. We

Known effects of unknown conditions.

[1] *Exceptis excipiendis*—deformed flowers.

proceed by the comparison of hypotheses explanatory of observed ratios, as we saw in discussing the statement of chances. If, to use an extreme illustration, we could say 'Fly Ophrys is exclusively insect-fertilised', *and* 'the observed plants of Fly Ophrys are in a place inaccessible to insects', then we should not need a single instance to fortify the conclusion that all these plants must remain unfertilised. But as we do not know with precision what conditions are operative, and to what degree, in securing or hindering the approach of the right insects to the flower at the right moment, we are reduced to enumerating observed instances in order to obtain an actual ratio between successes and failures, upon which we may base an estimate of the nature of the cause or causes, whether in the flower or outside it, which would probably have produced the observed ratio of successes to failures. We have as data, say, forty-eight cases and forty-eight successes in self-fertilisation, compared with forty-eight cases and only six successes in cross-fertilisation by insects. We have to conjecture or construct the kind or type of causes which are most likely to have produced these two observed series.

Supposing indeed that we take into account *all* unknown conditions whatever, no question can be raised, for it is a mere transcription of the series to say that the one flower is less adapted to the conditions which *have* acted on it, than the other to the conditions which *have* acted on *it*. And supposing that Darwin excluded interfering causes in counting both his sets of instances, as he did in one, there is no more to be said. The self-fertilised plant meets the unknown conditions wholly and the other does not. In order to compare probabilities we must have a suggestion as to some special kinds of causes that normally operate with an assigned frequency,[1] and for the

[1] We must in short take by way of hypothesis some 'natural cycle', or what comes to the same thing, some cycle external to that observed, otherwise there are no two ratios to compare in respect of each observed series. See Book I, chap. viii. We might indeed compare the probabilities that each series proceeded from a supposed cause, and from chance (unknown independent conditions) respectively, but this would be, where we know some of the conditions operative, to forfeit the use of knowledge which we possess. If we wished to reckon the probability of either series occurring by chance, I suppose we should have to take (*faute de mieux*) the chances of failure and success as even for each flower.

sake of illustration I will assume that obvious accidents have not been excluded. As every adaptation has its limits beyond which conditions become abnormal to it, i.e. are accidents, I am able by this means to suggest the idea that the two kinds of flower may be equally well adapted to normal conditions, but that *in the observed series of cases* the Fly Ophrys may have been the victim of a set of disasters which destroyed the flowers inspected, by causes lying outside the limits of adaptation of either flower. Abortion of the flower or destruction by insects before maturity may easily prevent seeding in one flower out of four. Now of course in the first place it is an impossible assumption that Darwin would not have noticed any extraordinary prevalence of abnormal interfering causes confined to the flowers of the Fly Ophrys. In order to obtain a useful 'not-a is not a' the two negative contents must diverge from the positive a and a only in a-ness and a-ness. They must be, as we have insisted, within the same real system; i.e. the R of general conditions must be the same in both, or in the same relation to both.[1]

But in the second place, making this false assumption for the sake of illustrating our point, we will suggest that one flower in four of the Fly Ophrys is *on the average* destroyed by accidents which no adaptation could avert. And then it becomes not impossible that in a given series of forty-eight inspected flowers, these accidents have been heaped together by unknown causes; and that the flowers, though adapted to *all* normal conditions,—i.e. as successfully adapted as those of the Bee Ophrys,—were nevertheless in forty-two cases out of a given forty-eight hindered from being fertilised by a series of extraordinary accidents. We have then to compare, as regards the Fly Ophrys, the hypotheses of maladaptation to normal conditions, such as to cause failure in forty-two cases out of forty-eight, and of perfect adaptation to normal conditions, hindered of its effect by abnormal conditions in forty-two cases out of forty-eight. The possibility of making this

[1] It is not indeed fair to say that in order to a just comparison the Fly Ophrys must have its insects as the other must have its wind, because the question is whether the Fly Ophrys was wise to rely on so capricious an agency as that of insects. But there must be no extraordinary influence known to be keeping the insects from it.

comparison by calculation depends on our being able to assign an average ratio of operation to the abnormal causes. Taking them to produce on an average established by general observation one failure to be fertilised in every four flowers, and excluding probabilities derived from the non-appearance of extraordinary hindrances in the instances of the Bee Ophrys, we have to determine the probability that in forty-eight independent flowers, with three favourable chances and only one unfavourable for each flower, we should obtain a set (in any order) of forty-two failures and only six successes. I presume that this problem is the same as to estimate the chances of drawing a black ball exactly forty-two times in forty-eight out of a box containing only four balls, being three white balls and one black ball. These chances would be expressed I suppose by $(\frac{3}{4})^6 \times (\frac{1}{4})^{42}$—the chances of six successes in drawing a white ball on *assigned* occasions—multiplied by the combinations of forty-eight things taken six together, in order to add together the number of independent ways in which six successes and forty-two failures can be realised.

This probability, which must be very low, owing to the enormous number of failures required, with the low chance $\frac{1}{4}$ for each, has to be compared with the high probability with which the assumption that, *normally*, insects only visit one flower in eight, and that therefore the flowers are maladapted to seven sets of conditions in eight, would give as a consequence the ratio of forty-two failures in forty-eight flowers. This would I suppose be the same as the chance that out of a box containing seven black balls and one white, forty-two black balls should be drawn in forty-eight trials. The combinations remain the same as in the former case, and the factor supplied by the fractions expressing the chances would be $(\frac{1}{8})^6 \times (\frac{7}{8})^{42}$, involving a high power, the forty-second, of the very favourable chance $\frac{7}{8}$. The comparison of these probabilities would be our warrant for deciding, on the assumptions which we have made, that Fly Ophrys is much worse adapted to normal conditions than the Bee Ophrys. In fact, our conclusion is much more certain than on these assumptions, for it is certain that any violent interfering cause which destroyed one flower in four would have been noticed and excluded by any such

observer as Darwin. But in as far as we rely on the exclusion we are ceasing to rely on number and are going back to analysis of content. The exclusion, however, in such varied and uncertain conditions is probably imperfect, and therefore, in our actual inference, I take it that we eke out our reliance on Darwin's accuracy of comparison by a reliance on the probability of a normal feature in the conditions (viz. a degree of unsuitability to the flower) as against the very low probability of a variety of accidental conditions which Darwin did not exclude. We shall illustrate this particular application of the inference from number of instances directly.

The above case may serve as a type of all Inductive processes in which number of instances, as number, plays an essential part. Their essence consists in selecting as most probable that cause or class of causes which would produce, as an alternative bearing the largest proportion to the sum of possible alternatives, the ratio actually observed among the phenomena. Apart from the assumption of any particular cause, every additional instance enormously increases the improbability of *every* single definite succession by making every such succession one among an immensely increased number of possible alternative successions (or conjunctions). If therefore any cause can be alleged or supposed, which would give that particular definite succession which exists in reality as sole alternative or as one of a comparatively small number of alternatives, the principle of impartial ignorance urges us to decide for that cause as giving to the actual observed succession the nearest approach to its actual position as real—i. e. the largest share of estimated reality. Or if two or more causes are suggested, from which each component event of the actual observed succession can be derived as one out of different numbers of alternatives respectively (e. g. as one out of three alternatives in one case and as one out of twenty alternatives in another), then we compare the probability of these two causes just on the same principle as that on which we compare the probability of a single imputed cause and that of the total absence of any single cause at all, forming a case in which the actual succession must be attributed to a succession of what we call accidents.

A particular class of accidents however, such as that assumed above as destroying one flower in four before maturity, is of course a class of causes, and may be defined and treated for purposes of calculation as ' a cause '.

Number of instances thus operates by increasing the improbability *per se* of every particular conjunction or succession of phenomena, and therefore increasing the probability of any cause which can be proved capable of producing the given conjunction or succession as one out of fewer alternatives than the number derivable from any other suggested cause or from the whole series of instances treated as accidental. Probability is estimated by counting, on the basis of impartial ignorance; hence the opposition between enumeration of instances and analysis of content.

The case of so-called elimination of irregularities by accumulation of instances may readily be exhibited as an application of the above principle. A class of causes, or common element in a variety of active conditions, is for our present purpose a cause or ground. If, on the accumulation of instances, there appears in the observed succession or conjunction any feature, e. g. of recurrence in certain cycles, or *a fortiori* of persistence in a single character, which can be hypothetically referred to any common element in the wholly unknown conditions; then the accumulation of instances progressively increases the relative probability of causation by this common element, by progressively decreasing the probability of every conceivable sequence, including the one observed, if considered as the result of accident, i. e. of independent causes.[1] In other words, it becomes more and more probable that, the unknown irregularities notwithstanding, the unknown conditions include a common element, however composed, relative to the persistent feature of the observed conjunction or succession, and uninterfered with by the unknown irregularities of the unknown conditions. Material considerations of content, suggesting an approximation to exhaustiveness in the enumeration of kinds of instances and consequently of kinds of conditions, are almost invariably

[1] See below, p. 170, on Kirchoff's proof of the presence of iron in the sun.

present to reinforce in some degree the argument from sheer probability.

Observation and Experiment.

iv. Experiment is observation under artificial conditions. What is artificial bears to a certain extent the impress of human intelligence, and is, to this extent, abstract and idealised. Human action, in virtue of the human thought which directs it, is definite and selective. And 'artificial' means produced or arranged by human action. The difference between observation and experiment therefore is in the degree of definiteness and ideal selection which is present in the material conditions of the latter process.

Natural Experiment.

a. It is obvious that natural conditions would serve the purposes of enquiry as well as artificial conditions on the assumption that they were exhaustively known. And if exhaustive knowledge of natural conditions were in no case possible, observation could not exist as a scientific process. But it must be noticed that in giving effect to the knowledge which guides it, observation itself tends to take on the character of experiment. The transition between the two processes is therefore gradual. Experiment would usually be considered to begin where we pass from intentional selection of our standpoint and from the use of contrivances auxiliary to perception, to actual analytic interference with the object under observation. Before the line is reached, however, observation passes into something which may properly be called 'natural experiment'. I quote an excellent passage from Jevons [1] in illustration of this point.

'It may readily be seen that we pass upwards by insensible gradations from pure observation to determinate experiment. When the earliest astronomers simply noticed the ordinary motions of the sun, moon, and planets, upon the face of the starry heavens, they were pure observers. But astronomers now select precise times and places for important observations of stellar parallax, or the transits of planets. They make the earth's orbit the basis of a well-arranged *natural experiment*, as it were, and take well-considered advantage of motions which they cannot control. Meteorology might seem to be a science of pure observation, because we

[1] Principles of Science, pp. 400–1.

cannot possibly govern the changes of weather which we record. Nevertheless we may ascend mountains or rise in balloons, like Gay-Lussac and Glaisher, and may thus so vary the points of observation as to render our procedure experimental. We are wholly unable either to produce or prevent earth-currents of electricity, but when we construct long lines of telegraph, we gather such strong currents during periods of disturbance as to render them capable of easy observation.'

Observation with accurate instruments.

β. There is a further point connected with this transition which calls for remark. We habitually speak of telescopic, microscopic, or even of spectroscopic observation. Considering what an enormous artificial interference the instruments thus employed exert upon the image of the object to be observed, it may seem strange that we call the result an observation and not an experiment. The instinct which guides our use of language is however just, at least so far as concerns the ordinary applications of telescope and microscope as magnifying instruments. An apparatus which merely brings the object nearer our perception is *par excellence* an observing instrument. In the compound microscope the image is variously transformed, and often goes through some degree of chromatic dispersion, *in transitu*, but as it is reconstituted before reaching the eye, these transformations do not amount to experiment. This question turns on the employment of interference not merely to make an object accessible to us, but to analyse its content. Thus the moment we modify the object under observation itself, e. g. by applying heat, electricity, or chemical reagents on the stage of the microscope, we say that we are experimenting. When we use spectroscopic devices to observe the real prominences of the sun, without waiting for a total eclipse, we are really analysing the solar image, though not the sun, but strong analogy from the general use of optical instruments makes us still say that we are observing. In actually compounding coloured lights with a colour-box for the purpose of equation, however, there is no doubt that we are experimenting. The fact is then that experiment is not merely observation under artificial or determinate conditions, but *observation under determinate conditions which constitute an integral part of the image or*

product to be observed. Thus common dissection is not experiment, though it introduces conditions in the way of separation and demarcation as definite as anything can be; but vivisection is experiment, because the determinate conditions it produces enter as factors into the action of the organism observed.

Experiment expressed in logical symbols.

γ. Returning for the sake of brevity to the symbols which we used before, we may say that the function of experiment is to exhibit both a and not-a as determinate cases of β, γ, δ, &c. which form the ultimate analysis of R so far as R is relevant to a. The cases of $\beta\ \gamma\ \delta$, &c. obviously may include zero values of any one or more of these factors, and apart from a special hypothesis to be tested—or rather if the hypothesis to be tested is merely that $\beta\ \gamma\ \delta$ are concerned in a—all possible combinations of values of the three or more series must be tried. a moreover is certain to be continuous, and to admit of variation within itself; for no phenomenon is utterly atomic. But in order to secure a distinct correspondence between phases of condition and of effect, it is well to treat every appreciable phase a, within the general a, in turn, as a bounded by not-a, so as to identify its condition a, viz. a phase of $\beta\ \gamma\ \delta$, with absolute precision, as being on both sides bounded by not-a, viz. other positive phases of $\beta\ \gamma\ \delta$ excluding that which is a. The goal to be attained, if the experimental conditions admit of it, is a reciprocal Hypothetical judgment; consisting of an affirmative hypothetical judgment in the form, 'If a (a determinate phase, or series of phases, of $\beta\ \gamma\ \delta$), then a,' supported by its *simply* corroborative equivalent, 'If not-a,[1] then not-a' (viz. determinate phases of $\beta\ \gamma\ \delta$ excluding the phases a), and by its reciprocally corroborative equivalent, 'If not-a, then not-a.'

Can this reciprocal, equivalent to 'If a then a', be justified by experiment, which can at best take the shape, 'in order to remove a you must remove a,' and not 'by removing a you remove a'? It can be thus justified on the assumption

[1] Not-a under experimental conditions is of course itself positive and exclusive of a. If there are different not-a's, as is quite possible at first sight, they determine different a's. E.g. aerial impulses too slow to be heard as musical sound, and discord, are two not-a's as against a's in musical sound.

that α considered as a phase of $\beta\ \gamma\ \delta$ is an ultimate analysis of R. For in this case all possible combinations of the ultimate components of R have been exhausted, and we can lay down throughout them all the demarcation between *a* and not-*a*. But if we take R in its primary meaning, of which we cannot stop short without special justification—viz. as the entire system of the universe—this assumption can never be true except in virtue of a consistent abstraction by which it is taken as true.

Such an abstraction is the source of mathematical necessity. I will not say that in mathematical construction we are secure from the irruption of any conditions beyond those which we have put there, because we may be guilty of omission or oversight on mathematical ground, and the fact that discoveries can be made in mathematics seems to show that such omission constitutes the gradually receding limit of the science. But it may safely be said that in mathematical construction we are secure against any conditions which do not fall within the definite general type of those which we have put there.

Apart from such an abstraction, the assumption that we have a perfect analysis of R is always erroneous, and the postulate that we must express α and not-α in terms of the ultimate analysis of R is theoretically incapable of being fulfilled. The approximate or presumptive fulfilment of the postulate depends chiefly on our general systematic knowledge of the course of things, which enables us, as we think, to draw a line between R_1 the whole irrelevant residuum, R_2 the real basis of both α and the positive not-α which make up the phenomenon *prima facie* in question, and therefore *as such* irrelevant to the distinction between α and not-α, and R_3 the limited number of precise positive conditions on the combination of which, including their reciprocal interference, the precise distinction between α and not-α depends. R_3 is finally reduced to the general α. It is obvious that R_3 has its roots in R_2, and R_2 in R_1, so that the distinction between these remainders cannot be pressed far except on the ground of specific knowledge. Gravity for example belongs to R_1 in relation to an acoustical experiment which I purpose to describe presently.

No doubt gravity is essential to this experiment in the same sense in which it is essential to all that takes place on the surface of the globe. But the variations of gravity within their actual limits do not affect the experiment appreciably or at all. Thus general systematic knowledge operates through confining the immediate problem to R_3 or at most to R_2 and R_3, by setting down R_1 as for this purpose not-R, viz. not a residuum within the problem, but one outside it. R of the problem (viz. R_2 and R_3) is related to not-R of the problem (viz. R_1) just as a is related to not-a in the immediate experiment.

And secondarily, in as far as R_1 is *not* materially known, but is an unknown residuum, a presumption of its irrelevancy may be supported by the *number* of instances in which R (as R_2 and R_3) is a sufficient R for the experiment, i.e. presents a and not-a as required. This confirmation of the line drawn between the R of the problem and the not-R of the problem is precisely the same in kind as the confirmation by number of instances of a material difference in the adaptation of two plants to their environment, worked out above, p. 135. Every successful trial to generate a and not-a on the basis of the R of the problem alone, increases the difference between the probability of the result on the hypothesis that it is due to the known factors included in the R of the problem, whose certainty of existence is assumed,[1] and the probability that the successive occurrences of a and not-a are due to independent causes, some of which must therefore fall outside the persistent conditions which make up R_2 and R_3.

If, on the other hand, we confine ourselves to the R of the problem in its most limited sense, viz. to R_3 analysed as β, γ, δ, then the assumption that we have in β, γ, δ an ultimate analysis of R can only be questioned on the ground of a further analysis suggested or presumed. The possibility of a *positive suggestion* needs no explanation; it would arise from conjunctive induction and pass through analogy in the ordinary way, having the form 'δ is probably complex, consisting of λ, μ, ν', and would be tested by further experiment in the ordinary way, some part of such experiment probably

[1] Because if we fail to produce them all, we do not expect a, nor count the case as a trial.

coinciding with passing $\beta\ \gamma\ \delta$ through their possible variations. This experiment would however then be extended by taking account of the variations and zero values of $\lambda\ \mu\ \nu$ and including or excluding these, as the result might require, in the analysis of a and not-a. A *presumption* of further analysis very commonly arises when no positive suggestion is forthcoming. We have a strong presumption e.g. from the history of chemistry and from the nature of ordinary substances that we shall not constantly be lighting upon new elements; and therefore we do not assume an unfamiliar substance to be an element—i.e. we presume that further analysis is possible—even though we should fail to analyse it at the first attempt.

After using the above example, however, I must guard myself against the idea that 'analysis' is for this logical purpose to be understood in a sense borrowed from chemistry. Logical analysis is the understanding of any whole in reference to its constituent parts or factors, and chemical analysis is only the understanding of a chemical whole as chemical. It is a trite observation, but perhaps necessary to be repeated here, that the analysis *of* an organism, if it is not its analysis *as* an organism, may destroy rather than display its inmost nature. If δ is an organic element, and λ, μ, ν are its chemical constituents, then our first business in 'analysing' is to ascertain whether we want these constituents λ, μ, ν, which are, strictly speaking, constituents not of δ but of δ_1 (δ as a *merely* chemical substance), or whether we want other constituents o, π, τ, which if we can we may then further construe into forms of combined chemical action $\lambda\ \mu\ \nu\ (o)$, $\lambda\ \mu\ \nu\ (\pi)$, $\lambda\ \mu\ \nu\ (\tau)$. In speaking of *organic* characteristics as capable of analysis, I have in mind such questions as the precise degree, direction and mode of transmission in which irritability in plants sets up reflex action; or how far certain movements are reflex and how far purely mechanical—e.g. in the case of circumnutation.[1] The description of analysis needed in

[1] I have not the smallest desire to deny that the joint action of $\lambda\ \mu\ \nu$ as chemical agents may make up, and, for all I care, initiate the action of δ as organic. The question of abiogenesis is an open one for Logic. I am only pointing out that, combined as δ, the constituents λ, μ, ν, acquire organic attributes o, π, τ, which are capable of having their nature precisely determined by experiment.

each particular case must of course be determined by the nature of *a*, and the consequent nature of parts or factors with reference to which it is to be understood.

Experiment with the Siren analysed.

δ. A very simple and beautiful example of the progressive reciprocal definition by experiment of *a*—*a* and not-*a*—not-*a* is to be found in the well-known verification of the connection between rapidity of periodic vibrations and musical pitch, as given by help of Helmholtz's Siren. The reader would do well to study the account and figure of this instrument in Helmholtz's Popular Lectures.[1] In the light of the account which has just been given of the logical purpose of experiment we may roughly analyse this arrangement as follows :—

R_1, or the not-R of the problem, may be typified by the action of gravity, which pervades all matter, but the variations of which within their actual limits are indifferent to the phenomena now in question.

The R of the problem, consisting of R_2 and R_3, within which *a*—*a* and not-*a*—not-*a* are to be sought for, is in general terms the musical sound produced by the machine, and its conditions, including the machine. Of these we may take as R_2 (extending, as we knew it must, continuously into R_1) the air in the room, the hearing ear, and the machine itself, as operative in the production of a physical effect which together with a hearing ear results in musical sound. R_2 is relevant as the proximate basis of the phenomenon itself, and as such, regarded by contrast to R_1 or not R, is itself an *a* defined by a not-*a* and connected with an *a*. But *prima facie* and outside the experiment itself, R_2 does not demand much analysis. The air in the room or some conductor of sound must act as a medium between the machine and the ear—sound cannot pass through a vacuum ;—the ear must not be outrageously abnormal—this is included in a reasonable interpretation of ' hearing ear ; '—and of course there must be no other source of sound undistinguished from the machine itself. And as R_3, the unanalysed whole which *is* the phenomenon, we must take the action of the machine as already somewhat idealised by analysis, i.e. in respect of its quantitatively specified effect upon the air in generating aerial impulses with

[1] Engl. Transl., published by Longmans & Co., Series I, p. 57 ff.

a measurable rapidity of succession restricted to certain limits, and in one series, or in two simultaneous series, at pleasure. *a*, the musical sound,[1] is most conveniently considered as included in R_3, but as also distinguished by anticipation and confronted with the gradually narrowing R's and their analyses as the problem to which they are all directed. Ultimately, however, *a* itself will of course be reacted upon by analysis, and will be found to include distinct elements both in kind and in degree.

If we omit, for the sake of brevity, to speak of the characteristics of quality and loudness in musical sound (and these are in fact not especially illustrated by the Siren), we find that R_3 is immediately reducible to a very simple relation, the relation of comparative rapidity of succession between series of puffs of air, which series differ in no other assignable respect. R_3 is, in other words, assumed *ad hoc* to be exhaustively analysed. Confining our attention, to begin with, to the case of a single series (and not two sounding at once) we become aware *first* of a constant relation between any given rapidity and the pitch of the note which is heard while that rapidity is maintained, and *secondly* of a relation of quasi-proportion, sufficiently explained above,[2] according to which rapidity is to rapidity in a definite numerical ratio, while pitch is to pitch in a definite recognisable relation, measurable by intervals but not made by summation of intervals. First, then, every particular rapidity is to us as an *a*, deviations from which on either side are *to it* as not-*a*, corresponding to an *a* deviations from which on either side are *to it* as not-*a*. But as each and every deviation from *a* brings a 'proportional' deviation from *a* with it, every such not-*a* is to some corresponding not-*a* as an *a* to an *a*; and we have therefore the most perfect case of negative relation between positive contents. But, secondly, when the quasi-proportional character of the two series attracts attention (which it did from the earliest times, as a fact demanding explanation, owing to the relation

[1] '*What* musical sound?' the reader may ask. I reply, *in fact* some musical sound in particular, but as a problem musical sound in general. It is impossible to particularise the sound you have heard, except as a result of advancing analysis.

[2] See p. 74, above.

of the length of strings to the notes which they sound) it becomes an essential element in the relation which constitutes R_3, and presents itself as a further determination of the mere principle 'rapidity has a constant connection with pitch', which forms the first simple a—a. We thus obtain the suggestion of a *law*, and the verification of this suggested law becomes the object of the experimental process. A law is treated just like any content a. The object is to show that a the realisation of the condition is attended by a the realisation of the consequent, and that not-a, any deviation from the consequent (ultimately perhaps a variation of the consequent), is preceded or attended by a deviation from or variation of the condition. Thus as always our goal is in the Hypothetical judgment, 'If a, then a,' with its reciprocal, 'If a, then a.'

It is further worth while to mention how the experiment in question obtains minute measurable variations of a and a at pleasure. If rapidity corresponds to pitch in a certain proportion, then two rapidities in the right proportion correspond to a definite harmony. Deviations from a harmony are recognisable by a trained ear with extreme minuteness. Helmholtz's Siren will sound two sets of impulses, of controllable rapidity, together; and in the first place by adjusting the two precisely to the proportion required by the law, it verifies the law a—a in a compound case. But then by a contrivance for very delicately, and measurably, altering the rapidity of one of the series, a slight or considerable discord can be produced at pleasure. If we were interpreting a—a as '1 : 2 gives note and octave', this result reads as a confirmatory content, 'not a—not-a,' i.e. 'deviation from 1 : 2 gives deviation from note : octave.' But of course, as before, this not-a is a case of a, rapidity corresponding to pitch, though not to two notes, one an octave above the other *because* the sets of impulses are not as 2 : 1 in rapidity.

But here, with the Siren alone, we are pretty much at an end of our analysis. That R_3 is not merely a law of rapidity in succession, but a complex theorem concerning shapes of vibrations and their decomposition into pure pendulum oscillations, related to the *quality* of a and to discordant beats in a (if a includes two notes sounding together), does

not appear from the above experiment. It would perhaps not have been suspected but for the obvious fact that an air wave must have some shape, on the one hand, and that pitch is not the only element in sound, on the other.

The point of the above illustration consists especially in displaying the various senses of not-*a*, and the various stages of its adjustment to *a*. R_1 is not-*a* in one sense, R_2 in another, and in a relative and shifting manner portions of R_3 are not-*a* also. The same applies throughout to not-*a*. Induction consists in separating the R's and in establishing those variations of *a* which appear, against any fixed starting-point, as relative not-*a*'s (and the same with *a*).

I may conclude this chapter by calling attention again to what I have insisted on in another work,[1] as the claim of an experimental apparatus to be considered in the light of a reasoning machine. It must be granted that in any logical engine whatever we have to make the conclusion, i.e. to read it off as a conclusion, and if we are to do this we may read off the connection of imperfect ratio and false harmony from the Siren as distinctly as we can read a combination of letters from Jevons' logical machine. In the operations of nature, causes have their consequences; but the causes are not precisely known, and the consequences are therefore not consequents. In experimental instruments we find the attempt made to generate actual consequences which shall also be consequents, as arising from conditions precisely known in respect of the mode and degree of their combination. Any instrument which does this may be called a reasoning machine, whether it deals with combinations and eliminations of letters as logical symbols, or with the same relations of actual number, or of any definite motions with their effects. The value of the connections thus demonstrated is of various degrees; but a complex experimental apparatus has the advantage in the synthetic variety of the contents which it exhibits as relevant to each other, if the logical machine has the advantage in the abstract generality of its formal conclusions.

[1] Knowledge and Reality, p. 327 ff. Cp. Jevons, Principles of Science, p. 282 ff.

CHAPTER V

SCIENTIFIC INDUCTION (*continued*).

Hypothesis and Postulate.

1. HYPOTHESIS is a name that may be applied to any conception by which the mind establishes relations between data of testimony, of perception, or of sense, so long as that conception is one among alternative possibilities, and is not referred to reality as a fact.

Hypothesis falls outside Postulate.

i. From Aristotle onward, indeed, logicians have been anxious to consider a hypothesis as the suggestion of a real agent—a thing or occurrence in a thing—related to the data as 'cause' to 'effect'; and to distinguish such a suggested 'agent' from a mere suggested 'reading' of the phenomena —a principle, law, or definition. Of course there is a primary difference between a material agent and an ideal law or principle, but the distinction is not ultimate in theory and appears to be, for this reason, incapable of being sustained in scientific practice. A 'working hypothesis'—and most of the great unifying conceptions of modern science are working hypotheses—is the suggestion of a real agent taken as equivalent to the suggestion of a mere law or principle. It is worth while for the sake of clearness to look at the distinction between law and real agent in a form recently given to it by Lotze, viz. as the distinction between Postulate and Hypothesis.

In the account to which I refer [1] the name of *Postulate* is given to the conditions which are absolutely and essentially involved in a given set of appearances, and apart from which 'the content of the observation with which we are dealing would contradict the laws of our thought'. These conditions, it must be observed, need not be abstract, except in the sense of being definite and precise. They might therefore, I infer, exhaust or define the nature of a real agent, in so far as a real agent is capable of being determinately known. But it is plain that as a rule they will not suffice to do so. The concrete

[1] Lotze, Logik, sect. 273.

nature of a material thing will contain much that is indifferent to the conditions precisely involved in any determinate effect.

By *hypothesis*, therefore, in this same account, is meant a conjecture which specifies the natural agents taken to be at work in a phenomenon and to be the means of fulfilling the postulate involved in it, in the case under investigation. In other cases, it is implied, the same postulate might be satisfied by means of other agents. And, it should be added, by a *fiction* is meant the reference of an effect to a cause or principle which we know to be incapable of producing it, but from the real effects of which it only differs by an error which is capable of being determinately assigned. Omitting the case of a confessed fiction, and including a fiction, not confessed to be such, under the title of a hypothesis, we may throw the remainder of our discussion into the form of an enquiry into the distinction between Hypothesis and Postulate.

The Postulate sets an abstract problem which Hypothesis has to solve in the concrete. The distinction *prima facie* coincides with that upon which Mill lays stress in his treatment of hypothesis, between a quantitative law of action, and the thing which acts according to that law. But it would certainly seem that every hypothesis in order to be established must be passed over into the content of the postulate, in the sense that, without the matter suggested in the *hypothesis*, no less than without that suggested in the Postulate, 'the content of the observations with which we are dealing would contradict the laws of our thought.' For this is ultimately the ground on which we affirm of Reality everything that we do so affirm. When the postulate is shown to contain the hypothesis, by a concrete proof that the suggested thing or fact is necessary to prevent self-contradiction in our thought, then we have a hypothesis with a *vera causa* (see ii. below). When the hypothesis is moulded into the postulate, not or not exclusively by proof of the concrete supposition, but in a great degree by attenuating its content into a 'law of action', then we have a 'working hypothesis', i.e. materially an abstract postulate, but formally a supposition of a real agent. Such a hypo-

thesis is a fiction which may or may not be a confessed fiction. In Mill's notes on Whewell [1] we see the process of attenuation at work, reducing hypotheses to fictions which are confessed by Mill and not confessed by Whewell. Modern science seems to the outsider more and more tending to substitute explanation by laws of action for causation by unknown real agents. But, in theory, a determinate agent may be involved in the postulate just as much as an abstract law, supposing that the agent is operative in the content in modes sufficiently many-sided to assign it a determinate nature. For logic, law and agent are alike conceptions by which thought constitutes the content into an organised whole; both may be 'within' the content, if we include in the content what is needed to constitute it rightly; neither can be within the content if we separate it, by an unreal and indeed impossible distinction, from the work of thought in determining it. Every object of perception is such a conception, by which data of sense are determined in a way necessary to make them intelligible.

The real distinction which Lotze should have drawn is not between the law of action and the concrete real agent, but between the concrete real agent as known to be necessary for the explanation of the observations, and such an agent as not so known, but arbitrarily imagined, or identified with something known from other sources. If we assume a thing thus arbitrarily, or on the ground of extraneous knowledge, then (considering the thing in the latter case apart from the extraneous knowledge on the ground of which it is assumed) we have the relation 'If a, then a', but not the reciprocal 'If a, then a'; i.e. in other cases other agents than a might satisfy the same postulate, or minimum of conditions, involved in a. But this unnecessary element in a hypothesis cannot of course be acquiesced in. The supposed real agent must either be elevated into the content of a postulate, or depressed into that of a fiction. Obviously, however, before deciding

[1] Mill's Logic, i, p. 335, and ii, p. 24; e.g. 'Can an agency undulate? Can there be alternate motion backwards and forwards of the particles of an agency?' Mill is maintaining in effect that Whewell's view of the imponderable agents reduces them to laws of action. He is distinguishing an *agency* from an *agent* (the ether). And compare Clifford on Causation, Lectures, &c., vol. i, p. 153.

that the latter course is the only one open to us, we must concentrate *all* available knowledge upon the supposed real agent in order to test its right to become a postulate. One science e.g. may need one aspect of it, and another another.

Hypothesis with *Vera Causa.*

ii. Thus to meet the difficulty that many characteristics of a *thing* assumed hypothetically to account for certain data are likely to fall outside what those data demand and justify, it is usual to require of a hypothesis that *a* the supposed agent shall be a *vera causa*. This can ultimately have but one meaning. It must come to this, that *a*, though containing elements which are superfluous for the explanation of *the data from which we happen to have started*, yet contains no elements which are not necessary to the explanation of *some data or other*. It is commonly said that a *vera causa* is one independently known to exist, or accessible to direct perception. Of course we do not restrict our conviction of reality to matters accessible to direct perception—the centre of the earth, the inside of a block of marble, the other side of the moon, are cases in point. And if we did attempt this restriction, what is direct perception ? All perception is inferential, and proceeds by furnishing conceptions which bring data of sense into intelligible relation. And if we require that the cause shall be independently known to exist, this is a mere question of the range of observations which it is to explain. A *vera causa* then is a thing, or occurrence in a thing, whose reality we are thoroughly convinced of from the necessity of reconciling observed data,[1] and there is no reason in the nature of things why a single science or a single range of reality should not suffice to produce such conviction. '*Direct* perception' is a mere popular phrase without logical meaning. The question is simply whether our data are determinate enough to guide us to the nature of a real thing as explaining them. What is *really* demanded in the *vera causa* is probably

[1] The most thorough and simple way of classifying matters known from testimony or history is to include them under the head of conceptions which are necessary to determine observed data, the observed data being the books, speech, &c., which bring the facts to our individual notice. As to ranking agents under the head of conceptions, I may say that this is not reducing agents to mere conceptions. As known and established to us, they *are* conceptions, though they may be more.

independent evidence of the thing's reality, with an eye to the doctrine of chances. A single coherent set of errors may vitiate a whole coherent system of appearances, but the chances against errors in *independent* sets of observations are the same as the rapidly increasing chances against coincidences of independent events.[1] This is a parody (as the doctrine of chances is always a formal parody of some material truth) of the operation of multiform data in moulding a concrete hypothesis, which will be illustrated directly.

Thus in a 'working hypothesis' we have postulate and hypothesis tending to identification by attenuation[2] of the hypothesis, in a hypothesis with *vera causa* we obtain the same result by extension of the postulate to cover the alleged cause and turn it into a *vera causa*.

Phases of Hypothesis.

2. In an ultimate sense, there is no knowledge without Hypothesis.

Rudimentary Hypothesis.

i. 'All science may be rightly described as progressive "colligation of facts" through superinduction of conceptions'[3] if it is understood that, though such conceptions are present in the real facts and are not mere additions out of our heads, yet in the progress of our knowledge such colligation does not operate upon the real facts themselves, but only on the facts as imperfectly understood by us. Thus the whole course of the present work has been an attempt to trace the progressive determination of feelings, or of facts imperfectly understood, by conceptions which may be regarded as hypotheses in course of development and proof. The continued identity of an individual, for example, which is the soul of the individual judgment, may be regarded as a conception or hypothesis which is superinduced (though without conscious reflection) upon the successive appearances which we observe, and 'colligates' these facts. And as we have seen in speaking

[1] If the chance of error in one set of data is $\frac{1}{2}$, the chance of independent error in two sets (of the same but independent liability to error) is $\frac{1}{4}$, in three $\frac{1}{8}$, and so on.

[2] A working hypothesis often, and perhaps usually, partakes of the character of a fiction, being in fact suggested as a *vera causa*, and subsequently attenuated till it is clearly not a *vera causa*, though retaining its original claim to be so.

[3] Green, Philosophical Works, ii, p. 288.

of Induction, hypothesis in a genuine sense, as a conscious activity, begins to operate where the individual judgment begins to be employed in explaining the conjunction of attributes, in conjunctive or enumerative Induction. From this point, at which Hypothesis is represented by the content of a generic or specific name, we have watched its development through analogy and through scientific analysis, till in the experiment of the Siren we found ourselves testing by determinate perceptive comparison a relation which can only be completely explained by a complex mathematical theorem.[1]

Mediate Hypothesis.

ii. Procedure by Hypothesis proper is mediate.

Hypothetical Nature of Induction.

a. It is clear from what has been said that we must assent in substance to the view of Jevons and Sigwart which is in the main that of Whewell [2] and De Morgan,[3] so far as it asserts the essential identity of Induction with procedure by Hypothesis. And indeed Mill himself might almost be reckoned on this side. He shows [4] triumphantly that the Method of Difference will test the premises of a Deduction, and the fact that the 'instances' on which it operates are in that case obtained by Deduction, he sets down as of no consequence, i.e. as not interfering with its Inductive character. But it is not so clear that this method, which unquestionably will test the consequences of a precise deduction and therefore the truth of its premises, will perform any other function that could be called Inductive. Mill's objection [5] against Whewell's hypothetical method, on the ground of insufficient provision for excluding unproved or unproveable elements of hypothesis, is an objection which arises from the impossible demand for *merely* negative and exhaustive determination. It is very probable that Whewell makes too little of the necessity for showing or for its being possible to show that *nothing but* *a* could produce *a*; but what Whewell seems to have rightly felt is that this is after all in its essence a material and positive question, depending on the degree and mode of connection between *a* and *a*, and being for logic the same as the question

[1] The theory of wave-propagation, which explains among other things the discordant beats produced by sonorous impulses which have not certain definite ratios of rapidity.

[2] See Mill's Logic, II. 24.

[3] Budget of Paradoxes, p. 49.

[4] Logic, ii. 12.

[5] See Mill's Logic, ii, p. 24.

whether *a as such* produces *a*. The possibility of proof or disproof, which is claimed as essential to the 'legitimacy' of a hypothesis, must be a material or real possibility, and reduces itself to specific presumptions that proof may be had, which are in themselves grades of proof. But while accepting the general view to which I have alluded of the importance of hypothesis in Inductive Inference, I am unable to agree with some important results which have been held to follow upon such a view.

Example of fusion between hypothesis and data.

β. I shall begin by endeavouring to lay the true doctrine very briefly before the reader, in the sense in which I understand it and in which it seems to me to follow from our previous discussions. It will then be necessary to speak of the relation between Induction in the scientific sense and the work of generalisation which is popularly ascribed to it, and I shall conclude the present chapter with some observations on the above-mentioned misapprehensions, and on the true relation of Induction to Inference as such.

The purpose of the example which I propose to analyse is to exhibit the mediate identification of a hypothetical cause, at first sight somewhat remote, with a given effect. I intentionally select an instance in which the identification is not quite perfect, in order to display the full nature of the difficulty to be overcome.

As a datum to be explained, we will take the curious fact, long known to scholars, that the Greek god Apollo, especially the Apollo of the Troad, is associated with the mouse, both in his appellation Smintheus and in recorded usages—there were sacred mice and figures of mice in his temple, and so forth.[1]

The conjunction of aspects which excites surprise in this fact is the association of an insignificant animal with the worship and the temples of a comparatively pure religion. A large choice of analogies lies open to us, any one of which might furnish some sort of mediation between these two extremes, and of these that which is at first sight the most

[1] My example and my arguments are all drawn from Mr. Lang's Custom and Myth, p. 103 ff. My purpose however only permits the most meagre reproduction of some points out of this interesting study.

remote may perhaps on a consideration of all the phenomena be considered the most hopeful.

It seems that in the Peruvian religion we find this same conjunction of aspects, the association of insignificant animals with the worship and the temples of a comparatively pure creed. And in that instance, it further appears, we have a definite and complete mediation or explanation of the two terms or 'extremes'. Before the establishment of Sun-worship by the Incas as the creed of the state, the Indians of the various tribes worshipped tribal animal gods, including all sorts of insignificant animals, the Indians of each tribe believing themselves to be descended from some one of these animals. 'After the establishment of the purer religion, the Incas had the good policy to collect all the tribal animal gods into their temples in and round Cuzco, in which the two leading gods were the Master of Life, and the Sun.' This toleration of an older and cruder in subordination to a purer faith is a very common phenomenon, as Mr. Lang truly observes, in religious evolution. And he cites an example of a festival described by Theocritus which still continues in a Catholic country.

Here then we have a content the whole of which is given (I assume) in perception or in the *proximate* interpretation of perception, viz. in history. Analogy or Induction would not commonly be held to apply within the limits of this content; but nevertheless in as far as within the single 'instance' or range of reality—which is really the life of a whole nation—a *principle* is detected by our thought, there is operative what constitutes the essence of inductive as of all other inference. But no details have to be referred to reality solely on the strength of the principle, because it happens that they are all warranted by testimony.[1]

Now if the content which perplexed us in Greek religious history fell *bona fide* within the lines of the content thus warranted and interpreted in Peruvian religion, no inference

[1] It is probable, and appears I think from Mr. Lang's account, that the interpretation even of the known succession in Peru into an intelligible evolution would involve, as almost every interpretation does, some remodelling and supplementation of details. So far we have inference in the popular sense.

would be necessary, or rather, the purely formal inference which recognised the identification would suffice to include the Greek problem under the same solution as that which supplies itself for the Peruvian problem. But the very slight and superficial abstraction which is all that we have thus far formulated of the Greek problem can warrant no such material identification—so far as we have yet stated the point, almost any hypothesis might explain it; the misunderstanding of a name, or the caprice of a priest or king. What we must now do is to look in the Greek problem for the facts and relations of which we have seen the significance in the Peruvian problem. But as historical data such facts and relations are wanting; and here we have the essential difference between Induction by analysis of Perception, and Induction by mediate Hypothesis. Our hypothesis is *prima facie* a conjectural matter of fact falling wholly outside the content which has to be explained. The view which I wish to illustrate is that our proof of the hypothesis must ultimately depend upon the characteristic positive connection between the hypothesis and its consequences. This connection is as we have seen elucidated and purged of irrelevancy by the establishment of limiting negations, but is not otherwise dependent on the disproof of an indefinite number of alternative hypotheses, and is no more restricted to mere probability than is the determination of any perceived data by any conception which makes them intelligible.[1]

We have before us, as a datum of fact, a surprising conjunction between Apollo and the mouse, especially in Apollo's temple. We have as a suggested fact which might explain this conjunction, a previous state of Greek or neighbouring tribes in which they worshipped animals such as the mouse, together with a religious evolution in which the earlier cult survived by the side of the later and purer worship. According to the ordinary process of Induction as inverse Deduction,

[1] Contrast with this the mechanical views of Jevons, Principles of Science, p. 152, and Sigwart, Logik, ii, p. 357. Jevons thinks that no proof by Imperfect Induction (Induction falling short of complete enumeration) can be more than probable. Sigwart thinks that a hypothesis is refuted by refuting its consequences, but not proved by establishing them, though it grows in probability as its consequences agree with the facts.

we proceed to 'deduce the consequences which might be inferred from the hypothesis'.

In drawing consequences from a hypothetical state of facts we have to apply that state of facts to the reality on the basis of which it is supposed, and to examine in detail the results of the combination. This analysis of the content of the hypothesis is not a contrivance of demonstration, but an inevitable necessity of knowledge. In working out, for example, the hypothesis now before us, we must take into account the customs relating to marriage and to names which belong to that phase of savage life which we are conjecturally imputing to the Greek race in the past. Among savages named after tribal animals which they worship and bear as name or emblem, and from which they trace their descent, the members of one family do not intermarry with people bearing the same name or emblem, and the children of every marriage take the mother's name or emblem (totem). These names consequently tend to become scattered throughout a large region, and are associated with the well-known phenomenon, for which in very early society there are obvious grounds, of counting kinship through the mother and not through the father. On the other hand, when this state of society passes away, as in European nations it has passed away, it is plain that a powerful family will crush out the names of the other families in a district, and form a local tribe called by an animal name. From this hypothesis thus analysed, if applied to 'mouse families', there follow primarily four results, which briefly stated amount to this:—

(1) There would be places named from mice, and mice will be held sacred in those places. This was so in the Troad.

(2) The mouse-name would be given locally to the god who superseded the mouse. This was so in the places called after the mouse.

(3) The figure of the mouse would be associated with the god in his temple, and used as a badge or local mark in places where the mouse had been venerated. The former usage was found, and the latter was not uncommon, in Greece.

(4) Stories would be told in the district in question to explain the worship of the mouse. This was so in the Troad.

I do not say that these four points, thus baldly stated, carry us very far. But in so far as they support the hypothesis at all, they do so not merely as an arrangement of coincidences due more probably, in a calculable degree, to a single cause than to independent unknown causes; but, like an arrangement of results *which some person has the power and a strong motive to produce*, they support the conjectural cause by the material connection of the data with it, or a material extension of the data towards including it. One of the above points for example is the appearance of the figure of a mouse as a badge or city emblem in Greece. This, when referred to an actual race of men exceedingly conservative in its customs, is a point, though a trifling one, actually in common between hypothesis and data. The badge or crest of a city is not the same thing as the totem of a family, but the connection of parts of cities with local tribes is too well made out in Greece and elsewhere to give us pause. And the veneration of an animal by the people of a city in ways strikingly analogous to totem worship is made out in the case of Egyptian cities. Of course this point *may* be otherwise explained than by the suggested hypothesis, and so may all the others; but they all, as referred to the life of a race, demand some explanation, and the only difficulty is to model that explanation rightly. It is this idea, that of moulding a hypothesis, that should be substituted for the idea of gauging its probability as something attaching to its definite and irrevocable form. To meet paradox by paradox, rather than admit that a hypothesis can only be established by the refutation of infinite others [1] and the non-refutation of itself, I would maintain that *of every set of data some positive hypothesis* (viz. that 'something or other' conditions these data) *is within our knowledge demonstrably true*, and that the problem of induction by the inverse method or by hypothesis is merely to further determine this 'something or other'. In this work of definition, as we have abundantly seen, negation is all-important; but it must be motived and relevant nega-

[1] This is the root of the idea that no results of hypothetical Induction can be certain. The idea is ridiculous when it is once seen that hypothetical Induction is identical in principle with common perception and with all Inference whatever.

tion, ' not *this*, because *that*, which has a determinate relation to this.'

I should weary the reader by further discussion of the mouse hypothesis, which moreover space forbids me to treat in its interesting details. But I must point out that by considering the peculiar marriage customs (e.g. maternal kinship), sacrificial and festival rites, and animistic beliefs, which are traceable throughout Greek life, and which are characteristic of the primitive phase that forms the content of our hypothesis, we can remodel hypothesis and data once more, and this time into a really intimate approximation to each other. Hypothesis and data approach amalgamation in the conception of a finely gifted race still bearing in its prime the traces of a natural though characteristic evolution out of a savage past. We might almost claim that a savage phase of life is a *vera causa*, apart from the proof of our special hypothesis,[1] not only in the Peruvian but in the Greek race. Is not the conception of a past and natural evolution, in the case of *any* race of men which we may be considering, a conception ' apart from which the content of the observation with which we are dealing would contradict the laws of our thought ' ? But if so, then, according to the distinction accepted above, the conception, *although* that of a real agent or event, is a postulate and not a mere hypothesis, and therefore is the conception of a *vera causa* ; and the work of induction is, as said above, to assign to the postulate in detail its actual content or law of action.

Other hypotheses, independent of that which the author advocates, are carefully dealt with in the chapter from which I have been quoting. And I think that any one who considers the matter in the light of this or any equally genuine piece of research must feel that just in so far as the adverse hypotheses are independent, their refutation, although a *sine qua non* of the establishment of the hypothesis advocated, can never genuinely contribute to that establishment. In other words, the refutation of other hypotheses is a genuine assistance to one hypothesis only when it elicits positive content which goes to model this latter hypothesis.

Before leaving this subject I must refer back to the dis-

[1] Every hypothesis *when proved* is a hypothesis with *vera causa*.

cussion of Book I [1] on cause and ground, and must explain that the content of a hypothesis may correspond, according to the degree of its purity or relevance, to any member of the series there described; to cause, to effect, to antecedent, consequent, or ground. The reason for treating an example in which the popular sense of cause is dominant was simply that the equally popular sense of hypothesis, from which the theoretical difficulty of its use arises, corresponds to the popular sense of cause (or effect). The more scientific type of hypothesis approaches more nearly *prima facie* to the nature of a postulate or ground—of a principle included in the facts, or of a systematic reality which they constitute. And hypotheses which are, to begin with, of this type do not present the great apparent difficulty of passing by sheer inference from isolated data to actual things and facts not included in them. As we have seen, a hypothesis which to begin with is not of this type, necessarily tends, in course of demonstration, to approximate to it; just as, in the case which we tried to analyse, certain isolated data and isolated suggestions about the Greek race tended to coalesce into a systematic conception of that race as developing in a normal fashion under the natural influences and conditions which appear to be common to mankind.

Generalisation.

3. It is unquestionably the case, that a process or result which may be termed Generalisation is somehow connected with Induction. The only question is how to state the connection.

'From many to all' exploded.

i. I trust that the popular idea according to which Induction is a process from what happens often to what happens always, from particulars to the totality of particulars, has been set in its true light by the whole scheme of our account of Induction. The conception, to which unhappily Professor Jevons adhered, of Perfect and Imperfect Induction as corresponding to complete and incomplete enumeration is hopelessly fallacious. It cannot, I think, be necessary to pursue this error at the present stage.

By mere determination.

ii. There is a sense in which all abstraction, i.e. all becoming conscious of the determination of sensuous data by explicit

[1] Chap. VI.

conceptions, operates as Generalisation. Such generalisation is embodied in the hypothetical judgment, which of course is not hypothetical *qua* judgment and is in no sense a hypothesis, but is an affirmation, based upon a reality illustrated by a hypothesis. The explicit conditions forming a determinate case which, as the antecedent in the hypothetical judgment, illustrate or qualify Reality, take the consequent with them wherever they go, and in this sense the judgment is general, absolute, or universal. Supposing the judgment to be absolutely true—and formally we can suppose nothing else of a judgment which we make, though of natural phenomena no judgments are absolutely true—it is absolutely universal. Varieties of detail may fall within it, but they do not affect it. Against such unessential variations, and against mere number of examples in time and space, the explicit antecedent appears as general, and in selecting and defining it a work of generalisation has practically been accomplished. There is no advance from known to unknown in the strict sense of the case we are now considering. There is no advance from known to unknown in saying that a pair of parallel straight lines which you may intend to draw to-morrow will never meet. If the ' intent and purpose ' of the antecedent ' hath full relation ' to the example to be adduced, there is *prima facie* no inference, no extension, no advance, in affirming the consequent true of that example.

A still stronger and a far more important case of such *generalisation by mere determination* is afforded by mediate or inverse induction through hypothesis. A hypothesis is a hypothesis because it is not to begin with present in the data, and has to be brought there by mediation. But to supply matter for modelling a conception which is not furnished by mere direct interpretation of sense, i.e. by perception or by testimony, a set of data must have wide range and be capable of a high degree of systematic inter-relation. Thus e.g. in an anthropological hypothesis about the past of the Hellenic race a considerable portion of the history of Europe is ultimately involved, and the data bearing on it are inter-related and elucidated.

In this sense a hypothesis or mediately obtained determination of observations by a conception superinduced upon

them, is likely to involve as a result an elucidation and articulation of a wide range of reality. Sparta and Athens, Crete and the Troad, Sicily and Magna Graecia, all fall within the region of reality which through determination of our knowledge about it by the anthropological hypothesis in question would acquire for us a certain set of highly important common properties and relations. Here the generalisation results from the range of the explicit system, and not from the mere abstract precision of a hypothetical antecedent. What we are systematising is a reality, and the judgment which expresses our conclusion may indeed, like all precise judgments, be thrown into hypothetical form, but its content makes it really categorical. In it therefore we have two kinds of generalisation, one depending on the range of the system which we have constituted, the other on the hypothetical abstractness which makes even this concrete system a case, within the lines of which systems differing from it in other relations may conceivably fall.

Material or Analogical Generalisation.

iii. The generalisation that falls within the limits of strictly scientific Induction is confined to what has just been described as Generalisation by mere determination. It is not generalisation in the sense of an advance from the known to the unknown. Obviously there can in no case be such an advance except in the sense that the unknown becomes known. And this advance is made in the determination itself; the case, when determined, is known, and is generalised in so far only as it is known. Water is composed of oxygen and hydrogen in certain proportions. There is no further generalisation in applying this to water such as we have analysed; and if there could be a doubt whether a certain liquid was in that sense 'water', the judgment gained by previous analysis would not *prima facie* determine it. The hypothetical character of this judgment is an automatic apparatus for excluding material generalisation. In the extreme instance of such exclusion the antecedent 'water' is little more than a name, to which 'composed of oxygen' &c. supplies the content. Then if 'composed of oxygen' &c. is not true in a particular case, that case *ipso facto* falls outside the hypothetical judgment. Or in a less extreme instance, 'water' may indicate certain

visible or other properties which are synthetically related in the judgment to the chemical composition. But here again the least variation in those index-properties may formally throw the case in which it occurs outside the hypothetical judgment.

This is all very well so long as we interpret the hypothetical judgment to be strictly hypothetical abstract or necessary. But the account given in Book I of the Universal Judgment in its sub-forms of Corporate and Generic Judgment reminds us that we have a Categorical element to deal with in the characteristic nature which binds things together into ideal or actual totalities, and we have to face the possibility that the nature of these totalities may conflict with the content of hypothetical judgments in which they are set down as antecedents. Every universal is an identity in difference, and the identification of the conditions by which inductive enquiry has determined a content is not, as we assumed just now, a purely formal activity, but is, like every judgment, a synthetic and material operation. Reliance on the accuracy of our analysis will lead us back to a Lockeian formalism, if we neglect the identification of the data analysed. 'Man is rational, because if a creature turns out not to be rational, it is not what we called a man,' is an argument which, unless specifically justified, has no more content than A is A because we called it A. If no distinct elements are fixed within the synthesis, the synthesis itself is destroyed. But on the other hand, if we affirm our analysis directly of a generic content which is categorically taken and includes a system of differences, it is clear that we are pledging ourselves to a material generalisation. Does 'water' for example, in the judgment above cited, include steam and ice? Apart from specific chemical knowledge, I do not see how we could predict that it would do so. And if we say 'water' for chemical science *is* matter of a certain composition, whether in a liquid, solid or vaporous state, then we have got back to the nominalist judgment criticised above; '*a* is *xy* because what is not *xy* is not called *a*.'

I do not mean to say that the above considerations are of serious importance in precise scientific induction, in which the

definition of the data as elements in a synthetic relation is always a primary problem. But *either* in popular applications of science—the most fertile of all sources of fallacy—*or* in provinces of knowledge which are largely dealt with by analogy, it is essential to bear in mind that the identification of the datum, which has been analysed or determined by a conception, with either the popular import or the analogical generic content of that datum, is always a matter involving a material synthesis and not a mere formal recognition. Where indeed the precise determinate conditions of a phenomenon are explicitly recognisable, there the identification of the phenomenon is a formal act, and the hypothetical judgment applies *ipso facto*. But where, as is constantly the case in practice, and, *owing to the nature of a universal, always in theory*, the conditions are not unambiguously recognisable, but only either a *part* of them, or a *case* of them, or an *index-mark* of them can be discovered, then we must form a synthetic judgment of identification or distinction, based on the general principles which we have seen to govern argument by analogy, viz. on the reality of a system of recognisable types and purposes.

Apart from such a material assumption the truth of principles derived from Scientific Induction itself would be practically though not theoretically destroyed.[1] A system of unapparent deviations in the properties of natural objects, such as to defy classification, might be such as to destroy the applicability, while not interfering with the formal truth, of hypothetical judgments. In our earlier discussions on the hypothetical and categorical aspect of judgments, it was conceded that the *pure* hypothetical judgment does not allege the existence of the elements which it explicitly puts in relation. But it is also clear that no ordinary result of Induction ought to be taken *bonâ fide* as a judgment of this type. A judgment which cannot be denied but which has no range of real application has only abstract and not concrete truth. If all our knowledge were of this character, as *qua* mere determination it conceivably might be, it would have no hold upon reality.

[1] i.e. would be destroyed for concrete and real theory, but not for abstract and formal theory.

So long indeed as the variations of natural objects observed a continuous and mutually coherent progression, we should only have a state of things not unlike the system of animated nature, which would be in some respects favourable to knowledge by the clearness with which it would mark the course of evolution, and might not be incompatible with human life. But it is easy of course to imagine varieties in fundamental properties of substances not indicated by external appearance, which though following strictly from natural antecedents, and not in any way miraculous, would yet be incompatible with such a degree of knowledge as is necessary to maintain human life on the surface of the globe. No analysis of water would help us, however true under the conditions under which it was made, if something which we could not distinguish from water except by renewed chemical analysis were liable to arise out of water by a concealed process of causation, and were endowed with the properties of sulphuric acid. No formal principle will meet this conceivable difficulty. Many distinctions all-important for human life *are* only learnt by degrees or are only drawn with imperfect success—e.g. between pure water or milk and the same liquids when contaminated with sewage-poison. We can only say that *if* we are to live on the surface of the globe the results of scientific induction must not only have formal or hypothetical truth, but must also have that degree and proportion of categorical application which is necessary to enable us to adapt ourselves to the environment. This degree of categorical application, of which mere determination, except in the case of an extended system of reality like the Hellenic race, or Europe, or the British Constitution, or the Solar System, can tell us nothing whatever, measures the work of recognition or of generalisation which is over and above the work of generalisation by mere determination. When I say ' Water is composed of Oxygen and Hydrogen ', I must mean by water, not necessarily all, but some large proportion of what I commonly take to be water. If not, my judgment, however true in the abstract, fails to grasp reality in the concrete.

The ideal of knowledge, no doubt, is not in this analogical generalisation, but in the second and larger kind of generali-

sation by mere determination, viz. in the progressive reduction of reality to a single system or to comprehensive single systems. It must be remembered, too, that the synthetic nature of every universal or identity is double-edged. If all sets of conditions have to be recognised and interpreted as universals, all sets of conditions should be fixed and determined in the inductive analysis as universals—i.e. with the full prevision that differences, variations, extreme cases, will arise within them. Nevertheless, it seldom happens even in geometry that a principle when first established is established in its full content and application. Inductive analysis can never make full provision for the application to fresh cases of a principle which it discovers, except in as far as it discloses the nature of a comprehensive *individual* system of Reality within which other individuals fall.

4. Our results as regards Induction are then as follows.

General view of Induction.

i. Our view of Induction as an inverse process differs essentially from that of Jevons by its dependence on material and positive connections, which are only defined by negation. Inverse procedure by hypothesis is for him essentially a matter of probability, and depends on the exclusion of alternative hypothesis simply *qua* alternatives, i.e. ultimately on the statement of chances[1] or the number of cases out of all conceivable cases which are in favour of the result in question upon the hypothesis proposed. This view essentially depends upon the false conception of generalisation which has been frequently alluded to, and according to which the ideal of Induction is perfect Induction, i.e. the summation of an infinite series. As we have seen,[2] the statement of chances admits of valuable and extended application where we are dealing with classes of unknown conditions, i.e. conditions known to us simply as furnishing such and such numbers of 'equal alternatives'; and in astronomical and other exact science it is justified by the splendid success of its results. I will venture however to point out, in respect of one example adduced by Jevons, that other considerations seem to have contributed

Difference from Jevons.

[1] Sigwart seems to waver between this view, and the true view of proof by content. Logik, ii, pp. 428 ff. E. Tr. ii. 308.

[2] p. 135, supra.

to the inference beyond those which fairly arise out of the statement of chances. Kirchoff's proof of the presence of iron in the sun [1] depends upon the exclusion of the alternative that the 60 dark lines of the solar spectrum coincide *by chance* with the 60 bright lines of the incandescent vapour of iron. The probability of a chance coincidence being (from the distance between the lines on the spectrum) about $\frac{1}{2}$ for each line, the probability in favour of a chance coincidence for all 60 lines is about $(\frac{1}{2})^{60}$, i.e. less than one in a trillion. 'But on the other hypothesis,' Jevons continues, 'that iron exists in the Sun, it is highly probable that such coincidences would be observed.' Here the proof seems to appeal to some of the considerations which belong to the positive connection between given content and hypothesis, or to material generalisation, or to both. Why should '*the* other hypothesis' be 'that iron exists in the Sun'? The answer must be, I should suppose, either that the 60 bright lines have a connection with the nature of iron, as *a characteristic* or exclusive differentia, which would dispense with the proof by calculation—or that though there is no exclusive connection between the nature of iron and the production of 60 bright lines, yet *in fact* no known substance but iron produces such lines, *and* it is very improbable on general grounds that a substance unknown to us but sharing this property with iron is present in the Sun.[2] The former of these considerations would belong to the nature of true Inductive determination, the latter group to the postulates of material generalisation. The real function of number and ratio in Induction has been sufficiently illustrated above.

Ultimate nature of Induction.

ii. After the discussion on p. 117 above of the connection between Induction and other inference, I need only sum up the view which I have taken in a very few words. Induction is

[1] Jevons, Principles of Science, p. 245.

[2] The fraction $(\frac{1}{2})^{60}$ represents, I suppose, the chance of 60 coincident cases all produced by independent causes; but ought we not also to consider the probability not merely of one unknown cause producing all the cases, and that cause being iron, but that of all the possible alternatives in which 2, 3 and so on up to 58 inclusive, of the coincident cases, are produced by a single unknown cause, and the remainder in each alternative by accident?

not a species of inference, as calculation, geometrical reasoning, analogy and subsumption, are species of inference. It has not, that is to say, for its differentia any peculiar nature in the universal which carries the conclusion. It is consequently, like Comparison or Recognition, like Observation or Experiment, a transient and external characteristic of inference. An Inductive proof, when completed, may be a geometrical construction or an arithmetical calculation, an articulate subsumption or a morphological analogy. Its Inductive character belongs exclusively to the process of discovery, and depends on the relation between the elements of the content and the qualification of reality from which the process of cognition starts. Inferential connection is one, and is necessary and invariable; but the points at which a single and coherent system may be in contact with the real world as known to an individual cognitive subject are infinitely various. From these points, whatever they may be, the cognitive subject has to build up the single and coherent system, which he then refers to reality. When these points are isolated perceptions, occurrences or qualities, then the task of building up the system which they necessitate is called Induction.

Inductive proof rests, like all Inference, on systematic and necessary connection of content. How many observations, what experiments, how many and how favourable conjunctions of phenomena, may be needed to disclose the connection to us, is, as Aristotle implied in the Posterior Analytics,[1] theoretically indifferent. The observations do not give us the connection, but we judge the connection on the basis of the system demanded by the observations, and this systematic or reasoned judgment is the essence of the proof.

Is a principle then proved by the number and variety of its verified consequences? It gains nothing from any repetition of identical consequences once established to be fact; but variety of consequences may be said to prove it by displaying its nature as actual and modelling it into concrete identity with themselves. I incline to think that the truth upon this

[1] Anal. post., p. 90, a. 24; cp. p. 87, b. 39; and see the author's Knowledge and Reality, p. 285.

point is best stated through the paradox proposed above.[1] Every fact, every sense-perception, every datum of testimony, absolutely and irrevocably proves *something* and necessitates the assumption of *some* agent or principle. Repetition of the same datum, *qua* the same (i.e. assuming that it was completely and correctly observed at first, which is *never true*), can add nothing to what it proves. But every further datum which can be connected with the first goes to develop the content of that agent or principle which both the data prove. If therefore we speak of the mere proof that *something or other beyond the datum* must be assumed, one datum is as good as a host to prove this, and the proof of it is absolute at first ; and to allege variety and range of data as contributory to *this* proof is to fall once more into the fallacy of generalisation from number of instances. What is proved once does not need to be proved again. Every datum proves irrefragably the reality of the system to which it belongs, *whatever that may be.*

But this representation of the matter, though it leads up to the truth, is in itself a paradox without real import. A proof which proves the reality merely of something or other is a proof of nothing at all. But if we speak of the proof of a determinate agent or principle or real system, then both range and variety of data are essential to the proof, and the proof of the whole is not absolute at once, and therefore the proof of any part, *as a part in that whole,* is not absolute at once. For the proof depends upon the intelligibility with which the hypothesis—to use the terms explained above—is adjusted to or included in the postulate ; that is to say, with which the alleged real system is identified with the real something demanded by all the data taken together. And from the nature of knowledge as a system the necessity of this synthetic connection can only be evident in an extended range of applications ; and hence it is—not from number of consequences, but from the varied determinations which are indispensable to define any universal in its inter-connected differences, that range and variety of data are contributory to the proof of a hypothesis.[2] Thus we

[1] p. 161.

[2] I am omitting, to avoid confusion, the consideration of repeated observation as eliminating accidental errors, which depends on the

may say, if we like, that variety and range of data contribute nothing to the proof of a hypothesis, but only aid in its definition.[a] But we must then bear in mind that the proof to which range does not contribute, and which each isolated datum effects absolutely and ultimately, is a proof of something in general, but of nothing in particular.

Induction, then, is the reference to reality of a system on the ground of particular differences within it by which reality is taken as qualified; and may involve, in the constitution of the system for knowledge and in its identification with those differences, any process known to Logic. It is essentially an advance from the Individual or concrete Generic judgment to the pure hypothetical, or to its higher form, the Disjunctive judgment. When we are able to start from a reality qualified to us by pure hypothetical or by disjunctive judgments, then we can go at once from the differences as in the universal to the relations of other differences, and we can refer these differences to reality on the basis of the universal itself which is accepted as real. We do not in this case employ species of inference unknown to Induction; but the process in which we employ them has not the peculiar relation to given Reality, e.g. the gradual emergence of negative determination, which constitutes Induction.

principle of chances illustrated above. Accidental errors are errors arising from a variety of unknown causes. Repeated observation distinguishes series such as are likely to be due to a single cause, from series likely to be due to unknown causes.

[a] It is a good way of stating how far a hypothesis is proved to ask ourselves what we should have to disbelieve if we disbelieved it. The more it is efficient as an interpretation of the data, eliciting and depending on their individualities, the more difficult it is to disbelieve it without disbelieving the data, or at least without disbelieving a certain reading and colouring of them which *ex hypothesi* is included in their verification. The proof that 'nothing else can explain them so well' is really dependent on this reading and colouring of them expanding into the detail of the hypothesis, not on the detached destruction of competing hypotheses. And then of course the wider the range of the data, the more difficult it is in turn to disbelieve *them*, without disbelieving the whole of the rest of our experience. There can be no doubt I think in principle that true conclusions—data as deduced—support their premises.

ON DEFECTIVE FORMULATION OF THE INDUCTIVE PRINCIPLE

Inference and Repetition.

iii. A point which I have touched upon above, relating to the basis of Induction, has recently been brought into prominence by the attitude of M. Bergson, with the imitation and repetition theorists whom he appears to follow,[a] to the creative and constructive activity of the intellect. I cite a typical passage (*Évolution Créatrice*, p. 218): 'L'intelligence a pour fonction essentiel de lier le meme au meme, et il n'y a entièrement adaptable aux cadres de l'intelligence que les faits qui se répètent.'

'Same cause, same effect.'

a. Such a statement is in the sharpest possible conflict with the view of intellectual activity which to many of us seems natural and obvious. But when we refer to the most accredited expositions of the logical theory of Induction, which attempts to deal with the characteristic working of the scientific intelligence in the advancement of natural knowledge, we find them dominated by ideas which appear to justify M. Bergson's position. What I wish to attempt is a brief reconsideration of the exact meaning and function of these ideas in Inductive Logic.

The basis of Induction is usually stated in some such formula as 'Same cause, same effect'. It is unnecessary for our present purpose to raise the questions connected with the converse formula, 'Same effect, same cause.' It is enough to understand the simplest truism of Identity, that a thing does what it is its nature to do under given conditions,[b] and cannot do otherwise except by some change in the conditions; from which it follows, that if, in an alleged causal nexus, the alleged effect is sometimes absent while the alleged cause is present, *ceteris paribus*, it is impossible that the alleged cause should be the real cause of the effect in question. The principle is sound, beyond any doubt, as far as it goes. It is, in fact, nothing more than can be read off from the law of non-contradiction, as formulated, for example, by Plato. The same thing cannot behave differently to the same thing in the same relation. If

[a] Cp. Tarde, Les Lois de l'Imitation, p. 15. 'Il n'y a de science ... que des quantités et des accroissements, ou, en termes plus généraux, des similitudes et des répétitions phénoménales.'

[b] Cf. Mr. Joseph's Introduction to Logic, chap. xix.

it seems to do so (Plato's condition 'at the same time' is superfluous), you can infer that there is a difference in the supposed agent. The same, so far as *it* is concerned (i. e. if no condition is altered) produces the same; what produces something different, out of itself, is not the same. If this much is not to be assumed, we cannot treat anything as having an assignable nature. Truth ceases to have a meaning. Anything might behave anyhow.

Now it is from this law or truism that, according to current logical theory, the fundamental Inductive test of causal connection is derived. The Inductive process is thus regarded as one of elimination.[a] You have before you, it is assumed, one or more suggested connections of cause and effect, and you labour to eliminate from among them all alleged causes that are present in the absence of effects with which they claim to be connected. Such elimination leaves, it is presumed, a surviving statement which approaches more and more closely to a true, i. e. an invariable, causal connection. The principle is simply that which M. Bergson refers to: What is the same, does the same; if the same product is not there, the same agent is not there. The same produces the same. And yet, if this were all, we should have a difficulty in denying M. Bergson's doctrine which I began by stating. It *would* then seem to be the case that the essential work of the intellect lies in binding the same to the same, and that the true type of the logical universal—the essence of cognition—is, as M. Bergson says, the relation of an abstract statement to examples which repeat its tenor wholly without variation. That water boils at sea level at 212° Fahr. would be such a generality; and according to the number of instances in which people boiling their kettles at or near sea level[b] found

[a] The rules of elimination which depend on the further principle, 'Same effect, same cause' (i. e. on the exclusion of plurality of causes), rest merely on a more precise consideration of the ideal of identity, which it is not necessary to take account of in order to understand the point at issue in this discussion. See Joseph, chap. xxii.

[b] I am satisfied to take a case in which strictly accurate repetition is all but impossible, because it illustrates the real fact, which is that the interest of the generality lies in the differences which it binds together. A *strict* repetition could have no interest at all.

the water to be about 212°, would be its rank and power as a piece of knowledge.

This a tautology.

β. But why *should* we deny M. Bergson's doctrine? Perhaps it may be the truth. As a *primâ facie* answer to this suggestion, we need only refer to such a criticism of tautology as we find, for example, in Mr. Bradley's *Principles of Logic*.[a]

M. Bergson's doctrine is logically bound to deny not only the advance from one truth or connection of fact to another, but the possibility of apprehending or of uttering any significant truth at all. It may appear that this criticism is exaggerated, because the doctrine explicitly treats (so far as I am aware) as outside the principle of the intelligence, only the difference between the corresponding terms of one nexus and those of another nexus, and not the difference between the terms themselves—alleged cause and alleged effect—which are constituents of a single nexus. But there is no escape by this road. If tautology is the principle of the intelligence, the connection of any two distinct terms, say, as cause and effect, stands on the same ground as the connection between two different connections. With tautological identity as the principle of intelligence, all systematic coherence, between term and term, equally as between judgment and judgment, inevitably vanishes.

But in fact there is (i) some misinterpretation involved in setting up the principle 'Same produces same' as the dominant principle of scientific Induction and as governing the nature of the generalisation which is the aim of that process; although

(ii) I admit and maintain that the current logical statement of the theory of Induction lays itself open to this misinterpretation. The view which I have taken above[b] indicates, I believe, the right theoretical direction, with its consequence as regards the place of elimination of erroneous hypotheses in drawing Inductive conclusions. But I hope that the point will be made clearer by a few additional remarks.

Its meaning.

(i) When you postulate as the basis of Inductive Inference, the principle 'Same cause, same effect', you do not mean that

[a] e.g. p. 29. [b] p. 164.

the effect is the same as the cause.[a] They must be different, if the relation of cause and effect is to be worth establishing. You do mean (α) that assuming the truth of an alleged causal nexus A—B, it only applies in cases which are absolute repetitions of it, i.e. where you have exactly the same A as before without any variation; and (β) that in examining the truth of an alleged causal nexus A—B, your rule must be that if you find a case in which, *ceteris paribus*, B is different (o or B_1) and A is unvaried, your alleged causal nexus A—B is disproved. For if it were true, the same cause would be producing, *ceteris paribus*, two different effects, which is impossible. (If A is plural, or rather, various, and B singular, this is not literally a case excluded by the formula 'Same cause, &c.', which is strictly taken silent about it, i.e. about plurality of causes, and no negative inference follows, unless we are making what usually counts as an additional postulate 'Same effect, same cause').

What you mean by 'Same produces same', then, is an assertion that the cause, in a nexus guaranteed by this principle, is unvarying compared with itself, and the effect unvarying compared with *it*self. You imply no comparison between cause and effect.

And your principle makes no suggestion towards the estimation of any possible cause and effect allied to or developed out of those forming the nexus whose truth we assume to be accepted. According to a proper interpretation of the word 'same' some such expansion would be permissible, passing from a—b to a—β and from a—β to A—B. But what makes it impossible is the demand for a methodic rule. Plainly there cannot be a general rule that will tell how much variation in your cause and effect, each from each, will be justified under the principle 'Same cause, same effect'. And therefore, if you want a rule, you must take one which justifies no variation at all, and makes your 'generalisation' cover nothing but sheer repetitions, and degrades your procedure

[a] In a remote sense some such meaning might be assigned to the true Inductive principle which I desire to see established, and it may be that some hint of this possibility prevents the formula under discussion from seeming as naked as it really is. Its strict meaning can only be that stated in the text.

in connecting the same with the same into one which admits of no novelty or true inference.

But the two types of connection thus disregarded, that of cause and effect, and that of any generalisation and its more advanced but kindred form, really contain the very life and mainspring of Inductive thought. How the suggestion of the effect B issues from the fact of the cause A ; or how the more complex and advanced *a* (*def*)—*b* (*xyz*) came to be substituted for the cruder A—B ; this is where the real work of the scientific intelligence lies. This is the work of invention or discovery, of which the imitation and repetition theorists, whom M. Bergson appears to me to follow, have never succeeded in giving any serious account.[a] It is the process by which isolated observations are built up into a science, through an assignment of conditions which is always becoming more systematically complete on the one hand, and more relevantly precise on the other. Examples of such an inventive pursuit of a universal relation would be the rise of the science of acoustics out of the old observation that the pitch of musical notes has a ratio comparable with that of the lengths of the stretched strings which produce them ; or the development and limitation of the conception of equi-potentiality as applied to organic growth in recent embryology. Here we have the plain fact, that it is the essential character of intelligence to bind different to different in binding same to same ; and that it is for the former character that the latter is valuable, and, indeed, it is through the former only that the latter can exist. But the sameness here in question is not the sameness of M. Bergson's doctrine or of the formal Inductive test. We can see this from the nature of its aim. The universality or generality, which is the goal of such a process, is not the relation of the terms of an abstract judgment, term for term, each to each, to the terms of repeated cases which fall under it. It is the relation of the different terms of a judgment to each other, or of an organised system of conditions, representing a certain range of experience (e. g. our experience of musical sound or of embryonic growth), to the several connected factors or conditions, whether constant or varying, which it embodies and explains. Its universality

[a] Cf. especially Bergson, Évolution, p. 177.

is not measured by millions of repeated instances, but by depth and complexity of insight into a sub-system of the world.

(ii) The logical theory of Induction gives but scanty attention to this work of the universal in suggesting and pursuing new connections, because, for good logical reasons, that is, because of the individuality of truth, it cannot be reduced, like the eliminative test, to something like a formal rule. Nevertheless, this work is the true spirit and mainspring of the inductive advance of knowledge ; and to disregard it, while insisting on an eliminative test, is an error analogous to demanding a general criterion of truth. But truth has no criterion except the fuller truth. And the real interest of logical theory in the advance of knowledge is to note how, by the analysis and purification of its conditions, a perception passes into an organised system of understanding. True Spirit of Induction.

The existing connections or universals with which the mind is stored, act as clues among the new experiences which confront us, selecting those that are kindred or complementary, and inventing new systematic ideas after the manner of what have been called proportional systems, and by means of relative suggestion.[a] That is to say, that an existing connection of thought, when confronted with new matter, is able to reproduce itself in a new form which is at once appropriate to the new matter, and continuous with the connection as previously thought. This is not a question of reproducing objects of thought which have previously been connected in the mind. It is a question of continuing some elements of such a connection into new forms of nexus, because the connection between the new objects has a real kinship with the connection between the old, although differentiated by the nature of the new objects themselves, and made, as a connection, something new, and not a repetition of what it was before, like the

[a] Cp. Stout, Anal. Psych., II, p. 80. I note that Professor Stout here observes that relative suggestion ' would not of itself enable (the discoverer) to fix in exact detail the special variations '. In the case he is dealing with, calculation was necessary. In our instance from embryology, observation is necessary. But it seems to me that the question what calculation ? what observation ? is answered by the governing idea in both cases, and the relevant conclusions are selected by it, and it is it that they develop.

continuation of a varying curve from the datum of a given fragment of it.[a] Such a continuation is plainly not a repetition, and I think that in view of the current theory of Inductive generalisation, the notion of repetition as a condition of knowledge is not meant to apply to such an inventive construction as that of which I am speaking.

Let us look at an example. In recent embryological discussions,[b] covering the old ground of preformation and epigenesis, we read of experiments which *primâ facie* suggest two precisely opposite causal connections.

Half an ovum, we are told, in certain cases will produce only half an embryo ; but in other cases the half ovum may develop into a perfect embryo. The former fact suggests a complete preformation of the organism, each part of it in a fixed part of the ovum ; the latter suggests that the ovum has a structure of which ' every part may become anything '. It is of great logical interest to look at the course which these two alleged types of connection have imposed upon Inductive research. Sheer prelocalised preformation is an idea, it would seem, that the experiments undertaken to confirm it immediately destroy. And if a universal nexus had no power of developing into novelty, this check would have been checkmate, and the idea would have been dead. But a universal can take on new shapes as demanded by new matter ; and though, as it seems, the ' mosaic theory ' (of the independent preformation of parts) must be abandoned in its rigid shape, yet the most various experiments on the tissues of organisms in later stages have shown that some of these are necessary to the development of some organs, and that therefore something essential to special development (perhaps ' organ-forming substances ') is preformed, though not necessarily pre-localised. The logical interest is, that the idea of preformation, defeated in its primary and rigid shape, has been able to act as a clue to new experiments in a different region, such as to confirm it when restated in a more subtle and flexible form.

So with the idea that every part of the ovum has the capacity

[a] Cp. Bradley's Principles of Logic, p. 281 ff.

[b] My example is drawn from Driesch's Gifford Lectures and Jenkinson's Experimental Embryology.

of becoming a whole. It is easily seen that this capacity is limited, and is sooner or later lost; but the idea of the kind of causation at work modifies itself according to the limitations which are discovered, and seems to suggest new lines of research which promise to account both for the capacity, and for its limitation and arrest. And the logical interest is, that by means of this suggestion, that of 'organ-forming substances' and their distribution, it appears as if the two universals in question, 'preformation' and 'epigenesis', might coalesce in an idea different from either, but satisfying the requirements of both.

Of course I am offering no opinion upon the value of these investigations. I only adduce them as striking examples of the ordinary course of a universal in its Inductive development. What works throughout is a continuity through differences; and its value is in the differences it connects. This is throughout the essence of creation and invention, which permeates the whole of life, and so everyday a process as the use of language is a striking example of it. No one ever used the same word twice in precisely the same sense; in 'finding the right word' there is always a creative effort.

Now the general rules of Inductive elimination, based on 'Same produces same', are simply the minimum negative criterion of truth, and can do by themselves no Inductive work at all. To rely on them alone is to reduce Induction to trial and error.[a]

The True Principle.

γ. Thus, I do not think it is true to say that 'Same cause, same effect,' is the basal principle of Induction; and if this is so, there ceases to be any ground for maintaining that it is the essential function of the intelligence to connect the same with the same. The true principle I should rather state in some

[a] It is a subtlety that in fact the underlying positive nature of negation often asserts itself, and the 'just-not *a* gives just-not *b*' affords a positive extension of the nature of *a* and *b* respectively, which may be theoretically valuable, see above, p. 134. Thus in Driesch's Tubularia experiment, it is now alleged, the capacities of different cells are just not equal, as they just belong to different elements of the body. And this suggests that differentiation is present in a certain degree—a positive correction and extension of Driesch's conclusion. Driesch, Gifford Lectures, I. p. 128, and Jenkinson, Experimental Embryology, p. 292 n.

such form as that every universal nexus tends to continue itself inventively in new matter. It is true that to guide this process we can have no general criterion, because, as we have said already, the only criterion of truth is the fuller truth—the science at a more developed stage. And, therefore, there can be no rules for it, and it tends to drop out of logical theory. But none the less, it is this process to which the whole positive construction or invention of our inductive knowledge is due; while the principle 'Same produces same' can only eliminate what, having been suggested, is found on further trial not to produce the minimum characteristic of a real nexus. We have seen, indeed,[a] how a good experiment may sometimes reveal a correlation of serial variations, which is in itself a positive expansion of the suggested nexus. But this is only incidental to the strict process of Inductive Elimination.

The neglect of the positive continuity between differences as the inventive factor in Induction appears to me to show itself in the doctrine that Inductive progress consists strictly in mere elimination of the unfit,[b] in reducing the number of nexuses that can claim the position of the true invariable law. This doctrine seems to me to subordinate the more important process and element of proof, because it can have no abstract criterion, to the less important, which is nothing but an abstract criterion. But if the aim of logic is not to give rules of practice, but to understand the nature of knowledge, this ground of subordination is invalid, and it remains true that the mainspring of inductive advance in natural knowledge, as of knowledge in general, is the power of ideas to make experience coherent, and that therefore the demand of continuity between term and term or between nexus and nexus—of a positive explanatory character attaching to the nexus—is a fundamental requirement of inductive science, which is in fact merely an elementary stage of knowledge, and shares all its positive characters.[c]

Developing the Nexus.

4. The modification outlined above in the idea of Inductive

[a] P. 175 and p. 181 footnote.

[b] See Bradley's criticism of one form of Disjunctive reasoning, Principles of Logic, p. 515, and above, p. 156.

[c] But see Mr. Joseph's example from the discontinuity between

universality or generalisation follows from this conception. The value of an Inductive conclusion, as of any piece of knowledge, lies in the amount of reality which it enables us to grasp, and this is very slightly tested by the number of cases in which the nexus is repeated in fact. And if the idea of identical repetition could be realised (which it cannot, for every so-called repetition is differenced by a new context) the frequency of recurrence would have no connection with universality at all.

What is here advocated as the true view of Inductive advance has been suggested by Green's treatment of logical theory,[a] and has in some degree been embodied in the present work, at the point [b] where it dealt with true Inductive generalisation as consisting in the range of differing data and conditions welded into a system by any investigation, as contrasted with the number of recurrent cases which may fall under a single abstract statement; and there is a definite logical necessity for making the former type of universal the goal to which the latter is a halfway house or less. For, as Plato [c] pointed out and as Mr. Bradley [d] has recently emphasised, statements of fact (implicit statements of nexus), but slightly hedged with conditions, must always be at the mercy of unexpressed factors for their truth or falsehood. They tumble backwards and forwards between 'is' and 'is not'; Plato's famous expression, which Mr. Bradley's argument in the passage just referred to strictly and precisely justifies. The remedy, as Mr. Bradley says, is to get the conditions into the subject; and this means either an explicit or an implicit reference to a complete system.[e]

physical cause and psychical effect, p. 453. I believe, however, that more could be done than is usually done to remove this discontinuity, though of course there can be no resolution of the ultimate difference of kind. But I suggest that a consideration of the way in which elements of brain-excitement reinforce and modify each other, would have made impossible the defects, say, of Kant's ethical doctrine. An idea unsupported by outlets of activity could not be a powerful idea, and therefore not one ethically fitted to be paramount.

[a] Works, ii, pp. 288–90. [b] Above, pp. 164 and 169.

[c] Rep., p. 479, *c*. [d] Mind, No. 72, p. 499.

[e] See above, i, p. 245, for judgments which imply, though they do not expressly include, a relevant scientific system.

The normal and natural working of intelligence, then, is creative and constructive, tending towards the concrete and to continuity within differences. The universality which is its mainspring is in itself a nisus to the concrete. This operative continuity is not represented by the linkage of the same to the same. Its law—the law of intelligence—is not the law of Identity, unless the law of Identity is construed in a way that takes it deep into the postulates of organic systematisation.[a] And phenomena which should merely repeat themselves would present an absolute barrier to the central nexus of the intellect. Mere repetition, in fact, if it were possible, would be incompatible with understanding.

I am, therefore, still confident that the restriction of Inductive proof to the disqualification of competing hypotheses is a fundamental error of principle.[b] What really works in the proof is the same as what works in the discovery, the power, that is, of an idea to harmonise experience. No doubt the hypothesis which best satisfies this condition would also be the least likely to fall a victim to the rule of elimination. But yet, theoretically speaking, if accepted for this latter reason, it is accepted, so it seems to me, for the wrong reason, and its value as knowledge is not genuinely apprehended. But this point is only incidental to my discussion, and I will not pursue it here.

[a] See below, ii, pp. 210–11.

[b] I am afraid that here I find myself in opposition to Mr. Joseph, whose Logic I greatly admire. And I must add that I cannot at all follow Mr. Lindsay's comment on the above remarks (The Philosophy of Bergson, p. 230), 'When we say, this is like A, and ∴ its effect will be like B, we are applying a result of that insight [viz. the insight that A causes B] and we are concerned with A′ only in so far as it resembles A. This implies that A′ repeats A, for its difference with A must for our purpose be ignored.' Mr. Lindsay has no doubt considered the relation of this statement to the conception of inference as a development of universals into their differences. But I really cannot understand it. Let A be a given depth of corolla-tube, seen to condition B, the length of an insect's proboscis. In applying this insight to A′, in which the depth is different, how can we ignore the difference? Or would Mr. Lindsay contend that no universals can be developed into definite new applications except in quantitative law? But this would surely be an extraordinary thesis. *All* non-mathematical inference, except perhaps pure subsumption, would be abandoned. For nature of universals see especially Bradley's Logic 281 ff. For further instances Stout Anal. Psych. l. c., or above 180; cp. also p. 192.

CHAPTER VI

Concrete Systematic Inference

A PURE hypothetical judgment, the outcome of scientific Induction or the embodiment of abstract relations in combination, expresses a synthetic connection based upon an underlying real system. Analogical inference, from which scientific Induction was a divergence, depended rather upon an estimate, usually inadequate, of such real systems in their concrete import. Now if, as a result of a highly exhaustive Scientific Induction taken together with an Analogical reasoning, we are able to recombine the abstract relations which the former has disclosed one by one, into a single totality which has an obvious significance, then this totality or system is the real determinate ground of each separate relational judgment that enters into our conception of it, and belongs, at the same time, to the concrete or categorical type of knowledge. For the ground which warrants a hypothetical judgment is in the last resort always a real system, and moreover the content of every judgment is understood [1] to have such Reality as it is capable of.

Philosophical Substitution.

1. Therefore, in dealing with totalities which are thus thoroughly concrete and thoroughly rational, we are able to advance from the figure of analogy 'A and C are B, therefore A is probably C', to the first figure of the Aristotelian syllogism, 'A is B, B is C, therefore A is C.'

In spite of all that has been written about and against the syllogism, I can find no more simple and natural expression than this for the reasoned judgment which embodies a *real necessity*. Thus applied, the syllogism is subsumptive in so far as it appeals to unity of relations within a concrete subject, but has abandoned the differentia of subsumption proper, in so far as the definite form taken by the result of the appeal depends on intelligible coherence and not on mysterious con-

[1] See Bk. I, chap. ii, on Categorical and Hypothetical Judgment.

junction. It is essential to such arguments that the teleological or quasi-teleological unity of the subject, which in analogy was conjectural and obscure, should be absolute and explicit. It is only this absoluteness that can warrant the position of the middle term as subject in one premise, i.e. as a qualification which prescribes the precise content affirmed of it in the predication. It is only this explicitness that can justify by a specific[1] necessity the determinate relations which the unity of the subject imposes on the two extremes. The conditions thus demanded can only be fulfilled in subjects the nature of which is known as a definitely organised system. We saw indeed, in the earlier discussions of Book I,[2] that such a system cannot avoid presenting quantitative relations between its parts, in as far as its pervading unity contains within itself differences of a common quality. But in a true concrete individuality such quantitative relations are secondary, resulting from the nature of the system but not exhausting it, and therefore the system, although definitely intelligible, cannot be 'constructed' by geometrical or numerical combination. Such combinations may however enter into it in various degrees. Judgments which deal with these concrete individualities are at once individual and universal, and have been analysed in Book I as a combination of these characters.[3]

Fluid though the distinctions between types of inference necessarily are, it will be convenient to distinguish the important class of inferences now before us by an unmistakeable differentia, at the risk of unduly limiting their province. This differentia is the ascription of *real teleology* to the content analysed. And by real teleology I mean the embodiment or operation of a conscious purpose entertained by a human intelligence. All other teleological inferences, such as those depending upon the *de facto* teleology (quasi-teleology) of the organic world are most conveniently relegated to the category of analogy.

The lowest case of real teleology is closely akin to that

[1] See Bk. II, chap. i, on specific necessity of Judgments.

[2] See Bk. I, chap. iii.

[3] See on the Corporate Judgment and the Individual Generic Judgment, above, Bk. I, chap. v.

which was the highest case of analogy. A tool, instrument, or machine, of which we know the use intended by the maker, furnishes this lowest case of real teleology, while any object of the same class the use of which we could only conjecture, furnished the highest case of quasi-teleology or analogy. It was in part from the example of an instrument contrived by human intelligence that Plato introduced the conception of function or final cause into philosophy;[1] and the ultimate meaning of 'organism' is a system of tools or instruments. The term 'mechanical' in its modern philosophical acceptation abstracts from one-half of the import of 'machine'; for though we are accustomed to think of *mechanical* determination as a resultant of any *de facto* combination of forces, yet we are not accustomed to think of a *machine* except as a combination of forces for a purpose consciously entertained.

At first sight, then, we have in the tool, instrument or machine with known purpose, an adequate example of the type of knowledge before us. 'A screw that is meant to turn one way only must have its head cut so as to give the screw-driver no purchase when turning the other way; a coffin-screw is a screw meant to turn one way only; therefore a coffin-screw is one which has its head cut,' &c., &c. Or again: 'A locomotive engine meant to drag a weight a at a velocity b must have boiler-space x and cylinder-stroke between the limits z and z_1; a locomotive which is to work in the Newcastle coal traffic must drag a weight a, &c., &c.; therefore a locomotive which is to work this traffic must be constructed as above determined.'

It will strike the reader however on looking at such examples as these that the premises are very closely allied to hypothetical judgments, and are much more 'constructive' than 'subsumptive'. It is true that in the analysis of a machine the inference does rest on the *system* of the mechanical combination,

[1] Republic, end of Bk. I: δρεπάνῳ τῷ ἐπὶ τοῦτο εἰργασθέντι. The examples alleged by Plato in this important passage are of very different values, and are well worth careful attention. The well-known description of the function of a thing as ὃ ἂν ἢ μόνῳ ἐκείνῳ ποιῇ τις ἢ ἄριστα leans to *de facto* teleology, and would not of course protect an object from a function alien to its nature but relative to human purpose. *Such* a function could justify no analogy.

and that this system with all the details dependent on it can, *in a machine that works well,* be deduced from the intellectual purpose which the constructor proposed to himself to realise in that mechanical combination. So far, as reading the significance of the parts in the coherent whole without which they would lose it, the inference is subsumptive. On the other hand, all tools or machines are liable to initial or acquired mal-adaptation. Their *de facto* function or actual result may diverge from their intended function. And when this comes to pass, their existence as mechanical combinations is not thereby terminated. A clock that has a hopelessly variable rate may not, philosophically speaking, be rightly called a clock (being absolutely useless to indicate time), but it remains a real mechanical combination in which co-operating parts produce a necessary result. In other words, though a machine embodies a purpose, yet it only embodies it in a mechanical form, dependent, that is, on the right adjustment of a mechanical combination, and therefore on the continuance of that right adjustment. Therefore in every such inference there might be substituted for the statement of purpose a statement of the mechanical system in which the purpose is supposed to be realised; and as the purpose is only present in the actual system of adjustment, and not as an intellectual idea, such an analysis would be in one sense adequate to the nature of the object analysed. *Such* inference might fairly be treated as employing merely hypothetical judgment and constructive combination, taking no account of any significant unity in the content of inference, or of any special relation between it and the real world. The system would, by such a transformation, have forfeited its individuality and have become a mere necessary sequence of relations upon relations in the abstract world of force and mass, instead of an actual whole in the unique structure which we call reality. It must be noted however that the limitation or abstraction which is needed to make such an account intelligible, has by the change supposed become merely arbitrary. *Qua* mechanical result, every cinder that dropped from the fire-box and every cloud of vapour blown from the funnel would have as good a right to be described and deduced

from the mechanical combination which makes up the locomotive, as would the capacity of the engine in the way of traction.

'But the purpose may be hypothetically inserted into the inference, as indeed was done above.' We may state a purpose or any other content hypothetically, if we indicate that by intentional abstraction we are doing so. I only say that, apart from any mark of forcible abstraction from reality, a judgment or inference that deals with a system having unity in a purpose presupposes the reality of that system because its content is adequate to reality, while a judgment which merely draws the necessary consequences of a determinate combination of forces, without reference to any purpose to which that combination is directed, is essentially hypothetical, for the particular combination has no pre-eminent individuality or *raison d'être*; and essentially imperfect, because in the absence of a *raison d'être* there is nothing to guide the selection of aspects or of consequences. In *this sense* the hypothetical, the arbitrary, and the merely mechanical coincide.

In the distinction between a machine which serves a purpose, and a machine which does not, we have in a nut-shell the question of categories. Both are actual mechanical combinations producing results, and neither has in it one whit more life or intellect than the other. But it is perfectly clear that our understanding of the useful one is incomplete if by preserving our ignorance of its purpose we remain on the same level of apprehension with reference to it which is the highest we can possibly attain with reference to the other. And it is absurd to say that the category so implied is an accidental aspect and does not represent a fact. It is true however that this category of purpose does not exist within a mechanical system in its proper or intellectual form, and that therefore the system can be regarded by a natural abstraction as on a level with a purposeless combination, and may by internal or external changes at any moment become such. This hypothetical aspect of a combination of forces, in virtue of which it produces its resultant according to fixed necessities and in complete indifference to any purpose, is the purely 'mechanical' relation of a machine, and if exclusively pressed

home destroys as we saw all possibility of regarding it as an individual thing having its unity in a function.

Beginning with the mechanical contrivances of which we have been speaking, there extend upwards in a series which forms the content of philosophy the phases and embodiments of man's intelligence and conscious will. All of these, the individual will with its complement in the moral order of society, the product of fine art, and the religious or philosophical system, are totalities which combine an explicit intellectual unity with determinate interdependence of parts. The statement of the general character of these embodiments of mind may serve as an example of the argument we are considering. 'The mind is a unity of reciprocally determinate but not reciprocally exclusive parts. A feeling is an element in the mind; therefore a feeling enters into a unity of reciprocally determinate but not reciprocally exclusive parts.' Or again: 'The British Constitution is in its main features determined by the thoroughgoing application of ordinary law; the position of the prime minister is a function of the British Constitution; therefore the position of the prime minister is in its main features determined by the thoroughgoing application of the ordinary law.' Or, finally: 'The general will is expressed in the moral order of society; the individual will finds its freedom in the general will; therefore the individual will finds its freedom in the moral order of society.'

When we consider the logical nature of such arguments as these, we notice two obvious characteristics of the content, and one, resulting from them, of the form.

Logical Content. Real System.

i. In respect of their logical content they are at once categorical and hypothetical. *a*. The systems which form the content of such reasoned judgments as these are naturally taken as real systems in virtue of their individuality. It is of course not impossible to construct a political or religious system on paper the consequences of which are laid down in hypothetical judgments and inferences from them, which in form might be identical with such judgments as are here employed. The content of such judgments has an indeterminate place in reality so far as it has a meaning or objective reference, and depends on determinate reality so far as it

proceeds to affirm actual consequences. But the content of a judgment which deals with an individual system is taken as real in our world unless the contrary is indicated; and even in hypothetical judgments that depend on the nature of the human mind, the real ground which would have to be made explicit in order ultimately to justify the consequences drawn is the intelligible and concrete system of that mind itself. *Primâ facie*, therefore, we are dealing in these arguments with categorical judgments about reality, which explicitly postulate the real grounds that in the hypothetical judgment were latent.

Apodeictic Sequence.

β. The nexus of the inferences in question is not, as in Analogical Reasoning and in Enumerative Induction, devoid of strict apodeictic sequence. The systems of which we have been speaking, although they need not be capable of mechanical, numerical or geometrical construction,—which however, as in the case of a machine, may play their part in the analysis of the concrete whole,—are nevertheless invested with hypothetical or apodeictic necessity in two forms; in the relation of their parts one to another within the systems themselves as wholes, and in their own *ultimate* relation as parts to the unique system of reality as a whole.

Of these the former is for our logical purpose the more important. Within such a whole as the normal order of civilised society, regarded as the expression of the general will, it is obvious that there are parts united by necessary relations dependent on the nature of that whole and capable of being expressed in hypothetical judgments if we abstract from the explicit assumption of the whole itself. We may say, for example, 'If a right, then a duty.' The justification of this statement would be given by the affirmation, as a real ground, of the moral purpose involved in the moral order, which purpose exhibits itself as right or duty according to the attitude which the individual will may assume towards it. Such an inference as this does not cease to be necessary when its ground, in this case the moral purpose and moral order, is affirmed to be real. The basis of the synthetic transition is here as everywhere the nature of an identity or universal, and that the universal is affirmed to be fact makes no dif-

ference to its apodeictic force. What in particular that apodeictic force may be, how it should come to pass that one thing can necessitate another, depends, as I have said before, on the ultimate fact of the nature of knowledge. What we have more particularly to observe at this point is the coarseness of the illusion that systematic necessity can only exist in spatial and numerical perception. Given the relation of man's intelligent will to an actual moral order, the relation of right and duty is as plain a consequence as, given the nature of space, the equality of vertical angles. And apart from a given reality, there is in either case nothing, from which nothing can follow.

Hence we arrive at the second aspect in which individual systems, though real, are nevertheless hypothetical. They are each and all of them, for us, hypothetical upon the *whole* given reality within which they exist. When we speak of a thing as real, we imply that it is complete and self-existent; for if it is not, its reality includes a condition beyond the content which we have included in the thing, and *it* therefore, *as we have formulated it*, not including the conditions essential to its own reality, is falsely asserted to be real.

Here we have the aspect of relativity which prevails throughout our knowledge, which is increasingly overcome by the work of intelligence in as far as it connects the actual and intellectual world into an organised whole, but is never thoroughly done away.

Logical Form. Syllogism in fig. 1.

ii. As regards the form of these inferences, it follows from what has been said that the only value of the syllogistic arrangement is to exhibit the structure of the reasoned judgment, which itself contains or displays the articulated universal. No question arises as to which premise we know first, and so which supports the other. The prior or previous phase of the inference is not the proof of detached premises, but the entire thought in a less precisely articulated form. If we are urged to say whether we know the major, the minor or the conclusion first, the only true answer is that, in their full import, we know them all simultaneously. As detached fragments of experience we may know any one of them first. And as each element of the universal when rightly under-

stood involves the others in their full determinateness, there can be no real difference in kind of import between major and minor premises, and no reason for preferring one order of the terms to another. The order will in fact be subjective, depending upon the qualification of reality which we take as starting-point, whether in time—if our inference has the accidental aspect of a progress in time—or because of its individual nature. The real purpose is the dominant essence of the universal, but the real purpose may be taken as conveyed by the general idea of the system in question as a whole, represented by its *name*, or as involved in the analytic scheme of its parts, or as concentrated into some special application by which some one part does the work of the whole. And thus any one of these elements of the universal may stand as the middle term in reasoning, i.e. as the ground or universal *par excellence*. Hence there is no use in considering the syllogistic rules at the point we have now reached. They belong to calculative and in some degree to analogical argument; but the postulate on which they rest, of the absence of reciprocal determination between the elements of inference, does not hold good of a coherent system when thoroughly known. We have thus arrived at a goal analogous to that attained by the theories of Quantification and of Equation in judgment, at a perfect reciprocal identity between the elements of the reasoned judgment, so that any one of the terms may occupy any place in the argument. But we have attained it, as we hope, without sacrificing difference to identity, and thereby destroying the identity itself. The equational form, though it symbolises correctly certain results of the reasoned judgment (the conjunctions which this judgment in fact involves), yet crushes into shapelessness its true living texture, and, as a simple sign of the deformation, forbids all growth and reconstruction within the inference itself, which reconstruction nevertheless, as we have seen and shall further see, cannot be avoided.

As a particular case of the inapplicability of the syllogistic rules to the inferences now before us, it may be mentioned that we have here nothing to do with inference from negative premises. We must take the negative form to have

done its work and obtained positive significance, in the process which we have watched of constituting such a system as that which we are now considering. We are now considering these systems as real grounds, and so with reference to what falls within them, and not with reference to what falls outside them. For to what falls outside the system itself, unless with reference to a further system including that 'outside', the system can *ex hypothesi* only be related in the way of bare negation that has no import and is no judgment. In analysing the completion of a type of knowledge it is vain to raise a question which would take us back to the beginning of the course we have traversed. But as a determining agency *within* a real system, and as invested by that function with positive import, negation reappears in disjunctive reasoning.

Disjunction and Disjunctive Reasoning.

2. The nature of disjunction and its imperfect forms have been discussed under the head of the disjunctive judgment, and it only remains here to recapitulate the inferential nature of this the most complete and explicit form of the universal.

Inference under a disjunction is usually represented thus: 'A is either B or C, A is not B ∴ A is C;' or, 'A is B ∴ A is not C.' Yet such an inference has no meaning except in the case of a disjunction of ignorance or a disjunction referred to a point of time. The categorical minor premise adds nothing whatever in the way of content to the disjunctive major premise. It only has meaning as resolving a doubt or as affirming one member of an alternative to be true in a given point of time. This defect could not be removed by specifying in the minor the ground on which that one member of the alternative is affirmed, for this ground cannot really fall outside the content of the disjunction and its specification can only throw a doubt on the categorical nature (in the narrower sense) of the minor premise itself. 'The signal is either danger or safety; it is red and so danger ∴ not safety.' Obviously here, if we can conclude from 'red' to 'danger' in the minor premise, this relation must fall within the knowledge which constitutes the major; and moreover, by introducing a specific ground of assertion it exposes the minor to a charge of being hypothetical.

We saw in treating of the disjunctive judgment that the

disjunction of ignorance and the disjunction referred to time are not cases fundamentally distinct from the true disjunction of knowledge, being justified, in as far as they are justified, by the same type of knowledge which forms the basis and content of disjunction proper. Only, being limited by an accidental condition (the speaker's knowledge, or an arbitrary point of time), they lend themselves to an appearance of progressive inference through supplementation by a perceptive or narrative judgment, which applies them under a limiting condition without expressing that condition. In the true disjunction, which expresses the organisation of a system as such, the reference to an arbitrary condition falls away, and although the judgment is capable of inferential application under specified conditions, whether of time or of other kinds, yet this application is not essential to its import, and is not demanded by its form.

We are thus driven to the paradoxical conclusion that the essence of disjunctive argument is included within the disjunctive 'major premise'; in other words, that this judgment is in fact not a mere premise but at once a categorical judgment and a complete systematic inference, in which the content of a real system, thoroughly understood, is developed in its reciprocal positive and negative bearings. The universal, or pervading identity, is developed in it as a system of *a*'s and '*just* not *a*'s',[1] such that in virtue of every 'not *a*' the system is positively determined to a certain definite *a*, and in virtue of every *a* the system is negatively determined to a certain definite not-*a* (which is *b*). Our ideal of inferential knowledge does not go beyond an individual system of this kind, of which every part is mediated in its turn by all the other parts and assigned by them its appropriate place in the whole, whose pervading nature is present in every part and prescribes the arrangement and content of all. Such a system contains its own applications, for the material conditions under which it developes its nature are given within it. The mere realisation of one alternative member as fact or as a point in time, e. g. in present perception, has in relation to such disjunctive knowledge the aspect of a case brought under it by an

[1] See account of Scientific Induction, chap. iv, above.

unknown condition, and so implies a defect in the disjunctive knowledge itself. For if there is no such defect, then perception or testimony can add nothing to the *necessary reality* embodied in the disjunction. A watch is either going or not going; and I do not need observation or testimony to tell me that at any time when the mainspring is broken it is not going. 'But your disjunctive knowledge will not tell you beforehand or apart from observation whether the mainspring *is* broken.' I reply, 'Oh yes it will, *up to the limits to which it extends*.' It will tell me the signs of breaking, the risks of breaking, the limit of breaking-strain; and therefore, supposing my knowledge of the world were disjunctively complete, it would tell me exactly when and how often the mainspring has been or will be broken. That it does not practically tell me this is not owing to the defectiveness of disjunctive knowledge but to my not possessing it. Therefore, as in all the affairs of life, I have to supplement scientific knowledge from testimony and unorganised observation, i.e. observation of what occurs under conditions not precisely known. But this observation, *qua* unorganised, adds nothing to knowledge, though in fact every content that is distinctly observed has necessarily *some* organisation, and leaves the disjunctive judgment a little richer than before. But as mere abstract position or affirmation of a case fully known before, it adds in theory no element whatever to our disjunctive knowledge of a real system.

Therefore the disjunctive judgment must be taken to correspond not to the major premise of the syllogism, but to the whole syllogism. The syllogism must tell us, for instance, that the human will, being an activity of the human intelligence, sets its purposes before it in the form of definite ideas. The disjunction would in this case perhaps tell us that the human animal asserts himself practically either through the intelligence as will or through the sensuous instincts as appetite; or again, that he asserts himself through the intelligence either practically as will or theoretically as knowledge. Here we obviously have the whole content of the syllogistic 'reasoned judgment' but in a more elaborate and more thoroughly articulate form. It is clear that the whole conclusion, in so far as it is a conclusion that grasps scientific

truth as the definition of a real system, falls within this disjunctive judgment. The application of it in a special historical case can be of no importance, unless the new example suggests new matter for the definition of the term involved; in which case the content of the example must be taken up into the disjunctive judgment.

I need hardly remark that it need not be an objection against a disjunction of this class that the determinations of the system do not exclude one another in time. The essential point is to know how the system in question, e.g. the mind, is organised into parts which as such exclude one another. I am not prepared or concerned to deny that will and appetite may coexist in a mixed state of mind, or even that appetite may be included in will; but in as far as the mind merely has appetite, it does not will, and in as far as the mind distinctly wills, it has not mere appetite. The disjunction would only be false if appetite and will were essentially identical parts of the mental system, and not, *so far as the mind enters wholly into either*, reciprocally exclusive.[1]

'Then mere differents are disjunctively opposed?' Yes, *if the conditions are precisely assigned under which the real subject becomes capable of the one and incapable of the other.* A 'conjunction' or conjunctive judgment about a single subject differs from a disjunction merely by the non-assignment of the precise relations under which the various determinations attach. Thus it is, as Plato showed, that knowledge can solve the apparent contradictions of the perceptive judgment. 'A is both great and small.' Knowledge distinguishes cases and explains, 'A is compared either with x and then is great or with y and then is small.'[2]

The inferential principle of Disjunction is nothing more than the principle of all inference in its most explicit form. Every matter capable of being known consists in a common nature including within it and constituted by parts or differences, which are related to one another at first sight negatively

[1] Appetite, when it enters into will, must surrender its character as mere appetite, not merely by the addition of something else, but by taking on a new character in itself.

[2] See Plato, Republic, p. 524.

qua excluding one another, but further, through this very negation, are related positively because by their negative relation they positively determine one another. Every such matter when explicitly stated in articulate form, is known as a disjunctive judgment. And this is the nature of the ultimate judgment by which the individual consciousness sustains its real world. The simplest cases of these reasoned judgments are to be found in the spatial perception, in which the determining differences take the shape of parts external to each other and so negatively related, but nevertheless by their position determining one another, and so through their negative relation positively related. But the most perfect cases are those intellectual creations that are the objects of philosophical science, in which the whole system not merely appears by its common nature in parts which remain external to each other, but tends to throw itself in its entirety into each of these differences, passing by an organic necessity from one difference to another. Here, in short, the differences are not merely parts which remain outside one another, not merely phases which succeed one another, but moments which succeed one another so that the earlier are retained in the later through a progressive development, and yet the distinctive character of each moment is not weakened. Such, for example, is the relation of the conceptions which by their development constitute the history of philosophy.

It is usual to treat of classification as one special form, among others, of logical thought. I am unable to regard it in this light. It appears to me to be merely an external consequence, reappearing in every kind of universal, of the relation between universal and differences. The nearest approach to pure classification is therefore to be found in superficial arrangements destined merely to facilitate reference, in the dictionary, the index, the Linnæan system. After this come the natural or morphological systems of botany and zoology, in which the universal appears though not explicitly, yet effectively, through analogy. While in mathematical conceptions as in the true systematic disjunction we have classification relegated to its proper place, as a corollary of the comprehensive application of explanatory theory.

3. By introducing into logic the real or conscious teleology of the human intelligence, we have rendered unavoidable some consideration of the judgment of value, which rests upon the correspondence of a real system and the purpose for which it exists. This judgment obviously presupposes two conditions; i. our knowledge of the purpose for which a system exists, and ii. our knowledge of the degree in which the system fulfils that purpose. The judgment of Value.

i. The former condition demands a real teleology;[a] that is, a conscious purpose for which the system is intentionally recognised or maintained by the human will. We cannot here enter upon the questions, belonging to ethical science, which arise with reference to the objective justification of man's recognition of a purpose in the non-intellectual world. Indeed we cannot avoid extending such questions in some degree to the world of man's own volition by admitting that e.g. the systems of law and government which appear *prima facie* to be made and maintained by man with a view to a purpose which he consciously sets before him, have nevertheless an element of growth or development which goes beyond the knowledge or intention of any single individuals at any time concerned in framing them. The works of mind, in short, are something more, as the works of nature are something less, than the intentional achievements of any individual will, and therefore our estimate of their value is in many respects analogous to that recognition of a purpose which we apply so fallibly to natural objects. We may however—for we must—assume on the whole that the persistent purposes of mankind are represented within our own intelligence, and that therefore in our estimate of law and morality, of art and religion, of political and social institutions, there is at any rate some firm foundation of real teleology. Real Teleology.

ii. The second condition demands *mediation*. We have to ascertain whether a whole fulfils its purpose by comparing the Mediation.

[a] See above, p. 99 note, on the defect of the conception of teleology, with the removal of which, however, it ceases to be teleology. The standard of value should rather be expressed as Individuality, and the condition, which many would insist on, that value involves a feeling mind, is satisfied by the consideration that a feeling mind is necessary to individuality.

operation of its mechanism with the idea which is intended to be its essence. This mediation was involved in the philosophical syllogism, in so far as the purpose of the whole was taken to be its essence or unity. But after analysing, in the disjunction, the matter of the universal into a system of reciprocally determined parts and moments, we have forced upon us the question whether the totality of these parts or moments corresponds in detail to the purpose with which we credit it. Such correspondence is what we understand by goodness or value. We may say for instance of a given social system that under it the people are either aristocrats who are not the best and do not rule, or a proletariate who pay no honour to those above them and who cannot be ruled. And this contradiction between the effect of the system as realised in its parts, and its recognised purpose, entitles us to say that it is a bad system; in the form '*a* being either ξ not *x* or ζ not *z* is not A.'

Extra-logical as this judgment of value may seem to be, it is really implied in the constitution of knowledge from the point at which quasi-teleology begins, and with it the conception of 'a thing' takes its rise.[a] I shall have to return to this subject in the last chapter when I come to speak of the ultimate nature of dialectical or logical necessity to which the term æsthetic has sometimes been applied.

The main features of Inference.

4. Inference was first defined on p. 1 as the 'mediate reference of an ideal content to Reality', and further explained on p. 3 as 'the indirect reference to reality of differences within a universal, by means of the exhibition of this universal in differences directly referred to reality'. And we have gone throughout on the principle that the species of inference are determined by the species of universal which occur in the realm of knowledge. Having attempted to analyse these species, and to point out their affinities and their distinctions, we have not much more to say about the nature of inference.

But it may be useful by way of recapitulation to read off from the somewhat tedious treatment to which we have subjected the phases of inference a few answers to the vexed questions which concern it.

[a] See note on previous page. If we replace the conception of teleology by that of individuality, the judgment of value will appear, as it ought, inherently logical, in the sense of Plato's ἀλήθεια and οὐσία.

i. Is the syllogism a complete antecedent scheme, prescribing the shape and outcome of every possible inference? ii. Is there any fundamental set of conditions to which all Inference must conform, and further, iii. what relation does the syllogism bear to such a set of conditions?

No antecedent scheme of Inference.

i. There is no such thing as an antecedent scheme prescribing, so to speak, a set of schedules in one or other of which every argument can be written out merely by filling up the blanks. The form of knowledge is an active and constructive principle, to the workings of which no abstract type antecedently prescribed can be adequate. Not merely is Logic incapable of passing judgment on actual truth, but it is incapable of prescribing beforehand the type of relations which an inferential totality may impose upon its parts. Granting that where we are dealing with imperfect subsumption, with the relations of attributes conjoined in individual subjects according to unknown grounds, the syllogism is able to anticipate the very indefinite form of combination that can result, yet we should not dream of claiming for it this capacity of prediction in the region of calculation, of mechanical or geometrical construction, or of philosophical subsumption. It is true that as regards the last-named process we found a type of reasoning which appeared to represent it adequately in the syllogism in Barbara. But the reader must have observed in the examples which were given, if judged by the standard of formal logic, that irritating inaccuracy of form which is known to teachers in the first attempts of pupils to construct a precise syllogism. In our examples and in their efforts this inaccuracy is due to the same cause; to the difficulty of moulding the vital and constructive action of thought into shapes prescribed by an artificial scheme, which does not precisely correspond to any single type of intellectual action. The violent transformations by which formal logic attains this end are not perhaps an undesirable scholastic exercise; for they unquestionably drag into light, though only as a meagre and skeleton framework, a certain ultimate community of type in all inferential operations. In so far as the difficulties of pupils arise from inability to transform or translate their intellectual operations *at all*, any exercise which demands such

transformation is perhaps better than none. But in the analysis of operations that constitute highly determinate individual totalities the difficulty of conforming absolutely to the scheme of the traditional syllogism rises into something like impossibility, because the parts within such a totality do not lie side by side like units in a ' class ', but have peculiar and distinct relations, imposed, each upon each, by their individual place within the whole.

Thus we cannot preserve, or can only by a *tour de force* succeed in preserving, the identical correlations of terms demanded by the rules of formal logic. In our example ' the mind is a unity of determinate and not exclusive parts ' ; we could not go on to affirm ' a feeling *is* the mind ', according to the good old type ' Socrates *is* a man ', and so we could not conclude that ' a feeling is a unity ', &c. But we were obliged to say either that a feeling is a reaction of the mind, or that a feeling is an element in and is a part of the mind, and could only conclude that a feeling is a factor or element in such a unity. And the other examples given in the same context, which preserve more appearance of correct formulation, are in reality no less charged with individual and diverse relations. The mere fact that the syllogism naturally leads on to the complete disjunctive judgment is the most striking proof of this. I may say at this point that to treat [1] the disjunctive judgment in systematic Logic as a form of thought needing completion by Induction, Analogy and Subsumptive Syllogism, seems to me to be a hopelessly erratic selection of phases out of the progress of the individual mind. This progress includes no doubt even in very early stages those imperfect shapes of disjunction which I have called the disjunctions of ignorance ; and *these* disjunctions are expanded into systematic knowledge by the progress of determining thought in its various forms. But to make the complete disjunction prior to the imperfect forms of syllogism involves a retrogression from complete systematic knowledge of a real ground to the knowledge of the operation of this ground in individual cases and in a latent form.

[1] As Lotze does, Logik, sect. 97 ff.

ii. If we ask the more reasonable question, *not* whether a form can be laid down beforehand for every possible inference such that the inference can be drawn by merely putting terms into the blank spaces of one or another of certain prescribed schedules, *but* whether in the common nature of thought a system of conditions can be discovered which in one way or another is conformed to by every act of inference, on this head I think that an affirmative answer may be gathered from our previous discussions. Condition of Inference.

(*a*) *Inference must have three terms and no more.*

The explanations given in chap. i of the present Book appear to me to justify this assertion. They consist in a sharp distinction between *terms* and *data*—the number of data being accidental, while the number of terms or moments depends on the essential nature of the universal; *and* in the restriction of Inference proper to mediate Inference. We *admit* however that the function of thought from elementary reproduction upwards is essentially one, and we more especially *contend* that every judgment, in so far as it is explicitly synthetic, that is to say in so far as it affirms one definite content to be a consequence of another definite content, is an activity only separated from Inference by the degree of distinctness with which its parts are analysed. Every such judgment, and therefore ultimately every judgment, can by further reflection be expressed as a three-term inference, and this is especially the case with what we called the true Immediate Inferences, Comparison, Abstraction, and the rest.

(*b*) *An explicit Inference is a conclusion from two premises and no more, which assert relations between differences qua belonging to a single universal.* Assuming therefore that the *propositions* which express the premises are not to be disguised purposely or through negligence, but are *bona fide* to express the judgments employed in reasoning, the two premises must have an identical term in common. And

(*c*) that *this identical term must be universal* follows necessarily from the theory of inference which has been developed, and follows also from the fact that this one term is able to stand in both premises. For a universal is that which without prejudice to its identity persists through or contains in itself

different relations. The simplest example may be found in what we termed the 'Inductive' Syllogism, in which, if we take the middle term as the meaning of a proper name, we argue that Socrates is both good and a Greek, therefore a Greek may be good. Here Socrates, although *ex hypothesi* an individual, is universal *at least* in virtue of the double relation to good and Greek—i.e. of the synthesis, in the 'middle term', of these differences. The universal or identity, however, need not, as in this case, be a 'subject', although it will be found ultimately to imply a subject. The identical point in space, in which two lines meet in a spatial construction, is the synthesis of two relations in space, but *is* not, only *implies*, space itself as a whole containing these relations.

And (*d*) I do not see how we can escape from saying that *not only one premise, but both premises must be universal.* The only apparent exception would be the case in which one premise is negative; about which it might be urged that the common term does not stand in two relations, but in one and none, i.e. in one only. If this were so, however, the negative premise would be a bare denial, would be no judgment, and could give rise to no conclusion. I do not see how a conclusion can arise without a synthesis of two positive relations.

If then (*e*) negation means bare denial, it results that there can be *no negative premise.* But as bare denial is not a case of genuine judgment we must interpret negation to mean significant denial only, and in this sense we must lay it down that *both premises may be negative.*[1]

Relation of Syllogism to these conditions.

iii. If now, in order to define our attitude towards the controverted questions which centre in the doctrine of syllogism, we enquire; In what relation does syllogism stand to the type of inference determined by the conditions just enumerated? we shall obtain the following results.

We must distinguish the traditional syllogism with its apparatus of rules and its distinctions of quality and quantity from the syllogism as treated in the present work.

The traditional Syllogism.

a. The traditional syllogism is a hybrid between what we have called analogical inference and what we have called inference or induction by complete enumeration. It would

[1] See chap. iv, above.

therefore (*a*) *exclude many forms of inference which perfectly conform to the above conditions, and also some which have been included in our account of the syllogism.* Not only would it exclude ' calculation ' and what has been called ' construction ' in the mechanical or geometrical sense ; but it would find no place for Induction or Analogy or even for philosophical subsumption as above described. Induction would be excluded by the conjunctive premise consisting in a number of individual judgments ; Analogy by the material weight and stress thrown upon the definition of the predicate, which the ordinary half-numerical syllogism has no power of indicating ; and philosophical subsumption by the genesis within it of new relations, not prescribed by any major premise. The traditional syllogism, in short, fails to recognise the synthetic activity of thought.

(*b*) *The form of universality relied on by the traditional syllogism is vicious,* except for purposes of calculation, which it does not attempt. It is true that its express form of totality ' All A are B ' does not really cover what we understand to be its import ; but its rules and transformations are derived from this express form, and exclude such vital and genuine processes as for example modal conversion. The fact that we interpret the numerical totality into true synthetic connection only shows that the inadequacy of this form of universal is actually recognised.

(*c*) There is *no justification for the traditional pre-eminence assigned to one premise as the ' major '* ; a pre-eminence which depends on the vicious quantitative form of the universal, and carries with it the *petitio principii* which has been irresistibly demonstrated to be present in the traditional syllogism.

(*d*) *There is no justification for the distinction between universal and particular premises,* except in as far as by a reservation depending on unknown conditions one premise may become merely *probable.*

(*e*) *The true ' reduction ' or transformation of arguments in figs.* 2 *and* 3 *into fig.* 1 *can only be effected by a material transformation of their content into the content demanded by fig.* 1 *through the processes of analogy and scientific induction.* Reduction without transformation of content is a grammatical *tour*

de force which illustrates no principle except that a simple inference can be awkwardly expressed.

The syllogism as reasoned judgment.

β. When we come however to make the comparison between our general conditions of inference and the syllogism as described in the present work, our results are somewhat different. Syllogism as we have described it is a subsumptive reasoned judgment depending upon the unity of differences within an individual subject, and making the intelligible ground of this unity explicit in various degrees, according to which the unity displays itself as a conjunction or as a coherence.

The syllogism as thus understood is (*a*) *co-extensive with subsumption, and exclusive only of calculation and construction.* The differences between the syllogistic figures in the sense in which we have retained them depend on the degree in which the Reality that stands as subject to the reasoned judgment is already qualified by antecedent judgment as a concrete unity or individual system. In the Inductive Syllogism the Subject is as nearly as possible a particular, a mere name or designative reference; in the Analogical Syllogism it is a particular as known under a universal characteristic, an individual; in the Syllogism of Philosophical Subsumption it is an individual thoroughly known as a universal in its particular differences, and so a concrete system.

(*b*) The *difference between the syllogism thus understood,* and *the abstract combinations of arithmetical or geometrical reasoning,* lies merely in the correlative imperfections of the two processes. The syllogism begins with the perception of unanalysed individual unity, which it is unable to bring to bear as a determinate relation upon the attributes conjoined within it, and thus rests in the mere fact of their conjunction. Calculation and construction begin with the perception of a specific determinate unity by which relations affect and generate each other, without making clear at the outset within what concrete system, and subject to what ultimate conditions, these determinate combinations (e.g. in space) are effected. The two sets of Inferences ultimately involve the same elements.

And therefore (*c*) *if the determinate ground is made clear within a subsumption,* or *the individual subject is made clear*

which includes a combination of relations, the two types of inference fall theoretically together, and either may be classed as the perfect form of the other. But, as we have seen, this identification would remain formal and not wholly *bona fide,* because of the comparatively indifferent and unconstraining character of the abstract totalities within which geometrical or arithmetical reasoning is carried on. It is true, on the other hand, that the syllogism as we have treated it has no repugnance to the genesis of constructive relations within the unity that is expressed in the inference.

Here we see the true interdependence of the classificatory ideal of knowledge with the ideal which takes the shape of explanatory theory. The former is teleological, categorical, and concrete; the latter is mechanical, hypothetical, and abstract. It is only by a combination of the two—which are not ultimately separable—that a real and coherent world can sustain itself in the judgment which is knowledge.

CHAPTER VII

The Relation of Knowledge to its Postulates

The formal postulates of knowledge.

1. It is usual to devote some discussion in a logical treatise to the principles or axioms on which the possibility of knowledge is supposed to rest. Adhering as I do to the conviction that 'The truth is the whole', I cannot be expected to attempt a justification of any abstract principles as points of attachment antecedently furnished upon which the truth of knowledge could be supposed to depend. But as postulates, as general characteristics of known Reality, which it is convenient to state in an abstract form in any systematic treatment of knowledge, because they are inwoven in the whole texture of the real world, some of these axioms call for comment both on their actual import and on their alleged necessity.

It is convenient to distinguish the abstract principles or postulates which are thus found to be involved in the nature of knowledge, as 1. Formal, 2. Material Postulates. This distinction must not be understood to mean that some are drawn from the nature of intelligence exclusively, while others are merely drawn from the content furnished by perceptive experience. It would be more correct to say that those which we call formal are drawn from the character of experience merely as experience, existing no doubt solely for intelligence, but for that very reason not separable in its source or nature from any other source or nature which could be described as intelligence pure and simple. Whereas those which we call material are drawn from the actual significance which we ascribe to the content of experience as developed in a concrete system, and being ultimately coincident with the conclusions of philosophy and of science must necessarily vary with the progress of these constructions. And it is obvious that the formal principles are in fact continuous with and grow into the material principles, the two kinds of axioms bearing at bottom the same relation to one another that exists between

the judgment that there is a system, and the judgment that the system is of such and such a nature. The former, of course, implies the rudiments of the latter, as the latter includes the import of the former. Accordingly the distinction between the two classes of principles will correspond to the distinction between abstract and concrete science ; [1] between explanatory theory and classification ; between the law of sufficient reason and the conception of a teleological whole.

I call these principles by the name of Postulates, because when presented to us as abstract reflective ideas they operate as guides to knowledge [2] which lead to their own subsequent substantiation in a concrete form. As reflective conceptions, then, they are postulates, i.e. principles which we use because we need them. But they only come to be reflective ideas because on analysis of experience they are found to be active factors in it from the first, factors which acquire their content *pari passu* with experience itself, of which they merely express the animating principle of growth. They cannot therefore be taken in a definite form as hypotheses or axioms antecedent to experience. Experience may be said to begin with the certainty that 'there is somewhat'; and the postulates of knowledge do but express in abstract form the progressive definition of this 'somewhat'.

Among formal postulates of knowledge it will be sufficient very briefly to examine the four most notable ; the Law of Identity, the Law of Contradiction, the Law of Excluded Middle, and the Law of Sufficient Reason. As a sub-form of the latter the Law of Causation demands no separate treatment.

Each of these laws may be interpreted in more ways than one, according to the degree in which we may acquiesce in its mere abstract form, or attempt to penetrate its further meaning. But at any rate with a view to anything like a separation between intelligence and experience, as such a separation is

[1] This is in strictness almost equivalent to the distinction between physical science and philosophy. But of course evolutionary science with the conceptions of 'higher' and 'lower' does not fall within physical science as thus defined.

[2] See the account of reflective ideas as guides to knowledge in comparison, &c., ii, chap. i.

purely fictitious, there is nothing to be gained by cutting down the content of these principles to a minimum, in the hope of restricting their reference to thought as opposed to things.

The Law of Identity.

i. The Law of Identity must be taken to signify *at least* that it is possible to make judgments that have a meaning and are true.

Tautology.

a. In the bare form 'A is A', however, a form which is not drawn directly from Aristotle or from Plato, the law does not *prima facie* possess this significance, and therefore indeed not any. If it means that A is A and no more, or is *mere* A, then it is aggressively untrue, for it denies the synthesis of differences which alone can make a judgment. If, again, the law is taken as a mere symbol of the pervading unity of the logical subject, and not as intended to exclude all differences from entering into it, then it is an inadequate symbol, erring by omission though not by exclusion. In an absolute tautology which excludes or omits difference, identity itself disappears and the judgment vanishes with it.[1]

Symbol of Concrete Identity.

Therefore, *β.* we can only assign a meaning to the law 'A is A' if we take the repeated A to be not a specification of the identical content, but an abstract symbol of its identity. The law will then mean that, in spite of or in virtue of the differences expressed in a judgment, the content of judgment is a real identity, that is to say, has a pervading unity. It says that there is such a thing as identity in difference, or in other words, there is such a thing as genuine affirmation—synthesis of differences referred to reality—which yet is true, that is to say, does not interfere with (but in fact is indispensable to) identity.

Unity of Reality.

And, *γ.* we are only expanding what is implied in the allegation of real identity if we say that the law 'A is A' ultimately asserts the thorough-going unity of Reality. A significant judgment, symbolised by 'A is A', lays down for itself no reservation beyond that which its own content may dictate,

[1] It is desirable to remark upon this peculiarity of the formal 'Laws of Thought' as represented in symbolic letters, because the error to which it tends is characteristic of false doctrines of identity and difference. Locke defines Identity by saying, 'When the ideas—vary not at all,' and the notion of negation in formal logic is also that of 'mere' or 'bare' negation. Cf. Euler's circles.

and claims therefore to be true without any reserve. Its simple affirmation leaves no room for any discontinuity in the real world, such that on one side of it the judgment may be true, and on the other false. If there were such a discontinuity, the judgment, such is the claim of the categorical affirmation—and all affirmation *qua* affirmation is at least categorical—would have taken note of it within its content, and would in that respect affirm under a reservation. But once true, always true. All reservations necessary to truth are included in the content. Reality, therefore, is one throughout. Relation to time, for example, is not involved in the fact of affirmation, but only, if at all, in conditions belonging to the content affirmed which depend upon facts in time.[1] Affirmation as such is unconditional, that is to say, is not limited by conditions outside its own content, and so if true, is true without reserve. There is not one Reality of which it is true and another of which it is false. Reality is what it is, and if it turns out not to be what we thought, then we thought amiss, i.e. judged falsely.

Law of Contradiction.

ii. The Law of Contradiction is but the complement of the Law of Identity. It supplies something without which the Law of Identity is not logically complete nor *distinctly* intelligible. But yet, by the fact of conferring distinctness, it is an addition.

Truism or false.

This Law also, *a.* in its barest statement ' A is not both A and not-A ', if understood to deny that A can be B, is either unmeaning or aggressively false. Considered as the principle of the negative infinite judgment A is not *mere* B, it *corresponds* as the form of bare negation, to A is mere A as the form of bare affirmation. In this form it is simply inadequate or unmeaning, and *equivalent to* ' A is at least A '. But taken as the exaggerated abstraction of negative judgment in the sense ' No A can be any not-A ', i.e. ' No A can be B at all ', it *corresponds to* the more open interpretation of the Law of Identity as ' A is at least A ', and is *equivalent to* the more aggressive interpretation of that law as ' A is mere A '.[2] For

[1] See i, chap. v, on Time in the singular judgment.

[2] The *corresponding* meanings of the Law of Identity and the Law of Contradiction, judged by the latitude employed in interpretation, are not their *equivalent* meanings. The more exaggerated denial is *equiva-*

it then denies that *any* B (not only that *mere* B) can be united in a judgment with A. This is simply a reiteration in negative form that A is mere A and no more.

A genuine law of thought.

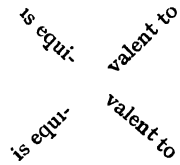
But if, β. we take the Law of Contradiction in the obvious sense that a statement and its denial cannot both be true, it bears witness to the fact that a judgment *may* be truly denied, i. e. that a judgment may be false, and therefore that there may be truth in a negation.[1] It has been observed above [2] that, apart from the traditional distinction of quantity, the difference between the Logical contrary and the Logical contradictory, i. e. between the principle of contradiction and the principle of excluded middle, disappears. But because they retain a meaning for vital thought although not for formal logic, even in the absence of quantitative distinctions, we will distinguish the two aspects of negation treated of by these two principles, and will speak first only of falsehood established by truth, and not of truth established by falsehood. Though really, if our instance of contrariety [3] is 'A is B' and 'A is not B', we have before us both falsehood established by truth, and truth established by falsehood.

A law of Reality.

γ. If we do not press hard on the implications of the Law of Identity, it may be said that the significance of the Law of Contradiction carries us one step further. But it is doubtful if truth can exist apart from the conception of falsehood, and

lent to the more tautological assertion, and the more pregnant or significant assertion to the denial of mere identity. Thus

'A is mere A' *corresponds to* 'A is not mere B'.



'A is at least A' *corresponds to* 'A is never any B'.

[1] According to the traditional rule, a statement may be so denied that both judgment and denial are false. But obviously in such a case some denial is true, though the one made is not. To say that a judgment is false is to say that it is truly denied.

[2] See above, on negation, p. 295 ff.

[3] I have pointed out before the inconvenient accident that the Law of Contradiction applies to Contraries only, while Contradictories or Logical Contradiction come under the Law of Excluded Middle.

therefore it is better to say that the Law of Contradiction simply confirms and reiterates that assumption of the unity of reality which the Law of Identity involved. Reality, the Law of Contradiction asserts, is a *consistent* unity; which is merely to say over again that it is a unity. You cannot, that is to say, play fast and loose with reality. What is true at all, as the Law of Identity said, is true throughout Reality; but more than that, every such truth is double-edged, and carries with it throughout Reality consequences by which it affects and limits matters that are *prima facie* outside itself. To infer from 'A is B' that 'A is not not-B' means at bottom that A is determined by B in respect of C or D.

Law of Excluded Middle.

iii. The law of excluded middle, expressed by Aristotle as 'Between the assertions of a logical contradiction there is no middle', i.e. no third alternative, applies of course to all strict denial, for all strict denial is a logical contradiction of the judgment denied.

A Truism.

a. In its symbolic form 'A is either B or not-B' it lays down the ultimate formal *schema* of negation as the absolute alternative. Literally interpreted according to this symbolic form it has corresponding defects to those of the previous laws when interpreted in the same way. That is to say, all that it absolutely lays down is the form of bare negation which is *per se* not enough to constitute a judgment, because it involves the truth of the infinite judgment; but which in relation to anything further, for example to the intelligible antithesis 'A is either B or C', is only the affirmation of a possibility, and the hypothetical definition of a relation. To invest a positive contrary C with the logical character of a contradictory not-B, is the work of determinate knowledge.

A law of Thought.

β. Interpreted in the plain sense, e.g. as by Aristotle, the law of Excluded Middle means that the *significant* negation of any judgment is an absolute alternative to it, viz. that not only the judgment and its negative cannot both be true, but one or other must be true, and if true, we may fairly add, must be significant. This means that falsehood can establish truth, or that negation can involve affirmative consequences. In this sense the postulate in question is the essential principle of disjunction, which is an absolute alternative *between two*

or more positive and significant members. Therefore genuine disjunction has not the form 'A is either B or not-B', but has the form 'A is either B or C', which invests the positive assertion, in virtue of which C is taken to deny B as its contrary, with the absolute exclusiveness that only belongs of right to the bare form of denial, which has for its essence to express the contradictory. In other words, the old account of the *contrary*, that it denies, and also asserts something more beyond the denial, must also be true of any *significant* contradictory.

A law of Reality.

γ. The principle of Excluded Middle, then, ultimately affirms that Reality is not merely one and self-consistent, but is a system of reciprocally determinate parts. In affirming that a significant or genuine judgment is possible, such that within it a negation [1] shall carry a determinate and explicit positive consequence—not merely, as the law of contradiction affirms, that a truth may carry with it definite negative consequences—the law of Excluded Middle fixes upon that reality which is constructed and maintained by judgment the character of a self-determining whole. For a nothing can only be invested with the character of a something by being a precisely limited nothing that implies a positive nature in the limiting and sustaining something, such that in affirming the nothing we are not affirming an absolute nothingness, but are covertly alleging a positive something which is or is involved in *the* nothingness of something in particular. From the mere and entire non-existence of mechanical cohesion, i.e. of any such thing as mechanically coherent substances, nothing strictly speaking could be inferred. The idea would be the content of a bare denial, and unintelligible. But from the failure of mechanical cohesion in the axle of a locomotive running at sixty miles an hour under precisely known conditions, all other substances retaining their mechanical properties, the most precise and detailed results could be predicted and must

[1] According to the *bare* scheme of Excluded Middle, the significant negation must be a negation of the negation; for though the falsehood of the affirmation involves the truth of the negation, yet in the phase to which such a scheme belongs we are hardly warranted in affirming that a negation as such has positive significance. This use of double negation is a factor in identifying contrary with contradictory opposition.

follow. This is a simple instance of the difference between the negation which has meaning and consequences, and that which has none.

Law of Sufficient Reason and of Causation.

iv. The law of Sufficient Reason, with its sub-form the law of Causation, is a corollary from that aspect of reality which the negative laws of thought have brought to our notice. Reality being a system of reciprocally determining parts, every part or feature of reality may be regarded as a consequent to which some other part or parts, or ultimately the whole, stands as ground. Every consequent, so this law tells us, has a ground from which it necessarily follows. Necessity indeed means nothing but the inevitableness of the consequent when the ground is given.[1]

In plain English, the Law of Sufficient Reason represents the demand of intelligence for the explanation of everything by something else. And it is plain that in the case of anything but the absolute whole this demand must go on to infinity, for outside any given content there is always something which can be regarded relatively to that content as something else. We have sufficiently criticised the operation of this law, the law of natural science as such, in the construction of the would-be totalities of abstract time and space, and it is not necessary to repeat the proof that this aspect of experience, taken *per se*, generates and must generate the infinite series. For it rests on the relations of parts in abstraction from the whole, or in other words, without the element of totality.

One point must be noticed here. Schopenhauer rightly maintains that *absolute necessity* is a *contradictio in adjecto*, because all necessity is *ex hypothesi* conditional. We have therefore not spoken of an absolute necessity but only of a real necessity, namely a necessity rooted in a ground which is a fact. We ought not to feel as if in this substitution the world had lost something of its rational coherence. Absolute necessity was a false ideal, and produced a fallacious preference

[1] See the admirable section 49 in Schopenhauer's treatise on the 'Satz vom Grunde'. His attempt, however, to show (sect. 50) that the law of ground and consequent in cognition does not entail an infinite series, although in causality or in space this is entailed, cannot be called successful. It depends on his distinction between Causality and Sufficient Reason.

of necessity to reality. For a *part*, necessity is a higher point of view than mere *perceptive reality*, because necessity involves relation to the whole, whereas perceptive reality, being isolated, is only formal[1] or potential reality. But for the whole, reality is a higher point of view than necessity, for reality is its self-dependence as a whole, while necessity would at once depress it into a part.

The above are the principal 'Laws of Thought'. We class them *not* as principles of intelligence apart from experience, but as principles of science or of rational experience as such, discoverable by analysis in every minutest portion of its texture, and capable of being regarded by a very easy abstraction as essential to its *existence* as contrasted with its special *significance*. They may therefore be ranked together as the formal postulates of knowledge, or as the formal aspect of the principle of Uniformity, in contrast with those which are not *prima facie* necessary to the existence of experience, or involved, at all events equally, in all reality as such; and which may therefore be considered under the head of material postulates of knowledge. The reciprocal implication of the formal and material postulates in one another, of a teleological significance in a self-consistent system, is plainly a matter of degree, and our task is to analyse the mode in which it does exist, not to predict how it must exist.

The material postulates of Knowledge.

2. To emphasise the transition from the formal to the material postulates of experience, I make use of the following sentence from a distinguished writer:[2]—

'It is conceivable that man and his works and all the higher forms of animal life should be utterly destroyed; that mountain-regions should be converted into ocean depths; the floors

[1] i.e. it has the contact with feeling which is the form of all contact with reality, but it falls short in content and is a mere fragment which has *something*, we do not yet know *what in particular*, of reality in it.

[2] I quote and comment upon this passage purely because it is a striking illustration of my point. I have not the least intention of imputing to its eminent author (Professor Huxley in Contemp. Review for February, 1887) that he in fact undervalues those activities, the annihilation of which, according to this passage, would make no breach in the order of science. I cannot but think, on the other hand, that any logical theory with which such a statement were compatible would be gravely defective.

of oceans raised into mountains; and the earth become a scene of horror which even the lurid fancy of the writer of the Apocalypse would fail to portray. And yet, to the eye of science, there would be no more disorder here than in the sabbatical peace of a summer sea.'

Translated into simpler language, this sentence means that if all these things happened, they would happen without a miracle; or in logical phrase, they would be capable of explanation according to the law of sufficient reason. And this is undoubtedly a truth that we must lay to heart. Our choice, being what we are, lies between the experience intelligible according to the formal laws, or none at all. A 'suspension of the laws of nature', a 'supernatural interposition' or 'interference', is perhaps the one and only matter that if alleged as a fact can be denied on the sole evidence of the abstract 'laws of thought'. Against any phenomenon, any occurrence, however extraordinary, these laws, apart from more concrete experience, have no foothold and no purchase. But the allegation that something is known and yet not knowable, nay more known *as* not knowable and in respect of the peculiar essence which makes it not knowable—this, if we would retain our sanity, we must refuse to entertain as conceivable. And if supernatural means anything but this, any causation handled by superior knowledge and power within the unity of Reality, then *for logic* it is *natural* and we must treat it as we treat all natural phenomena. We deny no occurrence on the strength of formal laws; we only deny a theory about the occurrence. Formal laws do not care how extraordinary a phenomenon may be; anything *may* have happened or may happen; the only question is whether it *did*, or *will*.

Much unclear thinking and much false sentiment might have been avoided if the mechanical aspect of nature had been recognised[1] long since as Professor Huxley states it. Nature, as a mechanical system, is not teleological. Disease and deformity are as natural, as orderly, as much according to law, as health and beauty. It is idle verbiage to enlarge

[1] e.g. by Charles Kingsley and teachers of his school who preach concurrence with and conformity to the 'laws of nature'.

upon a contrast between law and lawlessness in the natural world, considered as a natural or formally knowable system. The only lawlessness is in the supposed supernatural within the natural. Nothing that happens can escape from the principle of sufficient reason, and therefore nothing that happens is without an aspect of law.

But these considerations, though true, are not the whole truth. We unquestionably expect something more of the world than a capability of being known according to the law of sufficient reason. It is the nature and the warrant of these expectations that I now desire briefly to examine.

The maintenance of Life.

i. I do not think that it can be doubted that we expect an indefinitely prolonged—not necessarily everlasting—continuance of such conditions of the earth's surface as are compatible with human life. It would not be justifiable to derive this expectation from the formal postulate considered above on any such ground as the necessity of a human intelligence to the existence—as we understand existence—of the actual world. This merely logical necessity might at worst be satisfied by an appeal to our ignorance ; for how can we know that the human intelligence is the only intelligence, in the system of things ? But in any case we are now compelled to accept as fact a state of the globe prior to the existence of the human race, or even of organic life, and if we find no insuperable difficulty of form in this view of the past, why should there be any in a corresponding belief as regards the future ?

It may be said, again, that our whole state of knowledge, and the absence of urgent warning from our scientific look-out men, justifies a disbelief in any imminent disaster or transformation of the earth's surface. Now it is my contention in the present chapter that the postulates of which we are speaking simply sum up the pith and essence of our knowledge, and I have no reason to doubt that the actual state of scientific prediction is a large element in the practical certainty with which we regard the future of our globe. Unmotived possibilities rightly go for nothing, and it is the case, I suppose, that there are not at present above the scientific horizon any seriously motived possibilities of a speedy end to man's existence.

But I cannot think that this exhausts the question. It appears to me that the real root of our conviction is ethical, and ultimately depends upon our confidence in the relation of our purposes to the scheme of the universe. Such an ethical conviction is not a πού στῶ outside our knowledge, but is the very core of almost all that knowledge on which our distinctively human life essentially depends. The purposes of the civilised world form the real teleology [a] on which our organised knowledge of society and of all human achievement is based, and it is on the conviction, inwoven in this knowledge, of the reality of these purposes in their essential content, that our faith in the future seems to me to be founded, and under present conditions of knowledge to be rightly founded.

It may be said, with an appeal to eschatology, that such a faith is not even a '*quod semper, quod ubique*', &c., and that a speedy end to man's existence on earth has in fact frequently been expected by large bodies of human beings. On this suggestion two observations are to be made. In the first place, it would be interesting, both logically and psychologically, to know the exact effect of such a belief on the practical postulates of civilised life in those who hold it—to know, in short, the degree of reality with which, as a working belief, it has ever been held. To some extent the doctrine has been specially directed to meet the dangers which it tended to cause, by inculcation of the duty of diligence in business and of orderly conduct as the best preparation for the end. And then in the second place, as this adaptation of the doctrine shows, the conception of an ethical continuity of purpose is satisfied by the idea in question, although not necessarily under the form of a continued terrestrial existence.[1]

[a] See notes, pp. 99, 199, above. The argument would be sounder in form, but not very substantially different, if we substituted 'individuality' for 'real teleology'; the general principle is that our criticised desires though not our given desires have evidential value, where 'criticised' means divested of self-contradiction. But anything more than the briefest indication of this problem does not belong to Logic.

[1] Under this head, of a satisfaction for our ethical demand otherwise than in the form of our continued existence, may be classed in great part the curious psychological fact of the slight practical effect produced by prospective death even on men whose lives are by any cause gravely imperilled. I ascribe this, though in part only, to our prospective

If the question were pushed home, and we were asked to translate our ethical postulate into terms of time and degree, we could only, I think, fall back on conceptions akin to the βίος τελειὸς of Aristotle, i.e. on the conception of a duration and environment of life adequate to the accomplishment of some worthy purpose. And what catastrophes befalling the human race are compatible with the purposes of the world we cannot presume to guess.[1] It would be hard to believe, for example, in the likelihood of a catastrophe which should overwhelm a progressive civilisation like that of modern Europe and its colonies, so that the history of the world would have to be begun anew, without any influence at any time arising, by rediscovery of remains, from the prior civilisation.

'But we may be mistaken in our postulate.' Certainly we may be mistaken, as in our present knowledge, so in the sum and substance of our present knowledge. But unmotived

satisfaction in the maintenance of our essential activities and purposes by others after our death; and I do not think that this satisfaction would exist in view of a prospective extinction of the race. Again, the truth that a belief in *some* continuance is necessary to *any* action, and that *some* action is necessary to *any* continuance, is merely the minimum grade of the postulate we are discussing.

[1] The writer is aware of a strong prejudice in his own mind that a disastrous earthquake in London is an exceedingly improbable occurrence. Not, of course, that volcanic agencies can act otherwise than they must, but that such a degree of inconstancy as to tempt an enormous heavily built city to be erected, and then to turn and rend it, would seem malicious on the part of Nature. The prejudice is only mentioned as a psychological curiosity, and is not defended for a moment. The writer believes it to be a blundering application of an ultimately genuine principle.[a]

[a] I am aware that this note has been adversely criticised, and I admit, as I admitted in it, that the actual belief expressed in it is probably indefensible. Yet I do not cancel it, because it calls attention to a technical point which seems to me fundamental, and which I doubt if my critics have observed. It is this, that as inference from particular to particular is impossible, and you must always make the circuit through the universal nature of the system on whose manifestations you are arguing (see above, pp. 22, 139), it is necessary to accept a heavy responsibility when the whole nature of that system is concerned, and if you cherish a general view about it, and allow this view to affect your inference, it is illogical not to formulate and defend your view. If you believe that the world-system is wholly indifferent to the interests of civilisation, you shoulder just as heavy a logical responsibility as if you believe the opposite. And you are bound to exhibit your view.

possibilities of error must go for nothing; and in departing from the positive import of the knowledge which at present we possess, we abandon concrete reality for more or less abstract imagination. In this first material interpretation which we have been putting upon the law of the Uniformity of Nature, we have simply been analysing a condition which is essential to the maintenance of human life as reality now presents it to us, viz. the prospect of continuance. If the constancy of content which this prospect demands were ever to become doubtful with good reason, the doubt would *ex hypothesi* show itself in our knowledge on positive grounds; but till then we must accept this constancy not indeed as an ultimate certainty, but as a leading characteristic of our actual world.

The reality of values.

ii. But the uniformity of nature as materially understood goes at least one step further than to postulate the maintenance of human life on the earth's surface. It also postulates the reality of those purposes and achievements which make man what he is.

It is possible to fancy not merely a state of the earth in which the life of the human animal should be physically impossible, but a state in which though life were possible and actual, yet the apparent caprices of nature, however *formally* rational, should prohibit all advance in knowledge and civilisation. What degree of ambiguity in the appearance of natural bodies, in spite of an actual constancy of their properties, might make knowledge impossible, is a question which there is no sense in asking, as we have no measure by which to estimate the answer. Many ambiguities have been resolved by knowledge; but the operations of the intellect unquestionably demand not only the theoretical constancy of properties, but *some* degree of limitation in their variety. Exhaustiveness is, in short, though not theoretically deducible from the law of Sufficient Reason, a largely and increasingly essential element of knowledge. What would it help us that the specific gravity of gold is constant, if elements undistinguishable from gold by other ordinary tests, but differing in specific gravity, were continually to present themselves in our operations upon Nature? And although infinitesimal

variation is a predominant law of the organic world, yet knowledge is at least greatly facilitated by the existence of marked points of transition between species and species,[1] and it is plain that a succession of animals differing by variations of minute and equal value would not be compatible with our present modes of natural knowledge, although in geometrical matter the intelligence has displayed the power of theoretically grasping an absolutely continuous evolution.

It might be said indeed that we were alleging above that 'If there is to be human life there must be human life', and are alleging now 'If there is to be knowledge there must be knowledge', truisms which amount to nothing. So far as content goes, this may, by abstraction, be true. A mere analysis of content is *eo ipso* hypothetical. But the content which we are analysing is, moreover, affirmed of our real world as an integral element of the significance of that world, which significance is primarily ethical.

And this significance for which I am contending is not an *a priori* postulate or axiom, from which any specific knowledge could be derived apart from experience. If I am asked 'What is the material uniformity? How do you limit it? What does it imply?' I can only answer by pointing to the progressive content of knowledge itself. The postulate of Uniformity is ultimately that there is such uniformity as our knowledge in detail reveals to us. Do I believe that mass and energy are constant, that gravity operates in the region of the fixed stars, that any of the heavenly bodies have animated inhabitants, or that the elements are ultimately reducible to a single form of matter? None of these, I should have to reply, are questions of an ultimate logical postulate. Our convictions upon all of them must be determined by the state of our knowledge and by our estimate of its tendencies. From an ethical postulate we can deduce nothing but the empty form of a logical principle, the form that 'what is involved in ethical[a] reality is real'; the material details must come from science only.

[1] Owing, no doubt, to the extinction of intermediate forms.

[a] In any new work dealing with these points I should not make use of the term 'ethical', which now seems to me an individualistic term,

The three degrees then which may conveniently be distinguished in the interpretation of the Law of Uniformity of Nature or of the Unity of Reality, considered as the postulate of knowledge, may be assigned as follows.

Three interpretations of Uniformity of Nature.

(1) Reality is a mechanical system through and through. This postulate is expressed in the so-called 'laws of thought' which find their most explicit form in the 'Law of Sufficient Reason', or principle of Relativity.

Reality is mechanical.

(2) Reality as a mechanical system is adapted to the evolution and maintenance of life, i. e. is at least quasi-teleological. This is a first approximation to what is practically assumed as the material Uniformity of Nature.

Reality is quasi-teleological.

(3) Reality as a mechanical system is further adapted to, or includes as elements within its unity, the substantive purposes of human intelligence, i. e. is really teleological.

Reality is really teleological.

It is possible, by intellectual abstraction, to dissociate the first of these aspects from the others, as the import of 'mechanical' can be dissociated [1] from the import of 'machine'. It is not possible to dissociate either quasi-teleology or real teleology from a mechanically-conditioned system. The nature of a system can only be real in as far as the parts or differences that enter into it have a real mode of activity. Miracle destroys teleology, for it destroys the relation of part to whole. And activity or variation of activity, that has no ground in the one Reality, is miracle.

3. It seems desirable to conclude the present work by bringing to a point the views that have been implied throughout it upon the ultimate nature of intellectual necessity, and upon the sense in which such necessity can be predicated of any elements within knowledge.

The ultimate nature of Necessity.

i. It would be a tedious task to analyse at length the

applicable to an attitude right and characteristic for a finite being within a whole, but neither to the whole, nor to the position of the finite being completely considered. I should substitute some such expression as 'the conception of absolute reality'. 'Human' is an instance, not an ultimate. But obviously the problem goes beyond Logic.

[1] This concession must be read subject to the reservations of p. 99. This dissociation is not possible in an ultimate sense. But of course dissociation from any particular teleological scheme is abundantly possible, and that is the point of material importance.

A priori necessity and mediation.

components of Mill's discussions[1] relating to the basis of necessary truth. But nothing could, in my judgment, be more conducive to a thorough mastery of the question than a careful study of the chapters referred to in Mill's Logic in the light of some plain distinctions, which, in default of a better guide, I will here endeavour to lay down. By Mill himself, together with the writers whom he quotes, nearly every position of importance in the controversy is assumed in its turn, and the argument is a strange mixture of penetrating sagacity with unphilosophical confusion.

Mediate nature of Necessity forgotten.

a. Necessity, as we have abundantly convinced ourselves,[2] involves mediation or inference. No isolated judgment *qua* isolated can have necessity. Every necessary truth must, in so far as it is necessary, present itself as the conclusion from an antecedent. In the idle controversy whether axioms are known *a priori* or 'from experience' this aspect of necessity is forgotten on both sides.

'From something prior.'

(1) If *a priori* necessity is taken as inherent within the four corners of the axiom itself, the very nature of necessity is contradicted, and the only meaning which I presume the phrase *a priori* can ever have had is stubbornly denied to it.[3] '*A priori*' (ἐκ προτέρων) says in so many words that the knowledge to which this term applies is '*from* something prior to it', i. e. is derivative, inferred and mediate. The metaphor involved in 'prior' no doubt created for Aristotle a problem about the series of premises, which, it would seem, must come to an end somewhere in an ultimate premise; a problem which could only be solved, as Aristotle, I imagine, was really quite aware, by making the series ultimately return into itself, and lose its successive character by transformation into an organised system.[a] But this difficulty about the

[1] Mill's Logic, Bk. II, chaps. v and vi.

[2] Cp. especially above, 1. 134.

[3] I am quite unable, for the reasons assigned in the text, to subscribe to the views as to *a priori* knowledge which are stated in sections 355-6 of Lotze's Logik. In placing the test of 'self-evidence' in an immediate recognition without any process of proof, he appears to me to surrender altogether the rational character of knowledge. His subsequent explanation, sect. 358, seems to me exactly parallel to Whewell's practical retractation respecting the law of atomic weights. See below, p. 227.

[a] See p. 269 below.

ultimate premise of a series, even if unsolved, does not justify the neglect of the plain logical differentia imposed by the term *a priori* upon all that claims to be known *a priori*,[1] viz. that it shall be inferred from knowledge, whatever this may be, other than itself.

Indissoluble association.

(2) If, on the other hand, by those who object to the '*a priori*' origin of knowledge, supposed to be alleged as not experiential, an appeal is made to any form of indissoluble association, originating no doubt in constant experiential conjunction, but operating finally through a sheer psychological inability to disjoin the parts which insist on presenting themselves together in the mental picture, here if anywhere we have the *vicious* doctrine of *a priori* knowledge in its most outrageous form. For, it must be remembered, the past is past; the psychological history of our conviction cannot come into court when we wish to demonstrate the conviction to be true or false. It is of no use to say, 'I have seen it so often that I cannot help believing it true.' One might almost as well say, 'I have said it so often that I cannot help believing it true.' The question is not how often you have seen it, but what you now know that you saw, and under what precise conditions. If nothing in the content of the experience, as it now is in the mind, goes to exclude error or to carry conviction,[2] then *we believe it simply because we find it in the mind*, which is just the description of vicious or intuitional *a priori* belief.[3]

[1] Prantl, Geschichte der Logik, vol. IV, p. 78, quotes from Albertus de Saxonia, A.D. 1390, as the oldest authority for the dualistic use of '*a priori*'. 'Demonstratio quaedam est procedens ex causis ad effectum, et vocatur demonstratio *a priori* et demonstratio propter quid et potissima; . . . . alia est demonstratio procedens ab effectibus ad causas, et talis vocatur demonstratio *a posteriori* et demonstratio quia (that) et demonstratio non potissima.' Nothing could be more sharply opposed to 'immediate' knowledge.

[2] The distinct relations to the percipient, which make us sure that our recollection is not a fancy, are what perform this office in an act of 'simple' memory. In fact, no act of memory is absolutely simple, as indeed no intellectual act of any kind is. The truth of our recollection is inferred from content, not accepted because of mere psychical indissolubility.

[3] In the discussion alluded to in the text, Mill is on the whole the champion of organised knowledge and inferential necessity against unreasoned conviction and mere indissoluble association. But he

Organised and unorganised experience.

β. The distinction on which the relation of necessity to Experience really turns is the distinction between organised and unorganised experience. The former can give necessity; the latter cannot give knowledge. To maintain with Whewell that there is a necessity which does not depend on experience is to concede Mill's contention that necessity is a psychological illusion. If there is no organisation of experience into a system, the latter view is obviously the truth; but with the necessity which Mill rejects there must in that case also be thrown overboard the knowledge which he maintains. If there is organisation of experience, then the necessity which attends complete conception, although nothing irrational, supernatural, or immutable, is more than a psychological illusion. It simply means that given this and that, being the conditions imposed by our knowledge of the matter in hand, then the other must follow because of the relation between them.

This distinction may be, I think, pretty thoroughly elucidated with reference to Whewell's treatment [1] of the principle, in his time quite a recent discovery, that chemical combination takes place between elements in certain constant definite proportions only. Whewell was able to persuade himself that this law, when once understood by a mind with adequate scientific resources, could not but be accepted as a law whose falsity was inconceivable. Of course such an assertion, made by a writer suspected of a belief in intuitional

wavers in his position, (1) by refusing to maintain against Whewell that a justifiable *necessity can* be generated by experience, and confining himself to the contention that an illusory show of necessity can be so generated—this means that the experience of which he is thinking is the mere repetition of sense-perception and not a determinate system of science; and (2) by the constant appeal to the profusion of experimental evidence in favour of geometrical axioms, and in particular to the mental picture of parallel straight lines as the instrument, by a constant repetition of experiment, of generating the certainty that they are incapable of meeting. Here we lose sight of the principle which owes so much to Mill's advocacy, that one good experiment will establish a law. Sir J. Herschel as quoted by Mill wavers in precisely the same way, appealing now to iteration of experience, and now to systematic knowledge. Spencer seems to hold the view characterised in the text, not interpreting his test by conception into logical proof and therefore leaving us to suppose that it consists in psychical conjunction.

[1] Fully adduced and discussed in Mill's chapters above referred to.

or something like innate and unreasoned convictions of necessity, about a principle 'the discoverer of which was still living', was open to the ridicule with which Mill assailed it. But the interest lies in the explanations which Whewell subsequently offered, and which make the course of his mind in the matter tolerably clear. In order to perceive necessity in such a case, you must, he says in effect, understand the terms, you must conceive all the elements of the problem *distinctly*, and you must be furnished with a degree of scientific knowledge which not every man of science possesses. The 'intuition' of the truth, he says, 'may be a rare and difficult attainment.'

There can hardly be two opinions as to what all this means. Conception as thus understood is simply systematic knowledge, and the reason why you cannot conceive the law false is that you have attained a thoroughly *mediate* insight that the system of science requires it to be true; i.e. that if it were taken not to be true your system of reality would be shattered and overthrown. This necessity is read into the terms of the principle in question, the interpretation of which has been insensibly enlarged, and without careful analysis there is great likelihood that the principle will seem to possess a necessity involving no relation to anything outside itself. In the particular case in question it may be—though the suggestion is hazardous—that a confusion was operative in Whewell's mind between a very abstract principle which is involved in the place held by quantity in the real world, and the peculiar law discovered by Dalton as the law of atomic weights. All quantity is definite, and every combination is a combination of definite quantities. Nor can there be any doubt that every mixture has different properties according to the relative quantities of the things mixed together. Wine and water will mix in any quantities, but the mixtures will not all be the same. I venture to write down these platitudes, as Mill, in maintaining that the occurrence which Whewell called inconceivable really represents the general rule, almost seems to forget that every mixture is a mixture of definite quantities, and that a change in the proportion will make a difference in the mixture. No doubt this comparatively

formal principle is a long way from the law which Dalton discovered, viz. that the peculiar combination known as chemical combination would not take place at all except between definite proportions of the elements. But yet, assuming the *constancy* of the resultant combinations, e.g. that there is only one kind of water and not two or more kinds, and also the *limitation of their number*, i.e. that there is not in nature a series of compounds containing the same elements as water but in slightly different proportions—and I should have imagined that the truth or untruth of these two suggestions must have been notorious to chemists before Dalton's time—then presupposing all this it does seem to an outsider as if the law of combination in definite and constant proportions [1] was pretty much rendered necessary by the mere nature of quantity. At all events, without being so rash as to infer from the operations of my own mind to those of Whewell's, I may suggest that some such process as the above, which is obviously a mediate inference from matters of fact combined with a formal principle about quantity, constantly follows upon the discovery of a law. We are apt then tacitly to presuppose the matters of fact, and to identify the new law with the formal principle which it interprets. This, I venture to think, is the key to the general character of the process which Whewell's mind must have passed through in the case before us, with the result of his mistaking mediate for immediate necessity.[2] In any case, his reason for believing Dalton's law plainly was, as he says in so many words, that he thought he saw the whole order of nature to be involved in it. If the intuition of an *a priori* necessity excludes mediation or inference, then this logical process was not the intuition of an *a priori* necessity.

[1] The theory of atoms goes further than this in form. But I understand Mill and Whewell to be speaking of the law only in as far as it refers to definite proportions.

[2] It is said that men always begin by denying a new truth, and then say that they knew it before. This is simply that the material interpretation or development of an accepted abstract principle is at first strange to them and they resist it; but when they have understood it, they pass it over into the old formal principle, identify the two, and become unconscious that they have made any advance.

In as far then as Conception means this complete insight, its necessity is clearly the sole test of truth, being simply identical with the necessity of knowledge. Mill's polemic against the test by mere Conception is largely justified by the ignorant use that was made of this test, as if it were immediate and operated by mere inspection. In this polemic Mill shows himself alive to the true source of experiential necessity, although he rejects the term necessity except in reference to mathematical reasoning. Thus, strangely enough, Mill re-introduces into knowledge the distinction between necessary and not-necessary truth, which the experiential school might be expected to deny. And his account of the distinction is on the whole sound, referring it simply to the difference between the complete knowledge of the conditions, which is possible in mathematics,[1] and the partial knowledge of the conditions which alone is possible in ordinary physical investigation. It would be better, however, either to abolish the term necessary altogether, or to extend it to all scientific knowledge as such.

Mere *imagination*, on the other hand, as Mill rightly contends, though inclined to extend the contention erroneously to *conception*, has nothing to do with truth or knowledge either way. Allegations are not more likely to be true because we can imagine their content, nor less likely because we cannot.

It follows from the above considerations—

(1) That every judgment is *necessary*[2] and *mediate in as far as it is known*; and that no judgment has necessity or precision (which depends on the explicitness of the mediating conditions) if taken apart from the totality of knowledge;

and (2) That the content of every judgment, as well as its truth or necessity, is correlative to the one ultimate judgment, i.e. to the whole system of knowledge; and that therefore while we do well to maintain that the body of knowledge has certain indispensable functions, we nevertheless commit an error of principle if we deny that the identity of these functions is like other identities compatible with variation.

[1] The view of mathematical conceptions as hypothetical does not concern us here. See Bk. I, chap. iv.

[2] See also chap. i of this book, on the specific necessity of judgment.

Thus for instance knowledge, or reality as known, must have such a function of relativity as that which we express by the law of causation. But to suppose that the shape in which that function happens to be familiar to us, involving perhaps homogeneity of cause and effect, is necessarily an ultimate shape, is one of the most mischievous results of the fallacy of an isolated necessity. I do not think that there can be any doubt that even the conceptions of the straight line or of three-dimensional space are modified in their content by the explicit distinctions needed to save them from being confounded with arcs of great circles on a sphere surface or with space of more or less than three dimensions. Unquestionably the new conceptions, however unreal, make themselves felt as restricting the absoluteness of the old ones. Every judgment is relative to the whole of knowledge, and no judgment entirely escapes modification as this whole is modified.

Rehabilitation of formal distinctions.

ii. In order to illustrate the true import and value of such conceptions as that of *a priori* truth or of necessary knowledge, I will venture to give a brief sketch of the process, tending to repeat itself in history, by which such distinctions are most thoroughly apprehended, and which, if only in the individual mind, is perhaps necessary to their apprehension.

When, in an epoch of genuine enquiry, a student first opens his eyes, so to speak, in the philosophical world, he finds himself confronted by a multitude of traditional distinctions, some of which claim to be fundamental lines of demarcation. Impressed with the ruling idea of all great epochs or earnest intelligences, that of the unity of reality, he assumes a protestant attitude towards these distinctions, which appear to him incompatible with the demands of his genius or of his time. His iconoclastic zeal is inflamed by the justification which it finds in the obviously meaningless and mechanical rigidity of the tradition which it attacks, a tradition that has come to be in many respects a real offence against the primary postulates of intelligence. And turning from his contemporaries to the great masters of thought whom they profess to interpret, he finds in them also the phrases and ideas which he has learnt to regard as the symbols of an unmeaning super-

stition. And therefore, finding no help in man, such a protestant reformer in philosophy will proceed to reconstruct his world on the basis of that aspect of it in which its unity has been revealed to him; that is to say, in the case of logic, probably on the basis of sensation, of observation, of particulars, of inductive experience.

But when with labour and pains some progress has been made in this reconstruction, then for the reformer or for his successors there arises a further stage. The duty now falls upon them of maintaining the essential distinctions of thought, between perceptive comparison and geometrical demonstration, between empirical laws and laws of nature, between induction by simple enumeration and the constructive processes of methodic science. When these antitheses are fully developed, then the time has come for a rediscovery of the meaning of Plato and Aristotle. The language which science is compelled to hold reveals itself as coincident with that of the teacher who first explained in what science consists. The distinction between the province of self-contradictory opinion [1] and the province of coherent knowledge recovers for science the meaning which it had all but lost for scholarship. When it becomes unavoidable to erect, within the whole of 'experience', which has been passionately proclaimed to be coextensive with knowledge, the included wholes of 'empirical' observation and mere fact, as opposed to deductive certainty and mathematical necessity, then it is understood how such distinctions as these when originally made were distinctions within the knowable world, and were not incompatible with the unity of experience. No geometrician, I imagine, would accept the statement that the ratio of the diameter to the circumference of a circle, so far as ascertained, is ascertained by observation, because this would mean that it was found by direct measurement. But, in denying this 'empirical' origin of the cognition in question, he would not suppose that he was alleging its

[1] De Morgan's Budget of Paradoxes is little else than the self-defence of science against opinion. The failure to distinguish relations, which in the world of opinion makes difference into contradiction, is well illustrated by one of De Morgan's cases, an argument against the rotation of the earth which asks 'How can a man go 200 yards to any place if the moving superficies of the earth do carry it from him?' p. 78.

independence of our acquired knowledge concerning space and spatial relations. He would explain, I suppose, that no doubt the calculation in question was based upon spatial relations that could only come into the human intelligence through its being aware of a spatial world (however this its spatial perception is attained), but that nevertheless the conclusion is reached by a process of reasoning or calculation, and is not an observation in the sense in which it is an observation that there are ten volumes in the shelf at my right hand. And by extending the same reasonable interpretation to Plato and Aristotle which we extend to ourselves, remembering, that is, that all contentions are relative to certain purposes and proceed on certain assumptions, it becomes possible to recover something like their natural meaning.

The development of Logic in England from Bacon to Mill and Jevons is a good illustration of the process which I have attempted to describe. And on a still larger scale, extending to every side of life, I make no doubt that the Renaissance itself, and also the new Renaissance of Winckelmann, Schiller and Goethe, were examples of a similar phenomenon. Ancient systems of thought or of religion can in fact only be interpreted in as far as their interpreters feel the necessities which were pressing upon their authors. And thus the individual mind, in as far as its ideas develope from a root of genuine interest in reality, tends to pursue an analogous course. If a great master of thought could come on earth again after some centuries, he would seldom find his true followers among those who have never deviated from the straitest sect of his exponents.

Thus a cynic might say that the history of philosophy is a process in which the meaning of Plato and Aristotle is periodically forgotten by their disciples and rediscovered by their antagonists ; who then, perhaps, become their disciples, and so the cycle recommences. And the observation would be just except in so far as it implies that in each rediscovery no advance is made on the meaning as understood before. The cycles of philosophy repeat themselves, but not with identical content. The Encyclopaedia Britannica is a very different thing from the Encyclopaedia of existing knowledge as sketched in Plato's Republic.

iii. It has been suggested by a great writer[1]—and the suggestion falls in with many current ideas about philosophy—that the necessity or propriety on the strength of which synthetic connections are derived from or combined into an including unity, ultimately the unity of the world, may be rightly described as 'aesthetic'. This conception contains elements of very unequal value, and I suspect that the element for the sake of which it is recommended is one for the sake of which it ought to be rejected. 'Aesthetic necessity.'

It does not matter, or ought not to matter, whether we speak of self-evidence, propriety, or necessity. They all attempt to express the same fact, that in knowledge, that is in judgment, we are not free, but are under a constraint exercised upon us by the content of knowledge itself, such that some judgments have to be accepted and others to be rejected. But if we express this fact by the term necessity, then in virtue of the explanations which have been given above we exclude, and rightly exclude, an interpretation which the terms self-evidence and propriety admit if they do not compel, that is to say, an intuitional interpretation.

'Aesthetic necessity,' then, would either mean something which we might accept as a fact, though we should pronounce its appellation unduly limited, or else would be a contradiction in terms. I will consider the latter alternative first.

α. An aesthetic judgment, like a moral judgment, is in everyday life, at any rate, not explicitly mediated. It is the peculiarity of the aesthetic product, or of the aesthetic aspect of any object, that although coherent and rational, having passed through the medium of mind, yet nevertheless, *qua* aesthetically operative, it is not discursively analysed. Although in aesthetic judgment discursive analysis must play its part, yet such analysis is not the essence of aesthetic appreciation, but is on the contrary that which aesthetic appreciation has in common with scientific understanding, and is the mere organon of careful perception, by which the aesthetic product is constructed and brought to notice in the mind. A work of art, or any object regarded as beautiful, makes an appeal to feeling; which, as such an appeal, must In one sense, a contradiction.

[1] Lotze, Logik, sects. 364–5.

be immediate, although the feeling to which it appeals is moralised or spiritualised, and consequently there is on both sides, in the work of art and in the spectator, a rational content. This, though it appeals to feeling in an immediate form, is of course capable of being analysed in mediate form. But yet, as the work of art is the outcome of a spiritual mood of feeling in the artist, so it appeals to such a mood in the spectator. It was not constructed by combination of abstract relations, and though its fabric must be coherent and charged with intelligence, yet no mere intellectual reconstruction of such a fabric can reproduce the spiritual mood which is the essence of the work of art. This, if expressed in an abstract or inferential form, may retain a value for philosophy, but loses the differentia of fine art. Therefore, as necessity involves explicit mediation, and aesthetic judgment in the strictest sense excludes explicit mediation, to speak of aesthetic necessity is a *contradictio in adjecto*. It is this immediate or intuitional self-evidence, this appreciation by *feeling*, which, as I suspect, the suggestion before us intended to identify with logical coherence or necessity. If recommended in this sense, the suggestion must I think be absolutely rejected. Necessity only attaches to a judgment in as far as that judgment involves the whole of knowledge. Unreasoned necessity is irrational belief.

In another sense, a type of logical necessity.

β. If, on the other hand, aesthetic necessity merely meant that synthetic coherence of parts which every aesthetic whole shares with all universals whatever, then though we should admit the description to be true, and in one respect striking, yet we should have to add that it really did no more than refer us to one instance, and that an imperfect one, of the general relation to be described. An aesthetic whole is, so to speak, a universal made easy. In it the individual unity which belongs to everything real is not left to be toilsomely unravelled by reflection, but is presented in a shape capable of at once appealing as a unity to sense-perception or to imagination. Hence the discursive analysis which is instrumental in the apprehension of a work of art, however subtle in its ultimate refinements, is *ex hypothesi* in great part evident and unavoidable. In this sense and to this extent

the rational coherence in which all knowledge consists is strikingly illustrated, not by the aesthetic judgment itself, but by the analysis which accompanies the apprehension of a work of art in so far as this apprehension is of the same nature with the apprehension of any perceived object or complex of relations whatsoever. For this reason it is not uncommon to take a work of art as an example of the compulsion by which the nature of a whole controls its parts, simply because this control, which is the essence of individuality, lends itself readily to analysis in a work that is pervaded by an especially harmonious unity.[1] But precisely the same is the case with geometrical conceptions, and for precisely the same reason geometrical necessity, which is not only rational but also essentially mediate, is often taken as the type of logical necessity.

Of these two classes of examples the geometrical conception is the more perfect in one respect and the aesthetic in another. The aesthetic object is an imperfect type of necessity because its nature is not exhaustible by reasoned judgment, but consists in being such as to produce a certain spiritual mood. As this mood involves and is accompanied by some degree of reflective apprehension directed to the coherence of parts in the artistic whole, which coherence is necessary, there is apt to be a confusion between the feeling and its concomitant insight which leads to an erroneous notion of *immediate necessity*. And it may be added that in trained artistic perception there is an immediate reaction of repugnance or acceptance, analogous to the every-day moral judgment, which is right and accountable in its place,

[1] The famous simile of the statue in the beginning of the fourth book of Plato's Republic will occur to every one. This simile, occurring at a critical point in an important work, is perhaps responsible for a current idea that the Logic and Ethics of Plato and Aristotle were 'aesthetic' or 'artistic'. But the fact is that Plato and Aristotle dealt almost exclusively with the general principles which underlie all individuality and function, and illustrated these from fine art, from industrial art, and from science, almost indifferently. They possessed indeed no specific term for fine art, and though they gave a just weight to the idea of beauty, yet nothing in their theories was aesthetic if that means sentimental or unreasoned. If anything, they were too systematic and intellectual.

but is the worst possible elucidation of logical necessity, with which the form of feeling is wholly incompatible. The geometrical object is not open to this censure. Its nature is to be capable of systematic construction through and through. And the pervading nature in virtue of which the universal determines its differences, the root of logical necessity, is nowhere more explicitly formulated and applied than in geometry.

As to individuality, however, the matter is reversed. A work of art, though not an embodiment of real teleology,—for it has not a purpose conceived as a definite reflective idea,—has nevertheless the content or nature of real teleology, being thoroughly penetrated with reason [1] in the form of feeling. It is therefore individual in a special sense, as an outward and visible form thoroughly identified with an idea that pervades it, so that the work of art is distinctly relative to human intelligence, though it has no separable purpose embodied in abstract human thought. Thus a work of art is an exceptionally effective instance of an individual whole. In geometrical objects the pervading unity is of the most various kinds, and sometimes, taking the imperfect form of a progression to infinity, appears to be incapable of constituting a whole complete in itself. Even space seems powerless to limit itself, and therefore its parts seem rather to lie indifferently behind one another than to constitute a totality in which each has its peculiar place and function. In this sense no doubt the *peculiar* and *specific* necessity imposed upon parts by the whole which they constitute is better illustrated by the aesthetic than by the geometrical whole.

Yet the wholes of real teleology, the moral order, for example, as exhibited in a moral person filling his place in a community, illustrate the nature of rational necessity better than either the aesthetic or the geometrical system. The identification of necessity with the idea of an intuitional or isolated self-evidence is the rock to be avoided.

[1] Mr. Matthew Arnold's phrase 'criticism of life', applied to poetry, explains what is meant by saying that art contains reason. That the reason must be in the form of feeling this term 'criticism' appears to ignore.

Necessity, then, is a character attaching to parts or differences interrelated within wholes, universals, or identities. If there were any totality such that it could not be set over against something else as a part or difference within a further system, such a totality could not be known under an aspect of necessity. The universe, however we may conceive of it as including subordinate systems, must ultimately be incapable, *ex hypothesi*, of entering as an element into a system including more than it. Strictly speaking, therefore, its relation to knowledge must be one of reality, not of necessity. But also, strictly speaking, it is a reality which we have no power to question or to explain, because all our questioning or explanation falls within it. There can be no meaning in talking about what might be the case if the universe were other than it is, or about what has been the case to make the universe what it is.

But except in the case of this unique and imaginary reference of that which is assumed to be the absolute whole to something outside itself, every judgment is the synthesis of differences, in a whole or identity expressed or understood, and is therefore at the same time the analysis of that identity. It makes no difference to the ultimate or actual import of a judgment whether as a process in time it took its rise from the synthesis of two data, or from the analysis of one. In every judgment there are differences within an identity. In every judgment therefore there is affirmed a necessity based on a reality. The necessity itself may have for its content a further reality, or may remain an abstraction which can only be set down as descriptive or illustrative of reality. The latter is the case with the more extreme forms of the hypothetical judgment.

The various forms of universal which are the source of necessity and constitute the content of judgments, the comparative value of these forms for knowledge, and the affinities between them, are the object-matter of Logical Science. And because our intelligence creates and sustains our real world by a continuous judgment which embraces these forms, in their concrete connection, within the unity of its system, it is further true that Logical Science is the analysis, not indeed of individual real objects, but of the intellectual struc-

ture of reality as a whole. In speaking of the intellectual structure of reality, it seems to be suggested that reality is modified by knowledge and is dependent upon mind. How far and in what sense this is the case I have attempted to explain in some additional chapters dealing with current contentions of to-day.

Genetic Theory and Necessity.

4. In more than one passage of the first edition of this work I referred to considerations bearing on the limits of a Genetic theory of Logic. The development of systematic thought as it reveals its inherent nature in response to stimuli largely conditioned by its own advance, and according to its own necessity, appeared to me to be the true type of genetic analysis.[a] It seemed to me further that a sharp distinction must be drawn [b] between varied forms and degrees in which the conditions of knowledge might be fulfilled in various environments, and any attempt at evolutionary explanation of its ultimate principles, such as the law of non-contradiction. On the other hand I was careful to point out [c] that even such leading principles—the necessary functions, as I proposed to call them, of the rational mind—were not to be considered as formal propositions, given and self-evident each within its own four corners, and irresponsive to alterations in the general body of knowledge. I regarded them as roughly [d] comparable with the main functions of an animal organism, which may be fulfilled in all sorts of shapes and degrees, but must be fulfilled if life is to reside in it.

There must, I urged, for example, be a function in the body of knowledge corresponding to what we know as the law of Causation. But in what precise shape it is to be asserted has been and is still a matter of controversy, which will no doubt continue to lean in different directions from time to time according to the requirements of the matter to be dealt with.

I propose here to return to the above question, which has been the subject of much recent discussion, and has lately met with a substantive treatment in a treatise on Genetic Logic.

[a] Vol. i, p. 2. [b] Ibid. pp. 7–8. [c] Vol. ii, p. 229.

[d] Roughly, because for life the environment is the surface of the earth. For mind it is the universe.

i. There is, however, one general difficulty which may be dealt with in advance. 'What matter?' it may be replied to me. 'According to current views, and your own in particular, all genesis is only revelation, and there is no true creation *de novo*. "Tout est donné." Suppose that reason is only an evolutionary adaptation, selected by the environment from variations of thinking, for you at least that makes its nature none the less its own. However moulded, it had to be as it has turned out. What difference can the particular process make? What logical interest can you have in combating a view which professes to trace the genesis of the logical reason as an adaptation due to natural selection?' Now in a sense I am prepared not to admit but to contend that everything is modelled by the environment—the whole—which means, in the end, by something like natural selection. But within this wide principle there are distinctions which must be taken. Above all, we must distinguish systematic contrivance—the conscious working of a principle of totality and non-contradiction—from trial and error. The conscious endeavour towards non-contradiction and totality is no doubt a powerful instrument towards survival through natural selection, but it is also a great deal more. It is within itself a power of construction and of judgment, by its own law and necessity, in its own right. This power is what we call reason and intelligence; it is characteristically self-contained and self-complete; and has its own necessity, which is systematic, and not the mere success *de facto* that comes through trial and error, the pure and simple form of moulding by natural selection. Reason as an Adaptation.

How reason is truly creative I have briefly discussed above, and hope to consider more at large in another work. Briefly, I should urge that reason alone means creativeness, the continuity of the *bona fide* old with the *bona fide* new, and that there is nothing in the universe that is strictly creative except reasonable [a] and logical process—such for instance as we observe in every original work of art. That every such element is new and unparalleled is a quality secured to it according

[a] See above, p. 182.

to the degree of its individuality, which is one thing with its logical perfection. To repeat or be repeated means imperfect individuality—a failure, *pro tanto*, to hold one's own as an element in the whole. But I must not here digress further in this direction.

Reason, then, however it manifests itself in answer to demands of an environment, has its own necessity and does its own selection in virtue of its own constructive principle. It is the nature of this necessity, and the organisation which embodies it, that we investigate in Logic, and from the standpoint of which, so far as the system has been apprehended, we can judge and understand its partial incarnations in the course of evolution. This distinction between rational necessity and *de facto* survival will be further insisted on in the sequel.

Imitation plus Selection.

ii. I understand it to be the claim of the recent Genetic theory of Logic to explain the rise and growth of the characteristic organisation of thought which we portray in logical science, by a process of Imitation through which thought-variations are suggested, together with one of Selection, through which only certain of these are permitted to survive owing to their fitness for social and practical needs. Granted these factors, it is held, the nature of logical thought can be accounted for by them and out of them.

My contention is, on the other hand, that Imitation is merely a later and partial aspect within the character of relevant response which belongs to the principle of non-contradiction developing in its world of Identity and Diversity of experience, which is to it as the world of organic being is to the principle of Life.[1] And further, that Selection is something which Thought does for itself—as in the relation of any theory to the experience it unifies—and from its own standpoint. A Genetic theory, therefore, I contend, may exhibit the *de facto* evolution of the thought system and thought principle under historical influences; but it can never derive from other factors that systematic necessity of reason, rooted in the principle of non-contradiction, in virtue of which it pronounces some judgments to be true and others to be false.

[1] But see p. 238 above as to the different environments of the two.

iii. Imitation is a partial case of relevant response, which depends on a recognition of Identity in Difference. *α*. I can not agree with the view that this distinction is verbal, e.g. in its application to biology. It is easy to show that a working whole cannot be represented in terms of similarities between its members. And for the same reason the nature of the members themselves must in a great measure be omitted from such a representation. The Linnean classification, or the current 'natural' classification in botany, may be taken as a representation according to resemblances, though I should not admit that any scientific classification is so intended. But a region of the world, as a whole of competing and co-operating members, according to the light thrown by the principle of evolution, can never be represented in such a form as this. It can never bring together the things which have most to do with each other: competing species of plants, co-operative plants and animals, the soil, the climate, and their effect on the living things. Of course all this can be added in footnotes, as it were, to classification by resemblances; but it cannot be represented in the structure of the classification itself. It would be like trying to explain a locomotive by arranging its parts in classes according as they resemble each other. The reason of the impossibility is that the parts or members have their connection through their differences; and in a classification by resemblances, these, though they have their weight as differences, have no weight as instruments of identity. This whole subject is treated by Green,[a] and I think is too little understood. I should strongly suspect that the reform of logic in this sense in the great Idealist days promoted, or at least was akin to, the transition from Linnæus to Darwin.

Meaning of Imitation.

Imitation dist. Response.

β. Imitation (I summarise in my own language) is alleged to be a *vera causa*, it *shows*, is psychical, genetic, you can see it at work; the operation of a universal (that is, an identity in difference) is an assumption, shadowy, almost, I think, *a priori*, mystic, antiquated, invisible. I assume, it is urged, publicity, the common awareness of a situation in which more than one person is concerned, which ought to be explained.

Why held a vera causa?

[a] See p. 183 above.

Now I cannot see any ground for all this in the facts. Imitation no doubt is a fact, and plays an important part in furnishing the self with material. I quite recognise the value of the work which has been done on this subject. But surely response and reaction, indices of communication through a common nature, are much wider and more primary facts, extending over the whole world, physical and psychical. The adapted response is earlier—is it not ?—than consciousness ; and the process of its passing under the control of intelligence and being emancipated from trial and error, is fairly well understood, though still doubtful in some details. But the adapted response, as controlled by intelligence, just means a consciousness of the situation based on an inference which *pro tanto* dispenses with the test of material action; an inference based on perception is substituted for a certain number of errors, as when a man sees at a glance how to open a gate, which a dog will paw at till it comes open. There seems to me no assumption in this ; it is a plain statement of fact, and of fact more general and fundamental than imitation, and requiring no more assumption.

With responses adapted by intelligence on the part of two or more agents you have 'publicity' or 'the situation'. What you want, to account for this, is not imitation, but the power of consciousness to combine perceptions and see their results—in short, the unity of consciousness. As I understand, it is urged that this must not be assumed but can be and ought to be genetically accounted for. This I will speak of when I come to comment on the meaning of the term 'genetic'. My present point is merely that imitation is the secondary, less general, and less completely stated fact, and that the assumption of it, while involving, as much as a response does, the assumption of the unity of consciousness, is in no special way a help towards explaining the apprehension of a situation as a whole.

False separation of Imitator and Inventor.

γ. The treatment of facts introduced by this theory seems to me precarious all round. Particularly is this the case with the separation of the imitator and the inventor. I am convinced that a really critical study of any branch of history would demonstrate the crudeness of this antithesis when

offered as a matter of principle. The advance of the human mind, independently, so far as can be judged, of individual original genius, is one of the most striking phenomena of history, and one is inclined to add that the deepest transformations are those which have taken place in this way. It is an old and true saying that man must advance or recede; to stand still is impossible for him. That is to say, the application of tradition to life is in itself a generator of inventions; it is impossible even to borrow ideas without drawing conclusions which the lender never drew. And it is well known how rarely, if ever at all, an invention can be assigned to a single mind. The history of art is very instructive on this point, e. g. the education of a Turner.[a]

Truth or Belief?

iv. The second question (p. 240, on evolution of Thought), seems to amount to this: Does a genetic account of thinking explain by what character judgments are true, or only under what influence we have come in fact to hold (often wrongly) certain judgments to be true? And what bearing has either alternative on the theory of selective thinking?

Limits of Genetic account.

a. I will say at once that I see no meaning in a genetic account of knowledge, except as a history of opinion; but I admit that this involves a history of mental organisation. A simple illustration will do as well as an ambitious one. We constantly make such judgments as this: 'A. B. is a moderate Evangelical; he was brought up as an extreme one, in a family and circle whose views were extreme, but his work and intercourse with varieties of people have made him much more temperate.' Here we have the true place of a selective theory of thinking, so far as I understand it, in a nutshell. A. B. inherited a platform, an organised mental constitution and logical or quasi-logical system; i. e. he acquired it by adaptation to his parents' and teachers' views, or imitated them. Starting from this, he developed his later position through varied forms of social selection acting on his ideas, involving accommodation to practical needs; and he now has a mental content and organisation at once fairly

[a] See, in Mr. Finberg's book, the drawing copied by Turner in boyhood from an engraving, set side by side with the engraving from which it was copied.

harmonious with the circle in which at present he moves, and determined as a whole by the platform which he inherited. I do not doubt for a moment that a history of all of us and of the human race could be written in terms analogous to these with a great deal of truth. And it would not omit the facts of mental organisation. The metaphysician, the psychologist, the biologist, mathematician, and also the Englishman, Frenchman and German, would all prove to possess, yes, and to have acquired and developed, certain favourite categories, certain forms of logical or quasi-logical bias, and predispositions to accept explanations of certain appropriate types.

In such a historical enquiry some theory of selective thinking might have, so far as I see, very interesting applications. It would show by what needs and under what direction of attention the minds of nations and individuals had grown into certain structures, and had acquired certain logical predispositions.

But even here it would be necessary either to expand very largely the sense in which, or to limit very strictly the extent to which, we affirmed action to be the instrument of selection. If action meant all change of consciousness directed to an end, then, in referring the course of cognition and mental organisation to the needs of action, we should be making cognition itself the standard of cognition,[a] and saying that it learns to act as it does act primarily by seeking its own ends and secondarily by taking account of a certain contact with material action. Then we might fearlessly say that 'action'

[a] Mr. Stout in his Manual of Psychology seems to me to agree on the whole with me, never blinking the relative importance of the cognitive system as compared with external action, nor the liability of social endorsement to be erroneous. But in one place he seems for a moment, as I venture to think, to slur the distinction on which I am here insisting. On p. 547 he insists that because belief is a condition of activity, therefore activity must be a condition of belief. And this remark he extends to theoretical activity, though, indeed, as referring it to the provisional acceptance of working hypotheses, he gives it a very restricted and innocent application. But the point I wish to urge is this. In a 'practical' activity the end is assumed to be given, and it is not a cognitive end; therefore in this case there is some tendency to adopt beliefs which purely cognitive processes might not confirm; i.e. there is a possibility of a real non-cognitive influence on cognition. But in a theoretical activity, unless a preconceived opinion is to be supported

is the sole test and instrument of selective thinking. How 'action' operates, would be the further question, to which Logic would be the answer.

If, on the other hand, action were taken in the sense of the production of change in the external world, we should return quite a different answer. We should say that the influence of practical needs was a diminishing factor as the content of systematic knowledge increased.[a] We should point out that when thought has become complex, action on the external world is to it as sensation is to science, a condition which is little more than negative; something, disagreement with which demands more or less modification of the discrepant thought, but any given agreement with which carries us but a very little way towards truth. We should further urge that the much talked of 'social endorsement', as applied to systematic ideas, has no existence. This is a very important point in its practical bearing. Social endorsement does apply roughly to habits of action. But to cognitive ideas, to the actual content of inventions, and to theories, as such, it has no application, only touching them in one or two points out of thousands; and to suppose otherwise is a very mischievous superstition.[b] It is a transference of the ideal postulate of reason, that all valid judgment is valid for all intelligence, to the *de facto* social consciousness, to which it applies only in grades so contingent and varying as to be of no selective value whatever. The leading ideas of society, so far as they can be conjectured from their expression, are always in

(which is an *aberration from* the theoretical consciousness), the end to be obtained is not given, but is itself a conclusion to be constructed. It therefore involves *ipso facto* a modification of the beliefs ancillary to it, and the dangerous primacy of action over reason is not confirmed by this instance.

[a] Mr. Stout in his Manual seems to me perfectly clear on this point; and to be wholly free from the ambiguity whether thought is made true by being socially and practically selected, which I find in others.

[b] I hope I shall not annoy a friend who conversed with me in the U.S.A., in 1892, if I make use of his observation to me: 'Sir, the people of these States have endorsed the philosophy of Mr. Herbert Spencer.' The example seemed too apposite to be neglected, as showing the laxity with which a rough coincidence in one or two points is construed as an 'endorsement'.

arrear of the truth known to experts, and more especially are discrepant with its own habits of action, which do represent in a rough and unorganised form the external needs of life.[a]

The exclusive importance attached to action on the external world, and to social endorsement, even as influences on the history of opinion, is, I hold, a mere paradox, unsupported by facts. The subordination of the vast cognitive systems and interests of mankind (which have, it must be remembered, their own relations, dictated by cognitive needs, with the 'external world' or sense-perception) to the test of action in the narrower sense of material external change, I believe to be simply an elementary blunder. If, on the other hand, we are only asked to call these interests and systems 'practical', as Aristotle carefully pointed out that they are, in virtue of their inherent conativeness, we are asserting, I take it, the contradictory of Pragmatism,[b] but are returning to obvious truths.[c]

The Making of Truth.

β. And when we raise the whole question of Pragmatism, i.e. as I understand, not '*How do we come* to think something?' but '*What tests or makes* its truth?' the idea of selection by social endorsement, or by success in producing change in the external world, loses all claim to consideration, except as involving agreement with sense perception, which is provided by cognitive activities in a much more adequate form. As we have seen, nearly the whole of cognition is simply untouched by action on the external world. In such action itself the outward change effected is but a minor part, from which, as we know, e.g. in all ethical considerations, it is impossible with certainty to understand a man's mind; and when

[a] e.g. T. H. Green usually agreed with J. S. Mill on questions of public policy, though on all theoretical matters their minds were diametrically opposed. This is possible, just because theoretical ideas, even of social matters, have so very little of their content in contact with practice.

[b] Because Pragmatism says, as I understand, that the only ends of action are those which consist in change wrought upon the external world, and that, to these, cognition is a means. For me, cognition, as a harmony in our experience, has the character of an end of action, though not the whole end. But external change is *never* an end.

[c] See Stewart, Notes on Aristotle's Ethics, 1098, a 3, and citation from the Politics.

we come to the great cognitive systems the prerogative of such action vanishes altogether. Indeed, there is but one criterion of truth, and that is, a fuller systematic cognition of the content whose truth is in question. No history of opinion, no formation of a platform, no idiosyncrasies of mental organisation, can come into court when the question of truth is raised. Then we have to do with nothing but the systematic necessity of knowledge and the fact that fuller cognition can compel every false judgment to expose itself as flat self-contradiction.

Now the advocates of Genetic Logic seem to me to mean that selection by social and practical needs not merely accounts for our holding opinions, but also constitutes their truth or falsehood. If so, then, as the problem opens out, we have the whole of Pragmatism on our hands, and are, as I hold, beyond the limits of legitimate genetic explanation. Grant, e.g. for the sake of argument, that the unity of consciousness first appeared in practical action in the narrower sense given above (as it must have done if there was a time when consciousness was entirely 'practical' in its aim), or that it is motor in its nature, or that it appears in some sort of general sensory process. All that is interesting in the history of opinion, but has no bearing on the logical value of such unity. This is only to be discovered by an analysis of the part played by it in the organisation of experience so as to avoid self-annihilation by self-contradiction. It is an old story; granting (what is not true) that we need not play the game, yet if we sit down to it we must observe the rules. If we are asked, Why must we? there is no answer but to show by analysis in any given case that in trying to evade them we are disguisedly throwing up our hand. I can imagine its being replied, 'But you say that A.B.'s rules and platform are got by his history and education; then surely his truth is so too.' The answer is that his rules and platform are an imperfect appreciation of *the* rules and platform, and cannot stand against another, in him or outside him, which more nearly approaches them, and therefore is able to exhibit his as self-contradictory. His knowledge, or rather opinion, *qua* his, may be compared to his body, a *de facto* structure, accounted for by accident

and selection as well as nutrition and correlation. But his knowledge *qua* knowledge may be compared with the work his body is now capable of as a machine—a test to which his genesis has nothing whatever to say. Truth is the most organised organisation of reality in the medium of judgment; our history may excuse our failures in it, but cannot make them successes.

Views like this suggest to some thinkers the idea of 'the mind, for no reason, and by no regular processes, making its truth what it will'; or of 'the essential mysticism of *a priori* formalism which prevailed before the rise of the genetic point of view'.

This again is an old story. The very error with which I am charged appears to me to be merely in the mind of my antagonist. The whole antagonism of principle between classical and modern logic; the whole conception of a modern development of the genetic point of view, considered as anything which affects the nature and criterion of truth; the whole idea of 'thought in itself' as opposed to the nature of the real in cognition—all this appears to me to be the merest mare's nest. The truth of anything is for me simply its fullest nature so far as expressible in judgment, organised, as the fullest nature must be, so as to avoid diminution by the contradiction of its parts. What I deny is, not that thought is the expression of organised reality, but that the organisation of reality is confined to the production of material change in things. The nature of things is both general and special, and besides its more general and formal characteristics, there are all sorts of grades and variations as we push deeper and deeper into the heart of complex individuality. These, as found by analysis, form respectively the more abstract and more concrete elements of Logic. But obviously all of them contain and confirm the general nature of truth.

Why should not the universal 'be a mental experience which has for its physical counterpart the synergy of adapted action'? To me the answer seems simple—because there is very little thought, proportionately speaking, to which there is any adapted action, in the sense of external material

change, to correspond. I have said that I think that unity very likely first showed itself in adapted action. But no thought, probably, ever had its content exhausted in the adaptation of external action; no thought of a cultured mind can ever be so exhausted to-day, even in the most practical of activities; and a very great part of life, a part which even economically and industrially is an immense and commanding interest in the world, has no end in external adapted action at all, but on the contrary uses and transforms such action by making it its means. A great scientific laboratory, for example, has not its unity in a material operation to be produced; its actions have their unity in a cognition to be attained. The same point is very strikingly shown in the enormous material activities of a Wagner or Handel festival; whose whole practical business has for its determining purpose the production of a harmony in minds, of the same *general* (not specific) nature as a cognitive state. The harmony is the end; the 'action' is the means.

The formation of new reality, as a *bona fide* addition to the universe of what was not in it before, seems to me a contradiction in terms. But the discovery of reality new to us, and the adaptation of intelligence to it, is surely a fact which no one has ever denied. And what we call the discovery of reality, the coming to take part in it, as for example by education a finite mind must at some moment begin to—accepting its burden as part of the experience we have to work out—all this is not simply a finding of something pre-existent. It is an element, an appearance, of the tension by which something maintains itself in ultimate reality; an element or appearance without which the self-maintenance could not be complete. There are not two worlds, an original which pre-exists, and a copy which we make according to our discoveries of the first. When we discover, we neither add to the universe nor repeat it. We simply play our part, which as we are finite, has a beginning and an ending, in its self-maintenance.

Now if this distinction would satisfy the genetic point of view, I think we might come to terms. But if that view means *a* that new reality is created in the sense of being

actually added to the universe by no continuous self-maintenance or logical process, and not created in the sense of being discovered as above explained, by entering into its act of continuous self-creation, and β that action on the external world, and social selection, are the determinants and criteria of truth, then I am afraid there can be no reconciliation between us.[a]

[a] See Bradley Mind 79, 323 ff. where he urges that 'My act never is creative' (p. 329). I take it that he does not deny that the universe, as a life, maintains itself in some degree through my act. He only denies, I gather, that my act brings something new into the nature of the universe as a whole.

CHAPTER VIII

THE ABOVE THEORY OF JUDGMENT IN RELATION TO 'ABSOLUTISM'

1. A THEORY of Judgment must be criticised on its own merits. Still, it would point to some defect in such a theory, if, without the strongest possible reason, it should tie us down *ab initio* to an ulterior metaphysical doctrine. Our Theory prejudiced?

Judgment, we may say, should be an instrument of asserting whatever we want to assert. If it trammels us in our beliefs, we must surely be interpreting it wrong.

Therefore I understand it to be an attack on the theory of Judgment which, having originated elsewhere, is in the main adopted in this work, when we are told by distinguished writers [a] that it by itself [b] makes necessary the doctrine of Absolutism. The attack is primarily indeed addressed to reveal the slightness of the foundation of the latter doctrine; but I take it that its suggestion is double-edged, and might be briefly rendered thus: 'Your logical theory is a caprice which is enough by itself to force you to Absolutism, and will not let you say what you mean. Your Absolutism is a metaphysical doctrine founded on little or nothing beyond this logical caprice.' My aim in this chapter, as befits a logical treatise, is to combat the first of these two suggestions. But so far as the 'by itself' is concerned, this cannot be done without reference to the positive grounds which force the theory of Judgment to define itself in favour of Absolutism. And therefore to indicate the reasons for the latter doctrine, though strictly belonging to metaphysics, also becomes relevant here.

The criticism runs thus: If every judgment in ultimate analysis qualifies an existing reality by an abstract universal,

[a] Mr. Russell, Philosophy of Leibniz, p. 15, and Principles of Mathematics, p. 448; Professor Stout, Aristotelian Proceedings, 1902–3, p. 7; Professor A. E. Taylor, ibid., 1908–9, pp. 202–5.

[b] These words, 'by itself,' indicate a principal feature of the criticism in the sense in which I desire to repel it.

it is impossible to arrive at a plurality of individuals which can be ultimate subjects of predication, because no combination of abstract universals can confer the uniqueness [a] which alone distinguishes an individual. There can therefore be but one ultimate Individual to which all predicates must belong; and this doctrine is Absolutism.

On this basis there are two charges against our theory of Judgment. First, that its consequent, the doctrine of Absolutism, is false, and therefore the antecedent, the theory of Judgment, must be false also. That is, there are many ultimate subjects of predicates, and a theory which involves the denial of this must fail.

Secondly, in any case the theory of Judgment binds us from the beginning to a certain metaphysical view, which is an unfair and improper use to make of a logical caprice, or, let us say, of a logical analysis of the mere form of assertion.

No finite real self-existent.

i. The set of facts upon which the former charge is supported, begins, as I understand, with the necessity of recognising real pluralities of terms in logic and in mathematics. From this fact, as I read the argument,[b] is inferred, what is not included in it as a fact, the existence of a plurality of substances of which, on the strength of an appeal to our private experience, the self is taken to be the principal example. And the existence of such true substances is also independently affirmed. By substance is meant something which can only be a subject and never a predicate, and which is a uniquely individual existent, so far independent that as a part or element it is no less individually real than the whole, while the whole is no less individually real than the parts.[c]

Now the doctrine of a single Individual Reality rests on the demonstration that no finite individuals are self-complete and self-contained, and that therefore none such can be self-existing substances, or irreducible subjects of predication.[d]

[a] See Professor Stout, loc. cit.

[b] Taylor, loc. cit. It is very noticeable that this fact is not taken as itself including the existence of a plurality of substances; so that *prima facie* it is a proof that you can quite successfully work with a plurality of terms which have no claim to be substances.

[c] Ibid., pp. 208–9.

[d] Cf. Bradley in Mind, 74, p. 160, which I saw first after this passage was written.

I suppose that every discussion of substance to-day must start from the position which Lotze has made familiar ;[a] that to call anything a substance must indicate its mode of behaviour, and not an occult somewhat presumed to be inherent in it. From such a point of departure we come at once to the position that substantiality, like individuality, is a matter of degree. No finite real is wholly independent and self-existent ; none, that is to say, when taken as a subject, can be concerned in judgments which are completely true either regarding its predicates or regarding its relations with other subjects.[b] If this is so—and even the argument which I am disputing admits and maintains it [c]—there is no finite real which is in the full sense a substance. No judgment in which such a real stands as subject or term can ultimately be true ; the connections alleged about it must either be too much or too little.

I must explain that to deny the self-existence of any finite real, is not to assert that Reality could be complete without it. Nothing is self-existent, but nothing is non-contributory.

Degrees of Individuality.

ii. The above argument is merely carried into detail in the doctrine of degrees of individuality. This, if we start from Lotze's position, is indisputable ; and is over and over again asserted both by implication and in so many words in the argument under discussion.[d] There are terms, we saw it admit, which are not substances ; and when we come to substances, it is granted that the finite self has less individuality than the social whole, which nevertheless most people would not admit to be a spiritual substance at all.[e] And in fact, no finite individual is self-contained, self-consistent, or self-dependent ; all finite individuals differ in their degrees of these characteristics. This seems to me to be one of the truths which are accepted without being believed. I do not think that it is

[a] Metaphysics, Eng. Trans., p. 76. [b] See i. 206 ff. above.

[c] Taylor, loc. cit., and Stout, Ar. Proc., p. 21 ; and cp. Bradley, Appearance and Reality, in the arguments against Pluralism, pp. 141–3 and 607.

[d] e.g. p. 211, 'we might draw a distinction here between individual substances of higher and lower orders.'

[e] I cannot reconcile this with the requirement that the element is to be as real as the whole, and *vice versa*, ibid., p. 208.

or can be seriously disputed on philosophical grounds. All the distinctions which philosophy takes account of between higher and lower grades of life and experience come back to this. Any logical or metaphysical system is enough to show how the positive value of the law of non-contradiction embodies itself in such gradations; and the argument of Mr. Bradley's Appearance and Reality is, as I understand it, the same in principle throughout. Yet if this principle were not only accepted but believed there would surely be at once an end of pluralism and of the multitude of self-existent substances. If all finite subjects have in various degrees their reality outside them, it is idle to speak of any of them as substances in the sense before us. As a striking example of gradation, we may note how the series of individuals passes downwards into cases where individuality, and with it reality, touch a minimum, and fade into the extremes of self-contradiction and self-alienation, as in various grades of the animal mind, or in the terms, such as point or atom, for which it is not claimed that they are substances. Confront an upholder of selves as self-existent substances with a brood of new-hatched chickens, and ask him whether these are individual substances or not. They are certainly unique by their relation to presentation; but this, as we shall see, is a feature actually opposed to true individuality. If, further, they are in behaviour and capacities true individual substances, or if they are not, the answer is equally fatal to the substance-theory. In the former case an enormous difference of degree is admitted within the series, so great as to destroy the value of the self-existence claimed for its members; in the latter case a distinction of kind is admitted between grades of spiritual beings which cannot be other than arbitrary.

Experience of self fatal to doctrine of substances.

iii. The appeal to our experience of ourselves is of all things the most fatal to a doctrine of self-existent substances. The evidence is so abounding that it is hard to know where to begin. Perhaps it is enough to say that no doctrine of a monadic self, in the sense of a self which is single and substantial, has ever been able to deal with the self as it actually exists;[a] Plato's least of all, as he constantly admits and

[a] Cf. Appearance and Reality, p. 86 ff.

maintains. What we miss in him, what would have taken him fairly beyond the doctrine of the monadic soul, which hampers him as he himself points out,[a] is the conclusion which lies so near him, that the terrestrial course of the soul is the soul's opportunity for self-perfection, and that when struggling with multiplicity it has not fallen, but is for the first time (as compared with its self-existent purity) in the way to rise. The logic of his system in fact demands this point of view, and it might be said to be implicit in his doctrine of the earthly life; [b] but I cannot say that he has anywhere to my knowledge expressed it. Some kind of unification at some stage of being, no doubt we with Plato assume as inevitable. But what kind of unification, and at what stage of being, whether or not within the limits of an individuality that can be called ours—this is altogether a different question. Nothing in our experience seems to warrant or even to suggest it, while our moments of fullest life seem most distinctly to deny it. That our self, or will, or mind, at its best, is not the self or will or mind of a unique individual, bounded, so to speak, by our normal circumference, is the one definite point on which spiritual experience seems unambiguous.[c] And in the relation of the individual to society, described as before referred to, we have this admitted; and, as its consequence, that no individual which has a foreign environment can act in a way purely self-expressive. What kind of individuality is that, which cannot express itself in its acts? It is to me quite astonishing that an appeal in favour of a doctrine of independent substances should be made on the ground of our experience of ourselves. What all great masters of life have felt this to reveal has been a seeking on the part of the self for its own reality, which carries it into something beyond. And social experience, like that of art, is absolutely conclusive on this point.

iv. But a logical objection is raised against an apparent subject being in any sense a 'predicate'.[d] Difficulty in Subject being Predicate.

[a] Rep., ix. end and x. 611 C.

[b] As the need and value of the Fall is in Christianity.

[c] See Bradley's Ethical Studies, p. 288.

[d] It is noticeable that Mr. Bradley, in the Principles of Logic, spoke of judgments about non-temporal subjects as a class of singular

Class Predication.

It is urged that to predicate an individual subject of the Absolute has the self-contradictory result that the Absolute is included, so to speak, in that individual as a class of one; in other words, is identified with that individual.

Now the connection of Subject and Predicate in judgment has essentially nothing to do with the inclusion of the subject S in a class P. Judgments which are so construed [a] mean something else, and are in no case the equivalent of assertions of class inclusion. And the importance of this is, that though in some cases class inclusion is inferrible from (in no case equivalent to) them, yet, following the straight line of what judgment really means, not only do we never at all deal with class as such, but when we come to the point where Logic deals with the universal in its true form, we leave the preconception of class behind us for good and all. From the point where the development of the judgment branches into the assertion of differences within individuals (the Singular judgment with proper name for subject [b]) on the one hand, and the abstract nexus of different contents (the 'hypothetical' judgment) on the other, the predicate has nothing more to do with class significance. The meaning which has really underlain all its forms, the holding differences together within a whole of identity, becomes sole and unmistakable.

The real significance of the Individual Judgment is revealed when it has developed into the Disjunctive judgment, in which you have a significant individual subject-system set out in the subordinate actual forms which it takes under

judgments in which the true categorical, undiscoverable elsewhere, might conceivably be found. He gave as an example among others, 'The soul is a substance.' (Principles of Logic, c. 2, s. 7, 41, 81). I should suppose that the criticism of Appearance and Reality is hostile to the claims of these judgments to express metaphysical truth, although they might still be recognised as forming a separate class in Logic.

[a] Bradley's Logic, pp. 162–8.

[b] It may be said 'But you can treat this as a class judgment', as in the old type 'Socrates is mortal'. The fact is, you can play almost any trick with the forms of proposition, because they have so much in common. But what such a judgment form really challenges us to do, is to develope the content of Socrates as an individual whole containing connected differences. And so the predicates should be regarded as elements entering into him, just as his acts are.

different conditions. 'When the Absolute tumbles into the water it becomes a fish;' so in asserting itself under this or that condition of its own imposing it becomes Mr. Smith or Mr. Jones. Why not? No true relation of membership within a concrete universal can be expressed in a class-predication, or in any judgment to which such a predication is equivalent. And no judgment, strictly speaking, expresses by its form a class-predication at all.

Imperfect Individual can be conditional Predicate.

v. It is said that a predicate is always universal (meaning abstract universal), and that therefore an individual can never be a predicate, even of the Absolute.

First, it should be remembered that the individual is the highest and only true form of the universal, and if a member of a system, has in it the nature of the whole to which it belongs. It can, therefore, as has just been pointed out, be a predicate of that whole, if the conditions under which it becomes so are specified.

Secondly; no doubt a wholly self-complete and self-contained individual could not be a predicate of any other individual. No conditions could be assigned under which it would be so. They would be two perfect worlds, and there could not be two perfect worlds either side by side or in any dependence on each other.[a]

But we are free from all difficulty on that head, for it is amply clear and confessed that our individuals are finite and imperfect. They are, as we saw,[b] members within a whole on which they are dependent for their very self-hood and self-identity. Such individuals can certainly be predicates, in the sense in which members of a whole are conditionally predicable of the whole. The nature of an organism, starting as an equipotential whole, may express itself, in elements conditioned by being at one end of the body, as a head, in those conditioned by being at the other end, as a tail, or according to other conditions as eye or gills. Of course these organs are predicates of the organism as a whole, subject to the conditions which have differentiated them.

But there is something more. Individuals which like all finite individuals fall short of true Individuality are, as we

[a] Appearance and Reality, chap. xx end. [b] Above, 254–5.

have seen, not, as they stand, terms in true judgments.[a] They have no power to resist reduction when considered in the light of the demands of reality; and are in ultimate analysis connections of content within the real individual to which they belong.[b] And this becomes important in the present case; for though no one doubts that the self has a degree of individuality, yet its real character consists not in individuality but in a claim to it, which may or may not, so far as a first appearance can show, be realisable consistently with the existing form and arrangement of the self. That the latter is the case in a considerable degree, i.e. that the self, in order to become anything like a true individual, must be very greatly transformed from what we are aware of it as being, I hold to be an obvious truth, guaranteed by all experience and by every serious religious creed and philosophical belief.[c]

I repeat and summarise; a member in a whole can be predicated, under a condition, of that whole which is his subject.[d] And further, an imperfect individual is according to the degree of his imperfection a subject whose connection with his predicates can only be expressed in judgments which are untrue; and to bring his nature into harmony with the truth of the whole it must be transmuted and rearranged so that it can be expressed as a true connection within the content of the whole. It is plain from the argument before us that this is so. The kind of individual with which we are dealing is unable to express his own nature in his own behaviour. He is, in Spinoza's language, very largely 'passive'; the acts ascribed to him are not his own. And therefore judgments in which he appears as a subject are not true.

Take as an extreme case the minds of animals, of which we spoke above. Are they not best treated, most adequately

[a] See Mind, 74, loc. cit., and above p. 254.

[b] See Principles of Logic, p. 93.

[c] It seems to me clear that Plato, even if he holds the soul to be eternal, does not think the same of the self.

[d] Professor Stout, Ar. Proc., loc. cit., p. 21, seems to me to take an example of part and part for a relation of whole and part. The roof or pillar holds in each the nature of the cathedral, though not so directly that of each other. Certainly each of these is predicable, conditionally, of the cathedral, as an eye is of the organism.

treated, as streams or eddies of mind in which some temporary combination, some minor aspect or centre within the universe demands transitory expression, in cases where the needs and conditions do not exist which give rise to an apparently individual subject? No one, who has loved a dog, can doubt that its mind has a value of the same kind, if remotely the same, as his own.[a] No one, on the other hand, can well suppose that it has the distinctness and organisation of content which we should expect of anything that is to have a permanent place of its own as a separate member of the system of reality. Surely the solution must be of the general type which conceives this partial mind as contributing a character, some intensification of loyalty and affection, to some greater existence,[b] but not claiming in itself to be a unique differentiation of the real.

Absolutism rests on its own substantial grounds.

vi. So far then it seems clear that there are plenty of good grounds, akin to but not dependent on the theory of judgment in question, for presuming that there is ultimately but one true individual Real, of which all contents that can be affirmed in judgments are ultimately predicates. In fact it would almost appear that this is not denied.[c] And if so we have only to establish, in answer to the second charge, that our theory of judgment lets one say, for ordinary purposes, what one likes about 'individuals' as subjects of judgments, and about other pluralities of terms.

Freedom of Judgment on this theory.

2. And passing here to the second charge (p. 252), we recall that this is a point which has been greatly misapprehended.

i. For all current purposes of logical utterance—and we have seen that the criticism itself is at a level which concerns nothing more, nothing really ultimate—it is the doctrine of a sole self-existent subject which has first given complete freedom to the judgment. For, in view of it, the traditional theory of a

[a] Cp. Bradley, Mind, 72, 508.

[b] Compare the well-known and attractive doctrine of the final annihilation of the wicked only, which in its modern form consists in conceiving an individual participation in eternity as something which is not for every mind, but perhaps for some.

[c] Professor Stout, loc. cit., seems to me to affirm a plurality of ultimate subjects, but to admit that they are not ultimately self-existent.

Grammatical S P rejected.

proposition divided into S and P becomes a mere superstition.[a] It permits the judgment to be formulated as any complex of terms and relations, any arrangement of a plurality of apparent subjects, as well as of a substantive and adjective standing in the regular scheme as grammatical subject and predicate. Ultimately all this can make no difference; for the one part of the judgment is not judged of the other; the whole complex, grammatical S P and all, is predicated of the ultimate Reality. Thus one shape of judgment is as good as another, except that the most natural and convenient is the best. No one has resisted more strenuously the folly of forcing every assertion into the S P schema than believers in the sole Real. One may use the form of the common subject, as the present writer has urged,[b] to express the condition or limitation under which the ultimate Real accepts the predicated content. But this is not what the common S P schema takes itself to mean, and is not intended for a defence of it.

Thus I infer that no objection lies against the doctrine of a sole ultimate subject from any tendency to interfere with the freedom of the judgment-form, which this doctrine, more than any other, has tended to establish.

Individuality demands Designation—a mistake.

ii. But there is a last intensification of this objection to deal with. It is contended that whatever may be the fact as to what we commonly call subordinate individuals, whether in reality they are genuine subjects or not, our theory does not leave the question open, but cuts away *ab initio* all possibility of distinguishing them as individuals. For it restricts us to universal predicates, and universal predicates can never, by any complication of them, distinguish and define individual subjects. This can be done, and can only be done, by contact with immediate experience.[c] This is to say, that Individuality rests upon designation, to which a predicate can never be equivalent, for it never confines us to a '*this*'; and therefore an individual can never be defined by predicates. And I reply at once that Individuality cannot possibly rest on designation; and that what does so rest is not Individuality

[a] See Principles of Logic, p. 23, and above, i, p. 76.

[b] See above, i. 3, 75–7.

[c] Stout, Ar. Proc., loc. cit., 19–24; cp. Bradley, Mind, 72. 500.

but Particularism ;[a] the very sign of negation and imperfection, which, wherever it applies, is the proof *pro tanto* of the absence of Individuality. But yet the point is in a sense perfectly sound. *Our* individuals, so far as imperfect, do depend on designation for the recognition of their uniqueness. And this is a conclusive proof that they are not and cannot be genuine individuals. I cannot understand why Professor Stout calls them ultimate when, as it seems to me, he explicitly admits that they are not.[b] For designation just excludes self-containedness and self-completion, and that uniqueness which comes of filling a definite place in an ordered whole.[c] It is tending, I note, to become a commonplace that the individual can only be designated and cannot be defined. But in truth, ultimately, the distinction should be reversed. A true individual cannot be designated, but it alone, and nothing else, can be defined. Designation means pointing as with the finger; mute identification *ab extra*; but the true

[a] Bradley, Principles of Logic, 76–7 ; Mind, 72, loc. cit., and 74. 167-8.

[b] Ar. Proc., loc. cit., p. 21. I cannot think that the argument of p. 23 successfully impeaches Mr. Bradley's criticism of the analytic judgment of sense.

[c] No doubt (Mind, loc. cit.) it is impossible to recover, on the level of ideas, the uniqueness belonging to mere designation, the mute and negative 'this not that'. Objections may always be raised such as Mr. Bradley raises in the passage referred to. You cannot specify a partial and imperfect individual by conditions which ensure that he is unique in the universe. But this is not because he is individual, but because he is imperfectly individual. And *so far* as an experience possesses individuality—*so far* as it has a complete and self-contained nature, positive and real,—*so far* it has uniqueness because it includes the conditions which protect it against repetition by assigning its place in the universe. That these conditions cannot be complete when the individual itself is partial and imperfect is only natural. But for all that, in principle, uniqueness depends on completeness of explicit conditions and not on designation, and thus we are intensifying and not enfeebling it as we tend to complete the organisation of experience through ideas. If a perfect individuality is not to be experienced in the form of discursive thought, that is nothing surprising, and in no way suggests that it may not be approachable through that form. As we have seen throughout, individuality varies *pari passu* with degrees of being and reality. It is altogether perverse to find in it the character of the datum of mere contact, as of the undefinable. See Green, Prol., sect. 194 and author's notice of G. E. Moore's Principia Ethica ; Mind, xii. 259.

individual, and any real so far as individual, identifies itself not mutely but explicitly, and not *ab extra*, or negatively,[a] but intrinsically, by what it has in itself. If about any element you are able to urge that so far as we know there might be another just the same, that is a sufficient proof that the first is not genuinely individual. If it were, it would contain, in its completeness, the reason why there could be no other beside it. Uniqueness by designation, by mute contact with our experience, is, we might say perhaps, formal.[b] Uniqueness by adequacy of content and absence of need or room for repetition we might call material. In dealing with the imperfect elements which meet us in our experience we have need of both; but nevertheless the predominance of the one or of the other practically measures the whole distance, within our world, between the poles of the unreal which is merely given, and the real which is coherent and self-complete.

Doctrine of ultimate 'Subject' leaves philosophical theory free.

iii. We have sufficiently seen then I hope, that (*a*) the theory of the sole ultimate subject does not stand by itself, as a logical caprice, in necessitating the theory of the Absolute, but is the consequence of a comprehensive and well-supported philosophical attitude, and (*b*) that it does not, as a matter of expression, forbid our common so-called individuals any completeness that could be ascribed to them; but that they fall short only because they are incapable of receiving more, and, in the higher forms of judgment are denied only a means of distinction (the 'this'), which could not possibly be serviceable in establishing their individuality.

[a] i.e. by a mute discrimination against others.

[b] See i, 106 and 207 above on the relation of the Demonstrative to the Universal Judgment.

CHAPTER IX

Truth and Coherence

1. It seems worth while, for the reasons assigned in the Preface, to restate at this point the general attitude of the present work to the theory of truth. Disclaimer of 'Correspondence' Theory.

The main current doctrines on this matter have been conveniently designated in recent discussion as the theory of Coherence and the theory of Correspondence respectively. I should hardly have thought it necessary to explain that I cannot for my own part conceive how the doctrine of Correspondence can be adopted as a serious theory, were it not that in an elaborate criticism [a] of the first edition of this work it has been urged that I have myself adopted it.[b]

The genetic theorists have discovered the failure of the correspondence theory, and believing some of us to be old-fashioned, they attribute it to us and then attack it. But we think, or at least, I think, that no logician really of the first rank ever held it, and that our critics are belated in awaking to its impossibility. However, whether the misconception is my fault or my critic's, it will be well to make a short restatement of my view towards the close of so voluminous a work. The details of the criticism will all, I think, settle themselves if the radical misconception is explained. But I

[a] Cf. 'Bosanquet's Theory of Judgment.' Miss Thompson, Chicago Decennial Publications, 1903. I may note that for myself I entirely disclaim the epithet 'epistemological' which Professor Dewey frequently employs in his introductory essay. For I understand it to imply a theory of cognition in which truth and reality are treated as external to one another, in fact, some form of the correspondence theory. He is indeed discussing Lotze and not any writer with whose views I am in agreement. But I am not sure how far his criticism is meant to stretch, and it is better to guard oneself.

[b] Under all the circumstances, this supposition recalls to me a vulgar story current in my youth, of a doctor who, finding himself unequal to treating the patient's actual ailment, proposed to inoculate him with a quite different malady, 'for,' he said, 'I'm death on that.'

shall further take occasion to express my own interpretation of the present position in the philosophical world, with reference to logical theory, which offers certain highly suggestive antitheses.

An Expression which might be misleading.

i. I will say at once that there is just one expression in my book which in my opinion may have given some sort of colour to what I must call my critic's fundamental error. It is the phrase in which I stated the relation of Reality, as the subject to be defined, to thought as the process of defining it. I said :[a] 'It is an essential of the act of judgment that it always refers to a Reality which goes beyond and is independent of the act itself.' Such an expression, taken by itself, or in a treatise framed on wholly different lines from the present one, would not have been inconsistent with a conception of reality as an existent world external to our thinking, in resemblance or dissimilarity to which lay the truth or falsehood of our ideas. But in criticising a work which takes for its watchword the saying that 'The truth is the whole', offering this as the solution of the difficulty that a world outside thought cannot be laid hold of by thought, it does seem to me a gratuitous misconception. And further, I think it is one which not only every paragraph of general theory, but still more the whole progress and structure of the book disowns. The mere structure of the treatise is enough to explain the expression.

Reality is independent of the Judgment in two senses. There is, of course, an ultimate Reality ; a higher experience than ours ; we must postulate that if we do not mean to accept e.g. all individuals' worlds of experience as separate and unconnected. When I speak of this Reality as independent of our act of judgment, as it is in an enormous proportion, I do not mean to exclude the truth that our judgment, in an infinitesimal degree, contributes to sustain it, and forms an element in its life. In this limited sense the two forms of Reality are interdependent. But their interdependence is not correspondence, and their independence is not that of original and copy.

This Reality then shows itself in our world of experience

[a] i, 97.

in a way which is independent of our act of judgment in a second sense. For our immediate experience, our feeling, our possession of a contact with a world, has individuality in a mode which as a mode of experience [a] our judgment cannot confer or originate, but can only attempt to restore by a secondary process, when its unity is transcended. The contact in feeling has existence and quality together, and primarily is satisfactory and self-contained, though carrying a sense of diversity which challenges analysis in judgment, but is as such independent of interpretation through judgment.

We construct our world as an interpretation which attempts to restore the unity which the real has lost by our making its diversity explicit. This construction is our intellectual world. It is a form of reality, possessing some of its characters; and there are other forms, higher and lower. But none of them can be a world external to our thought and yet acting as its standard. The thing is a contradiction in terms, not because of the metaphor of externality, but because of the vital autonomy of the thought system.

If we ask, how we know our interpretation to be true or false, to possess or not to possess the character of reality, so far as its discursive form allows, the answer comes from the principle of non-contradiction, which is only another form of words for the principle that the Truth is the whole. This could easily be shown at length.[b] The important point is that the principle of non-contradiction is positive and constructive; its force cannot be evaded by a logical quietism, by saying nothing. For you cannot get away from the world; if you try to say nothing you are in contradiction with a mass of experience; not with a presumed external world, but with what enters into your own being; and you leave it in contradiction with itself.

ii. Our doctrine of truth is therefore wholly immanent. There is no external standard, and, of course, no possibility of applying it if there were one. The criterion [c] identifies itself

The Criterion immanent.

[a] For its *content* is modifiable. See below, p. 297.

[b] I hope to go over this ground in much greater detail in a forthcoming work of a more metaphysical character.

[c] We have been warned that a criterion is properly a label, extraneous to the character which it indicates. But any such criterion in highly

absolutely with that imposed by the doctrine of coherence.[a] And the structure and nisus of the treatise is a simple embodiment of this principle. It is a progressive interpretation of the 'this'; the contact with reality in which we possess both existence and quality. It is an advance from one form of individuality to another; from individuality which has never gone beyond itself to individuality which has experienced contradiction and is being approximately restored as an explicit system of non-contradictory content. It is a product of the interest and purpose to explain all that you can; to push the explanation further and further in response to the demand for removal of contradiction in the relative whole of experience at every stage. This interest and purpose is the clue pursued by the effort of judgment from beginning to end. It is the special and distinctive cognitive interest. And a treatise like the present endeavours to trace in its genesis the system developed by the action of this interest which is of course inclusive of all more special stimuli and occasions. The whole interpretation, as referred to the individuality that appears solid, but therefore only implicit, in the 'this', possesses the character of reality, viz. individuality; not perfectly, but in the degree in which the form of finite thought can achieve it.[b] We know this by the fact that this character, the character of a systematic whole, is the condition of our possessing a world of experience at all. If we let a contradiction stand, we possess so much the less of reality. Something cancels something, and we are the poorer and dissatisfied.

Truth its own test.

iii. Immanence is the absolute condition of a theory of truth. It is this that makes the fundamental contrast between the coherence and the correspondence theory. As I said at

organised matters is a bad, i.e. highly fallible criterion. And it is well to insist that in such matters the only sound criterion is the character itself or some important element of it.

[a] See the author's Knowledge and Reality, p. 331 (publ. 1885), for a criticism of the simile of the foundations of knowledge. This criticism is always decisive of a writer's attitude to the correspondence theory. Cf. Bradley, Mind, 71. 335.

[b] Need I say that errors in the personal thought-process are expected and admitted?

starting, truth is individual.[a] This is only another form of words for the principle of non-contradiction, the principle that the truth is the whole, and the doctrine that coherence is the test of truth and reality. Truth is then its own criterion. That is to say, it can only be tested by the more of itself. Your completest system at the moment cannot be further tested. You can only test it further when you are in a position to make it more complete. Then what interferes with its greater completeness must go.

Is it necessary to say a word about comprehensiveness? Sometimes we are told that our criterion is mere formal consistency. This can mean nothing but that the critic has not thought the matter out to the bitter end. By coherence or consistency we mean the consistency, so far as attainable, of the whole body of experience with itself. Nothing less would satisfy the law of individuality or the necessity of non-contradiction. But in this interpretation of consistency comprehensiveness is obviously included.

Not all correspondence means copying.

iv. One word more about correspondence. If an identical principle operates in different worlds, e.g. in the experiences of different spiritual beings, the products are likely to correspond. And I notice a tendency[b] to aid the process of inoculating us with the malady which is not ours, by insisting on this obvious truth. If the fundamental principle of reality is operative in the sphere of finite thought, of course this sphere will show a character that possesses certain common features with those of other spheres or of the ultimate real. But if correspondence,[c] i.e. identity in certain characters of two or more systems, must result, that is no argument that correspondence is the criterion for either system. If two men add up a sum right and therefore the same, that does not mean that the sums are right because they are the same, or that one man has copied from the other. Of course, there is a reality which is more than an individual's thought. There is, at least, the thought of other individuals. And undoubtedly these will correspond, i.e. will show a structure identical in

[a] i, p. 3 above.

[b] See even Joachim in The Nature of Truth, p. 174.

[c] On the nature of correspondence, see Essentials, p. 18.

principle but different in details. But that is nothing against the character of both being immanently determined.

I shall return in a later section to the question in what sense the coherence theory fails.

The Logical World to-day.

2. I will now venture to state what I believe to be the cause and tendency of the peculiar logical movement of to-day.

'Life,' 'Practice,' 'Feeling.'

i. It is plain that the last half century has brought to philosophy in general a great revival of interest. This revival has coincided with a marked increase of the tendency, traceable in European thought ever since Rousseau, to emphasise the philosophical value of feeling, of practice and action in the plainest meaning of the words, and of what has come to be called, in an almost technical sense, 'life' and 'living'. The movement has conceived itself as a sort of democratic revolution in the things of the mind,[a] and is obviously connected with the change of affairs in society and politics. A supposed aristocracy of intellectualist principles is to be dethroned. Truth is to become more vital, more accessible, its touchstone more obvious and more easily applied. Life, one may say, is to be substituted for thought as the central object and impulse of philosophy.

All this has had and is having the usual effect of revolutionary demands in philosophy.[b] The new theorists are insisting on something which was really vital in the older tradition, and the result of their movement will probably be a certain alteration of balance and emphasis in the formulation of that tradition. One can hardly suppose that a movement so widespread and so popular will bring with it no elements of gain at all. If it brought nothing but its adherents' interest in philosophy it would already have brought a good deal.[c]

The misconception which governs the movement.

ii. But the movement itself, I am sure, is conducted under a misapprehension. It has hold of something very partial

[a] Cp. the author's Philosophical Theory of the State, ed. 2, Introd. Nietzsche represents perhaps the 'Saviour of Society' who attends upon some democratic movements.

[b] Cf. the analysis p. 231 ff. above, of the relation of epochs of empiricism to the traditional distinctions of Logic.

[c] As will appear, I believe this to be far the greater part of the gain it will bring.

and consequently sees, and, as I have pointed out, further produces by its assumptions, a fundamental opposition where there is really nothing but a part unduly contrasted with its whole.

Let us particularise. Genetic Logic, the treatment of thought as a system or at least an aggregate of adaptations evolved in response to the needs of practice, has in principle adopted and popularised the coherence theory of truth. This doctrine, being as we have seen a doctrine of immanence, is essential to all vital philosophy and logic, and, to the best of my belief, no other has in fact been held by any leader of European thought from Plato downwards.[a] But by restricting the coherence which is to be the standard to the coherence of adaptation with external action, at first (as no one can doubt) in the purely normal and everyday usage of the latter term, it has on the one hand voiced a popular demand, but on the other has precluded a real understanding by itself of its own philosophical position. And so it strongly tends, as we saw, to assume that in the older philosophy, which it feels to be in some way its antithesis, the view opposed in principle to its own, that of correspondence to an external standard, must be the prevailing one. And it conducts its controversy on this basis, reinforcing its attitude by utilising another popular demand, that for actual individual endeavour and modification of things, which it is unable to unite (the great and ultimate test of a philosophy) with the belief in a perfect and timeless real. And the completer form of its own logical view, the coherence theory of truth, it is apt to stigmatise as a mere formal consistency.[b]

[a] See, for example, my remark on Aristotle, p. 224 above. I know that this has been adversely criticised, but I believe that when we consider the full meaning of apprehension by *νοῦς* as the sort of insight which comes, for instance, by induction, my view will be seen to hold good. Cp. for example, Burnet's Ethics of Aristotle, pp. xxxvii and xlii. I may say in general that I should have guarded myself much more emphatically against the correspondence theory if I had ever imagined that it could by any mischance be imputed to me.

[b] As I suggested above, the controversy is thrown completely askew if you take Lotze as typical of philosophical Logic. The whole statement of the issue, as based upon the contrast of thought in general with reality in general (Dewey in Introductory Essays to Chicago

Fallacies of Genetic Logic.

iii. Thus in a very able statement [a] of the contrasted positions of genetic and the older philosophical Logic, I seem to myself to find three connected misconceptions at the very basis of the whole representation.

First, there is Dualism. Thought is from the beginning conceived in contrast to its occasions. It is taken as reflective, as what arises now and again when we set ourselves consciously to 'think'. That is to say, this is the limitation of the thought with which the writer deals. Something called Constitutive thought is mentioned in contrast with it; but whether this is simply the working thought by which we carry on unreflective life, or some theoretical construction of a creative force in the universe it seems impossible to tell. What is clear is this much, that not merely the limitation of thought as a distinctive form of reality which operates through ideas, but the special limitation of 'pale reflective thought' as against 'active endeavour', or of 'abstract description' as against 'living appreciation' are accepted as formulations for the object of the new conception of Logic.[b] 'Thought arises in response to its own occasion.' Then, by removing only the definiteness of the occasion, which ought to be retained, and retaining the dualism of nature between constructive and discursive thought, which ought to be removed, an antithesis is created against philosophical logic which assigns to it as its characteristic problem the relation of thought in general to reality in general, as the epistemological issue out of which its whole treatment springs.[c] And an apparent corroboration of this attitude is found by giving a predominant place to an analysis of Lotze's position.

University Decennial Publications, 1903) appears to me thus utterly falsified. If we want to deal with a master of philosophical Logic why not select Hegel or Plato or even Green? That is, if one was not going to take the obvious course of considering Mr. Bradley's whole position with regard to Thought and Reality.

[a] Dewey, l. c.

[b] This takes us back to the conception of thought as decaying sense, which, whether right or wrong, is sharply opposed to the conception of it in the masters of Idealism. I should explain that Idealism, in the sense in which I use it for the philosophy, say, of Hegel, is the antithesis of what is commonly called Rationalism. But I know of no other name that would carry the reference.

[c] Dewey, p. 6, and cp. Green, Prolegomena to Ethics, p. 27.

This idea of the situation—I say it mainly to make my own conviction clear—seems to me wholly and utterly false. The relation—the nature of the antithesis—is in my view altogether different from this.

In Logic as I understand it, attempting to follow out at a long interval the practice of the masters, there is no epistemology in the sense supposed,[a] no treatment of thought in itself as opposed to reality in general, no question of a bridge from the one to other. In analysing the thought-world it holds itself to be analysing the structure of reality, the detailed and articulated responses by which the living body of experience exhibits its endeavour to approximate as a system of ideas to a non-contradictory whole. Of course all these phases could be construed as responses to the environment. But the environment for thought is not the sphere of external action but the universe of experience. The occasions which evoke responses of thought within specific limitations are merely a fragment of this total environment. The genetic theory, so it seems to me, has merely insisted on an arbitrarily limited fragment of the genuine logical theory.

From this, therefore, it is separated in degree rather than in kind, by a further error involved in its naive Dualism; an error for which I can find no better name than Occasionalism. Thought, we are told, is always within the limits of a specific occasion, a specific purpose. It is charged against what is treated as general logical theory [b] that it disregards these limits, or only regards them as throwing light on the terms on which thought transacts its business with reality. 'But in the end all this is incidental. In the end the one problem holds. How do the specifications of thought as such hold good of reality as such? In fine, logic is supposed to grow out of the epistemological problem, and to lead up to its solution.' [c]

[a] The explanation i, p. 3 above, was intended to guard me against the appearance of dealing with 'epistemology' or 'a theory of cognition', by which I mean an examination of the nature of knowledge as something apart from the reality which is then taken as its external standard.

[b] It should be remembered that this is not accepted as a just title for philosophical logic.

[c] Dewey, p. 6.

All this, as I see the situation, is the same old half-truth turned into a complete delusion. There is no discussion of a relation of thought in itself to reality at large. No question arising out of it determines the course of logical investigation. But it is perfectly true that thought (in a way, as we shall see, comparable to life, about which the same error is made) has in all its specific responses and adaptations the universe implicitly before it. Its adaptations, like those of an organ in an organism, are controlled throughout by a system of functions which is a response to something continuous in the nature of the environment—as in life, to the conditions of organic existence on our earth's surface; so in knowledge, to the condition of belonging to a universe. Occasionalism, the insistence on response to specific occasions as the condition of thought, thus misses its underlying and continuous character, as the active form of totality; the nature by which all experience strives of itself towards the whole. Thought is essentially the nisus of experience as a world to completion of its world. The intervals of conscious reflection are merely one of its forms of advance, and are not, in their paleness and meagreness, characteristic of thought, which is essentially organic concrete and constructive. In its Occasionalism again the genetic theory is saying something so far true, but fragmentary, and is again taking it as the basis of an antithesis which has no existence, except as a relation of a partial to a more comprehensive view.

And lastly, Dualism and Occasionalism take shape in Adaptationism. This is more than a recognition—which would be justified—that all thought may be regarded as a response or adaptation to surroundings. It consists (*a*) in neglect of the character of thought as a system of functions adapted to the removal of contradiction throughout experience and having always this complete systematic function operative in controlling specific responses or adaptations; And (*b*) in the suggestion that, considering the complete explanation of evolutionary growths to be only possible through regarding them as adaptations to their environments, each to each, the antithesis of origin and value ought to be treated as superseded, and psychology, for instance, should become in

its aspect of a historical science a serviceable instrument in logical valuation.

a. As to the former of these points, it is now I think recognised that to consider a living organism as a mere box of patent[a] contrivances, a collection of adaptations to particular situations of environment, is to consider it inadequately. Every adaptation is built on a system, and the system is determined by essential functions, which may be regarded if we like as a great general adaptation. But these functions, as a system, it must be borne in mind, constitute a large proportion of the environment for every specific adaptation. In every adaptation life is there as a whole, and has the whole nature of the environment in view, not as a general abstraction, but as a concrete whole that enters into every specific situation. So with thought. It is, if we like, all developed as responses; but it is inadequately considered if it is considered as a box of tricks. Thought never really forgets the universe. There is always more in it than its occasion brings, or rather, it makes its occasion more than it is.

Thought not a collection of devices.

b. And the idea that evolutionary explanation has disposed of the antithesis between genesis and value seems to me more particularly to invert the real relation. It is true of course that natural history is much interested in natural selection; but the decisive point for logical theory is that natural selection is not in the smallest degree interested in natural history. One may fancy oneself pleading before the court of natural selection. 'Only give me time, and I can explain everything! The fact is, I was not adapted to to-day's environment, but only to yesterday's. That is why I am not equal to the situation.' But the court, I take it, replies, 'My dear sir, in the court of history that would be interesting, but in this court it is wholly irrelevant. We must ask you to deal with the situation of to-day, or—.' It is being equal to the whole situation that is the criterion for Logic as for Morals. Past adaptations can justify no theory of to-day. Have we or have we not a system

Value not dependent on history.

[a] The Mendelian theory is not quite this. But even its way of regarding an organism, as, if I grasp the idea rightly, a group of more or less independent factors, seems difficult to accept without further explanation.

which gives the possible maximum of non-contradiction, in the construction which it puts upon the fullest conceivable experience? This is our standard for the present, and in it, for the past. And Professor Dewey says what seems to me equivalent to accepting this standard. 'The historical point of view explains the sequence; the normative follows the sequence to its conclusion, and then turns back and judges each historical step by viewing it in reference to its own outcome.'[a] Yes, but the sanction lies surely not with the history of adaptation, which shows a certain stage to be *de facto* the outcome; but with the court of natural selection, which applies the test of adequate or inadequate adaptation, that is, of power or impotence to deal with contradictions, taking the whole body of experience together as constituting the concrete situation. This is the test, the test of coherence and non-contradiction, which philosophical Logic accepts; the immanent test of the presence of the character of Reality within the thought-form as one of the many branches or appearances of the real.

Psychology passing into Logic.

iv. Psychology, from anthropology upwards, beginning with a natural history conditioned by quite other environments, leads gradually up to a situation in which, as the proper character of mind emerges, the logical test by present adequacy of working supersedes the historical explanation by past adequacy of work in a less complete environment. 'Working'; that is the apparent watchword, the name accepted on both hands for the test which might bring the two theories together. But to cover the problem of philosophical Logic it must take the environment as the widest conceivable experience, and must recognise the fact and right of cognitive interest.[b]

When once the ultimate criterion is accepted, with the extension of the supposed new view to its natural boundaries, that is from practical working to dealing adequately with experience, I cannot understand how the relation of Psychology to Logic should present a difficulty. I have observed above that the epistemological attitude which the

[a] Chicago Publications, p. 16.

[b] The true type of the relation of Psychology to Logic is in the relation of associated contents—impure universals—to pure logical connections.

new theory is attempting to force upon the old is nowhere, so far as I know, accepted by it.[a] And in fact the historical method, the explanation of past phases in the light of their environment, was not derived by philosophy from the historical or evolutionary sciences, but rather by them from it.[b] It is a notable characteristic of Plato, and could hardly have been more prominent than it is in Hegel's Phenomenology and in his Philosophy of Mind. It is unfortunate that there is really no word free from irrelevant suggestions for what we mean by Idealism when we apply it to the philosophy of Plato or of Hegel. But taking 'Objective Idealism' as a more or less accepted equivalent, we may say that the history and estimate of thought-adaptation in relation to the environment has always been the peculiar pride and province of objective idealism. Only, the actual test of truth, of the character of reality in the thought-form, was by it always kept separate from the historical estimate of imperfect forms, the justification of which had shown itself, as we may say, doubly relative.[c]

Summary —Defects of the new attitude.

v. This then, is one part of the logical situation as I feel obliged to conceive it. It is well to vindicate for Logic the sphere of Life and practice as against an imaginary heaven of ideas—to which however no master of thought has relegated it. It is well to bring the development of thought together with the conception of adapted response, and to apply to it the general idea of natural selection. It is well to vindicate for the individual mind a living share in the self-maintenance of Reality as against the idea which Plato repudiated of a statue-like immoveable system. All these are attitudes of special emphasis due to the philosophical and semi-philosophical movement of the last fifty years. But if the reforming theorist limits practice to the sphere of external action, adaptation to the history of *de facto* success apart from the principle of its determination, and our living concern with Reality to effecting in it

[a] I have explained why I think it misleading to take Lotze as a specimen for criticism.

[b] A remark of W. Wallace. I have not the reference.

[c] 'Relative' as falling short by the standard of our best experience; doubly relative, because that standard is itself not absolute.

ultimate change, in a time which is ultimately real, then his view remains fragmentary, and he has failed to grasp the inheritance which is coming within his reach.

Realism as Immediacy.

3. Complementary to the view of truth which I have just attempted to explain—the view for which thought is an adaptation, and truth along with reality is *bona fide* in process of being made—is the reassertion of Realism in the modern world. Realism, indeed, however opposed to the conception of a universe in actual genesis, belongs at bottom to the same impulse of modernism. The very same flowing tide which carries with it the demand that truth shall be a mere adaptation to vital needs, brings also the antagonistic requirement that truth shall lie in a relation to simple given fact. On both sides we have the demand for immediacy; here the immediacy of satisfaction, there the immediacy of apprehension. And the second, as we admitted of the first,[a] has doubtless, even from our point of view, contributions to offer. The first, we hoped, would bring about a correction of the confusion of Idealism with rationalism, and destroy the conception of a pale and meagre thought, identified with decaying sense. The latter, we hope, will undo the unhappy connection with mere psychicalism or mentality [b] and bring into prominence the more robust conceptions of a philosophy which admits true differences of kind within the whole.

I propose to devote the following chapter to explaining the attitude involved, in the theory of truth which has been followed through the present work, to mental states and the claims of naive realism.

But here some remarks will be in place concerning a doctrine of truth which, as far as I grasp it, shares on one side only the position of naive realism and simple apprehension, while on another side committing itself to a special theory of existence with which naive realism has directly nothing to do.[c] The doctrine of simple apprehension, and the true meaning of the

[a] p. 268 above.

[b] See e.g. Mr. Moore's Refutation of Idealism, cited and commented on in Joachim's Nature of Truth.

[c] I think that even in their theory of existence the two have an impulse in common, that of hardening into isolated existence purely relative objects.

principle that knowledge makes no difference in what is known, will be spoken of in the following chapter.

a. 'The world is a world of many things, with relations which are not to be deduced from a supposed nature or scholastic essence of the related things. In this world, whatever is complex is composed of related simple things. There is no identity in difference, there is identity and there is difference, and complexes may have some elements identical and some different, but we are no longer obliged to say of any pair of objects that may be mentioned that they are both identical and different.' [a] The world of simple things.

The core of the view, as is well known, is the rejection of what have been called 'internal relations', i. e. relations grounded in the nature of the related terms; and the assertion of mere external relations, i. e. as I understand that there is no reason why relations should be so grounded.[b] The phrase 'internal relations' seems to me not quite satisfactory, as suggesting relations between parts within a given term. At least the view which to me appears reasonable would be better expressed by some such term as 'relevant relations', i. e. relations which are connected with the properties of their terms, so that any alteration of relations involves an alteration of properties, and vice versa.

The following reasons for accepting a doctrine of relevant relations appear to me to be unimpeached.

(1) In a large proportion of cases the relevancy of the relations to the properties of the related terms involves a community of kind. You cannot have a spatial relation between terms which are not in space. You cannot have a moral relation between terms which are not members of a moral Relations relevant to kinds.

[a] Russell, Philosophical Essays, p. 169. I do not think it is maintained on our part that relations can be deduced from the properties of single terms which are in relation. I understand the point of interest to be that you cannot explain one term of a complex without explaining the rest. Every complex, it must be remembered, has a special quality of its own, and every member of it has a quality relative to this; see i, pp. 139-40.

[b] Op. cit., p. 161. It would be important to know if it is maintained that relations cannot be so grounded, because then we could ask for the author's explanation of the more obvious cases in which they appear to be so.

world. Why is it absurd to ask for the distance from London Bridge to one o'clock? Surely because the one term is in space and the other in time. This is not a general argument that if the relation were other the terms would be other, from which any possible conclusion might follow.[a] It is an analytic determination of a common positive element on which both property and relation depend.

The meaning of terms relative to their grouping.

(2) There is further no case in which on philosophical scrutiny [b] the relevancy of relations to properties is not perceptible. I do not say that the relation can be reduced to a fact about the one object only together with a fact about the other object only.[c] The point of the relevancy of relations, as I understand it, is that each of two or more terms can only be understood if all are understood. 'Father' and 'Son' is a vulgar traditional instance. But I do not see that it is not a sound one. And in every case, I think, the basis of such a necessity can be shown. This or that observer may not possess the knowledge or the acuteness required to formulate the element which changes with the relation in precise detail. But it can always be shown what sort of thing must be relevant to the relation. So much so, that I cannot think this to be really and totally denied of so-called external relations. And I will pass on to a point of view which raises this question.

Relations express behaviour of terms in groups.

(3) Relations are true of their terms. They express their positions in complexes, which positions elicit their behaviour, their self-maintenance in the world of things. This is really the all-important argument. And I cannot believe that if the doctrine of mere external relations were completely stated, we should not find the same thing admitted by it, in one way or another.[d] If the relations make no difference to the terms,

[a] Russell, Philosophical Essays, p. 166.

[b] I have in mind Mr. Bradley's argument in Appearance and Reality, ed. 2, p. 572 ff.

[c] Russell, p. 161.

[d] As I understand the appearance of this is avoided by connecting the mind with the relation straight, so to speak, and not through the terms. But this seems to me simply a bold omission of a fact in the complex. Does not the conception of a 'sense' in a relation like love necessarily admit this? The term A is different according to the 'sense' of the relation of love between A and B. Or take spatial

it follows that things do not react or behave with reference to the complexes to which they belong. Yet if Charles I had died in his bed, he would have died in a different bodily attitude from that in which he died on the scaffold.

Relations not asserted to be adjectives.

b. I do not understand relations to be adjectives of their terms. They are not adjectives because they involve other terms which are as substantive as any of which we might be inclined to pronounce them adjectives. Relations cannot be reduced to qualities, nor qualities to relations. Relations are just the way in which discursive thought represents the unity of terms which it cannot make adjectives of one other. As Mr. Bradley has said that they are a *modus vivendi* between predicates of the same subject whose unity we cannot really construe to ourselves, so it might be said they are a *modus vivendi* between terms in the same universe, of whose unity in the imperfection of our experience, the same is true.

None of the objections which have been put forward appear to me to touch these points.[a]

I quite understand that on the doctrine offered to us Identity in Difference must go. And I quite see for myself that it must go 'in the end', that is to say, in any experience for which objects are self-contained, and cease to transcend themselves. What our pluralist realists[b] are grasping at is therefore justly anticipated. Undoubtedly the Real is self-complete and self-contained. But I insist on the words 'in the end' because it is their repudiation of them[c] that I take to be the root of their failure. They are the extreme Absolutists. They are not content to have the Absolute 'in the end', as we more modestly claim it, not meaning after a lapse of time, but in so far as what are fragments for us point out to us a completion beyond them. And there is surely a difference of completeness in different experiences. But they

relations in the visual field. When a new object is inserted in the field, every object in it becomes a member of a new pattern, and so necessarily exhibits a new quality.

[a] Of course I am following Mr. Bradley, Appearance and Reality, loc. cit., though he is not responsible for what I say.

[b] I do not wish to use a name that will be disliked. I merely invented an appellation that seemed to be fair, for shortness' sake.

[c] Russell, pp. 159, 163.

will have the Absolute here and now; and to make it handy and adaptable for everyday use they split it into little bits. A universe of tiny Absolutes; that is really what they offer us.[a] But if any of these Absolutes imply any term beyond themselves their absolutism breaks down. And we have tried to show that in all relations this is the case.

Truth and Error not absolute.

c. As to error we have only to bear in mind that degree of partiality of the truth asserted must combine with a belief that it is the truth, the whole truth, and nothing but the truth, in constituting the degree of erroneousness. And also, for practical purposes and within certain limits we let imperfect truth pass as absolute. A repudiation of the phrase 'in the end' denies these distinctions. But surely in denying them it denies nearly all the facts of life. Presupposing these reservations, what has been said in satire [b] is surely a plain truth, which only needs complete application to make it obvious. A man who accepts the view that all his judgments have only partial truth is certainly *pro tanto* less wrong in each of them than if he believed he had got in each the truth, the whole truth, and nothing but the truth. But obviously, in this form the principle is only a general warning, and cannot directly amend the actual partiality of what a man judges as truth. For this follows from determinate reasons, and in each case he must judge or not judge. A purely general warning cannot guide his judgment. But it can stimulate him to caution and criticism, and this is an obvious excellence in his whole cognitive system, which is excluded by the belief that partial truth can be absolute. A man who has grasped the warning that you must only believe about one-half of written history is certainly *pro tanto*, i.e. if both have the same positive knowledge, nearer historical truth than one who thinks he may with safety swallow it all. And though this caution alone will of course not tell a man *which* half to believe, yet it will place his cognitive system in a much truer relation to the facts, than that of a man, who, making the same judgments as the other, believes them to represent absolute truth. It is the

[a] I suppose this is a familiar idea in the case of the Atomists and the Eleatics. See Burnet, Early Greek Philosophy, ed. 2, p. 387.

[b] Russell, p. 155.

case no doubt, that you cannot, out of caution, half make a judgment; you must make it or not. But it is further true that to make an additional judgment, 'there is a good deal more to learn about' this or that character or incident, puts your positive judgments in a proportion to the facts which is likely to be much more in harmony with them, than if you entertained no such critical principle.

d. I believe the fact to be that the doctrine of which we are speaking gains its vraisemblance and its apparent clearness, from clinging to just the region of so-called plain and simple fact, the illusory hardness and isolation of which—really a defect of low-grade knowledge [a]—it takes for absoluteness. And in this region it does seem *prima facie* absurd to take error as partial truth. You must be, it appears, either right or wrong. The fact is fixed, and you are in relation with it or are not. There are no degrees of truth, and nothing which is truth in the beginning and not in the end, or in the end and not in the beginning. I will try to show the nature of this delusion, as it seems to me, by a few words on truth of fact and truth of system. The illusion of simple fact.

'It is plain—that the truth or falsehood of a given judgment depends in no way upon the person judging [it is common ground that there must be a mind to judge], but solely upon the facts about which he judges.' 'Thus the judgment that two terms have a certain relation R is a relation of the mind to the two terms and the relation R with the approximate "sense" [= direction of the relation from A to B or from B to A]; the "corresponding" complex consists of the two terms related by the relation R with the same "sense". The judgment is true when there is such a complex, and false when there is not. The same account, *mutatis mutandis*, will apply to any other judgment. This gives the definition of truth and falsehood.' The complex, it is to be remembered, is composed of simple related things.[b]

[a] Of course no one uses the whole of his own experience in his theories. He uses what for some reason has struck him and seemed typical to him. I do not think it is without precedent that men of very high attainments should rely theoretically on very naive types of experience. I think analogies for this are rather common.

[b] Russell, pp. 169, 173, 184; cp. Stout, Ar. Proc. 1911.

I wish to explain, by a comparison of judgments differently related to 'the facts', why it appears to me that, in the first place, truth and falsehood depend on the judging mind in another and more vital sense than is here admitted, and not on the mere presence or absence of a complex of entities corresponding to the judgment, and, in the second place, that the facts themselves, though they are real, are not real in the way here asserted, as bits of reality, immediately accessible to apprehension, and corresponding each to each with the terms of our commonplace judgments.

Stating a fact may be telling a lie.

(1) Let us begin with Charles Reade's mediaeval physician, who, having a grudge against a reluctant patient, tried to have him arrested, laying an information that he intended to fly the country. But 'his sincere desire and honest endeavour to perjure himself were baffled by a circumstance he had never foreseen nor indeed thought possible. He had spoken the truth. AND IN AN AFFIDAVIT'. For the patient *had* fled.

Here the doctor told a lie, but in telling it, he spoke the truth; if, that is, we judge by correspondence with the facts. One might urge that his assertion, being contrary to his belief, was not a judgment at all, but a form of words intended to produce action in another's. This I think is true.[a] But it does not seem to me to destroy the point of the instance. Why could a form of words, corresponding with the facts, be in his mouth nothing but a lie? Because it was contrary to his belief? But what does that mean? Belief is not a chance thing, sprung from nowhere. It means that it was contrary to the system of his knowledge as determined by his whole experience at the time.

Stating a fact may be an error.

(2) Take another case—the so-called true conclusion from one or more false premisses. Here again we have truth, if judged by mere correspondence with the hard fact. For example, on a local railway I know, the signals are down all Sunday. A stranger unaware of this practice might infer that a train is due. And it might well happen, three or four times in the day, that at the moment of speaking a train was in fact due. Judging by hard fact this judgment would be

[a] See above, i, p. 34.

true. But would the man be right in his judgment? It is a point on which probably his companions might wrangle with him *ad nauseam*. He seems to have got a truth which he had no business to have got. If he had known a little more—possessed a little more truth—he would not have got it. And the truth, as he possesses it, is felt to be unsatisfactory, and half or more a falsehood, because its dependence is wrong: that is, it is judged, as a truth, in part at least, by the system of judgment with which it is connected. And more than this; it is infected, in its own nature, by the faults of this system. Its logical stability is highly incomplete; it would be upset by a second trial ten minutes later, or by a most trifling bit of additional knowledge. But logical stability—incapability of being confronted with a contradictory experience—is, we shall see, the very core of truth.

In the closer tissue of a science, this defect amounts more obviously to actual falsehood. The 'true' conclusion participates so definitely in the character of the system from which it issues. Those theorists who held that agriculture is especially and peculiarly a desirable industry held, in this view, I suppose, what corresponded to an indubitable fact. But when they deduced it from the view that wealth is not genuinely produced in any other occupation, they connected it with grounds which destroyed its value, and made it a dangerous falsehood, by including in it an unjustified presumption against other forms of industry.

Strictly speaking, there is no reason for dropping the premisses in stating a conclusion. And if they, being false, are retained, the falsehood of the conclusion, though apart from this corresponding with facts, is exhibited on the face of it. Here again, it is obvious that the truth or falsehood of a judgment depends not merely on correspondence to a complex, but on the completeness and comprehensiveness of the system with which it is connected in the mind.[a] Its truth is threatened, we have seen, both if it is at variance with the

[a] You may say there is nothing in this but that one judgment about one complex is true, while another about a fuller complex including the first is false. But what is shown is that correspondence to *its* complex is not enough to make the first judgment true.

system, and if this system fails to give true connections, *prima facie* outside the judgment directly in question.

How we come by 'simple' facts.

(3) Now let us take the strongest instance in favour of non-dependence on the judging mind. This, it appears to me, is to be found in the current knowledge of facts currently admitted, forming the stock-in-trade of daily life and conversation, and considered out of the context of science or of any critical analysis.[a] 'Charles I died on the scaffold.' This judgment most people would describe pretty much in the language cited at the beginning of this section. It is true, they would say, because it corresponds to a complex of terms and their relation, which are or were facts or things. There is or was such a complex of things and such a relation between them, and therefore the judgment which expresses the mind's relation to it is a true judgment. What the facts are or were is taken as a matter of general agreement; it would be held pedantic to ask where we get at them, how we apprehend them, what precisely they are or were, what meaning the judgment actually carries with it. Our intellectual outfit for everyday use consists of 'facts' postulated in this way—the normal furniture of our mind; what Plato called the world of opinion. We take the material hurriedly from authority and tradition; or from negligent perception interpreted by authority and tradition.[b] We do not pursue their context. We do not fix their limits or analyse their detail. Thus we let them shrink and harden into isolated counters dealt with by our thought, worn and defaced by rapid and careless exchange. And it is of these current counters that our world of fact is constituted, which we take to be self-existent, independent of our minds, each fact independent of the others, related to them but unaffected by their relation, complexes which are the standard of truth to our judgment. If our judgment corresponds to facts as presented to us in these current counters in which we commonly believe, that is all we ask.

[a] It is such facts, I suppose, which another school would consider to have received Social endorsement, and to be made true by answering their purpose.

[b] Could even a scholar, for instance, as a rule, exhibit a convincing argument that the works ascribed to the ancient authors were really written at such times and by such persons as is commonly supposed?

(4) Now I am not suggesting that these facts are not actual, and that the judgments which correspond to them are not true, in a sense sufficient for their purpose. My contention does not tend to making less of the facts, e. g. to reducing them to mere ideas, but to making more of them, i. e. to showing that as realities they cannot stop at the arbitrary point we have adopted. And, no doubt, it follows that the mind has had much to do with them already and must have much more to do with them as they proceed. As they stand, they are a selection out of reality for everyday use, carelessly handed down or observed, clipped, worn, their interconnection neglected. But they do well enough as a standard for everyday truth, and our judgments, which we take to 'correspond' with them, do well enough as everyday truth.

The facts are more not less than 'simple'.

But, even within this world of what we conceive as correspondence to hard fact, we do acknowledge differences of truth, or, if this language is preferred, degrees of correspondence to fact, according to the furnishing of the mind. 'Charles I died on the scaffold,' we commonly assume is not so true in the mouth of a child who has just learned it by heart as in the mouth of a schoolboy who knows something of the history and significance of the seventeenth century. And in neither's mouth is it so true as in that of a historical student to whom the seventeenth century is a familiar world and a living interest. It is not a thing which is true or false by touching or not touching.[a] From the first, it is an appreciation of elements in a system, and of their determination by the system, and is a matter of degree. Our ordinary estimate of truth fully admits this to be the case.

We have been urging so far that the system of the judging mind is an element in truth, and also, in the last paragraph, we come in sight of an inference affecting the actual things or facts which are taken as the standard.

(5) I will pass to an instance which clinches both these points.

In the full facts the 'simple' facts are lost.

When we come to consider the knowledge of any leading historical authority on the period of Charles I, we find two

[a] See Aristotle, Metaph., 1072 b 21 *θιγγάνων καὶ νοῶν*.

remarkable things. First, quite undoubtedly, and in all common usage, such a man's judgment 'Charles I died on the scaffold' is far truer than that of the child or the schoolboy or the ordinary conversationalist. This shows how much depends on the mental system of the judging mind.

Secondly, when at this level we begin to look for the single standard of fact which we are accustomed to rely on, it is not to be found.[a] At first sight, it is absorbed into the great historian's knowledge. For us, something picked out of that knowledge is the standard. Our 'facts' as we used to call them, now show as little bits or threads of reality, which we or others for us have selected out of the huge web of the world as known by such an authority as this. Of course the facts have not turned into any one's mere mental system. But they seem essentially continuous with mental systems. We do not mean to deny that they—as much of them as is warranted on good authority—are real facts. What we are saying can only mean that he helps us to get at them. That is all very true; but then, when we get at them through his knowledge they are much developed from what they seemed when we were readily passing them from hand to hand among each other. Now we see that even in their discovery they are not simple or independent. They depend for being discovered and warranted on an enormous constructive work of criticism, starting from present experience, and continued through heaps and heaps of testimony and evidence all of which is instrumental to that view of facts which will give the highest degree of coherence to the system so constructed.[b] Yes, but 'the facts',

[a] Compare with this the difficulty which the layman often has in asking a question such as a scientific man can answer. To the layman a point appears simple and single which to the expert is full of distinctions and reservations. The writer once procured a meteorological record of temperature with a view to its bearing on a stoppage in the building trade. But he found, of course, differing readings of several instruments under different conditions, and could not tell, without further enquiry, which of the temperatures was important for his purpose. The simple 'fact' vanishes as you come nearer, as a headland breaks up into an intricate outline of planes and edges as you approach it, or if you try to read a book with a microscope.

[b] Cp. The Presuppositions of Critical History: F. H. Bradley. Parker, 1874.

it will be urged. All this is getting at 'the facts'; but the facts were there all the same, however hard to get at; and when got at, by whatever means, can be and are the standard of truth. Well; but we must consider the point that the facts are not to be found simple of themselves, as we incline to imagine in our everyday exchange of them. They are not and cannot possibly be the working standard of first-grade thought. You may copy them in your judgment, when the historian has found them out for you. But the working standard, which determines them, is not themselves, but his immense critical construction. Accounts of eye-witnesses, e.g. are nothing but material; and, as a rule, very contradictory material.

The facts, then, though bits of reality, are mediated to us by an immense mental construction, and are not really separable from this. They are not and cannot be, as simple and isolated, the first-hand standard of truth. We may select certain results and make them up into a standard for a certain level of truth, e. g. one good enough for examination purposes, and that different for different examinations. But that is simply an artificial extract.

That is one point. The facts, in history at any rate, are not simply there, so that they can act as a given standard, correspondence to which is truth. The primary working standard is critical system, or, what is the same thing, scientific investigation.[a]

The full facts are comprehensive systems.

(6) But then there is another thing. When we get our facts, our results, what we take to be real, it is something much beyond what we were wont to take as facts. It is a commonplace that in the higher knowledge we are beyond what is commonly called fact.[b] We may say that our current counters were fact, but they were neither the whole fact, nor nothing but the fact. What is the full significance and implication of the death of Charles I? And could we seriously say that a judgment about it is true in which its full significance and implication is ignored, more especially as on the other hand the picturesque and immediate aspect of the event is

[a] See, for an example of what is involved in a simple measurement, if it is to be precise, Knowledge and Reality, pp. 330–1.

[b] See e.g. Bradley's Logic, pp. 92–3.

certainly not affirmed? The facts are not 'in the end' isolated and independent. There is a stage when they seem so, but you cannot arrest them at that stage. As coherence with a system is the standard by which we establish facts, so the part they play in a system of reality, their influence and importance, which imply a further transformation, is the standard by which we judge their degree of reality, and therefore the degree of truthfulness of the judgments that affirm them. Ultimately, these two systems are one, the system of experience, a critical system which is always transforming the facts, as we know them and rank them, towards a higher logical stability.

Of course these remarks contain nothing that is new.[a] But I hope they clearly explain my view about the relative places of correspondence and coherence in the meaning of truth, and about the alleged independence, both as regards mind, and as regards each other, of the things or facts of the real world.

Coherence does not imply correspondence.

4. The standard of system or coherence is a standard applicable to discursive thought. It is the standard of truth, which itself does not pretend to be the perfect or all-inclusive experience.[b]

A judgment is true, as I understand the term, when or in as far as its self-maintenance as a judgment is perfect. That is, in other words, when the whole system of the judgments, which experience forces upon the mind which makes it, contains less contradiction in case of its affirmation than in case of its denial. Such a judgment is 'true' because on the whole it cannot be denied—not, that is, till there is a change, other than its denial, in the body of experience.

[a] The line of the discussion is closely akin to that of Plato's discussion of trueness and reality, which agree in the character of logical stability. See Companion to Plato's Republic on 479 ff., 509 ff.

[b] It is perhaps hardly necessary at this time of day to say that I have now in principle adopted Mr. Bradley's view of the relation of thought to reality, with which the ideas of my early work, Knowledge and Reality, were more or less in conflict. I shall refer below to a reservation on this view which I still entertain, and which I think is consistent with the attitude of this work. The point is merely that there is more analogy between the work of thought and solid and complete reality, than Mr. Bradley, treating thought as solely discursive, seems to allow.

i. Stated in this way, which appears to me to be the right way, the doctrine that truth consists in the self-maintenance of judgments, which again consists in their systematic coherence, does not seem to me to fail quite in the way which has recently been imputed to it.[a] Judgment professes to express the nature of the real so far as it can be uttered in a system of predicates and relations. It does not propose or suggest, so far as I can see, that the real is another system of predicates and relations, which that constituted by judgment pretends to reproduce or to resemble. Therefore its failure is one and decisive, simply consisting in the fact that it is not, like the higher experience which we suppose to be the sum and substance of all Reality, solid and immediate as well as perfectly individual and non-contradictory. It does profess to qualify Reality, to tell us about the nature of Reality; and in as far as it arranges content in a non-contradictory system it does so tell us and qualify Reality. It sets out the content of the real in a shape of special interconnection and emphasis, the definiteness and varied accentuation of which in the diverse worlds of knowledge constructed from different centres, obviously proffers a side of the whole without which the perfect experience would in certain respects fall short of perfection. In the dissociation of the perfect experience involved in finiteness, this side appears alone.[b]

Coherence does not fall back on Correspondence.

But, so far as thought is discursive, it does not profess to furnish any appearance of Reality but its own, and if it is said to be 'about' the 'other' of thought,[c] that involves no claim to represent the fuller experience in its own character. Reality is operative *in* truth. The nature of the latter's self-maintenance as tested by the principle of coherence, non-contradiction, or individuality, (all of them expressions for the same character) leaves no doubt of that. But the claim to have Reality at work in it, subject to special conditions, involves no appeal to correspondence, though correspondence in a sense must result.[d] And in my view the fallacy above

[a] Joachim, Nature of Truth.

[b] That is, markedly distinct in character. No side of experience is ever really alone.

[c] Joachim, pp. 170–2.

[d] See above, p. 267.

signalised—a sort of *post hoc ergo propter hoc*—is involved in the assertion that 'current Logic, consciously or unconsciously employs the nature of truth as correspondence, and if that notion is challenged throws the burden of justification on metaphysics'.[a]

The failure or limitation of the coherence theory of truth lies then, I urge, simply in the fact that judgment, to which it belongs, is an appearance of reality in relational form, doing its best to attain individuality in that form, which up to a certain point it achieves,[b] but which, because it is relational and points endlessly beyond itself for completion, it can never thoroughly attain. But it possesses, as we have suggested, merits of its own, clearness, special interconnection, emphasis, apart from which it is easy to divine that the ultimate Reality would lack an element.

No 'approximation' to an original.

ii. Thus I suggest that the enquiry I am referring to leaves its own true track in emphasising the impossible demands of perfect coherence,[c] as an attribute or essential of perfect truth; instead of adhering throughout to the position that the perfection of truth is not within its own character, but must lie in a reality different in kind. The importance of this point is that in this way an imaginary perfect type of truth and coherence is set up, by their 'approximation' to which actual truth and coherence are to be judged. The term

[a] Joachim, pp. 119–20. This suggestion seems to me quite fatal to a working logic.

[b] I shall return to this question, in speaking of the reservation above alluded to.

[c] Ibid., pp. 170–2. 'A theory of truth as coherence, if it is to be adequate, must be an intelligible account of the ultimate coherence in which the one significant whole is self-revealed; and just before "any partial experience", e.g. human knowledge, is "true" more or less, according as it exhibits a character more or less *approximating to* the complete coherence' (my italics). I suggest that the 'ultimate' or 'complete coherence' is not an intelligible expression. Coherence is the substitute, possible only in a system of predicates and relations, for the immediate unity, transcending mediateness, which we are compelled to ascribe to a perfect Reality. I repeat that the affinity of two exhibitions of a principle, or of two kindred principles, has nothing to do with correspondence in this discussion, which means correspondence of a copy with the original by which it is to be judged. The application of it in other senses in this context involves the fallacy of *post hoc ergo propter hoc*.

approximation, I take it, involves the correspondence theory to which accordingly at this point the enquiry harks back. Thus we lose the immanent standard, and with it the whole merit of the coherence theory. But reality in all its forms and phases can defend and maintain itself according to the principle of non-contradiction. It never depends for its relative logical stability upon approximation or correspondence to anything else.

iii. And further I suggest that it is a confusion to use the conception that even truth is not quite true to suggest a recurrence to a correspondence theory.[a] The meaning of this conception is very simple when we once have grasped the point that no experience short of perfect reality is altogether itself. It is in that sense, that even the truest truth, such as the coherence theory of truth, is not quite true; that is to say its fullest completeness lies in something, a more perfect form of experience, which is beyond itself; and we may call this, to emphasise the relation of transcendence, a truer truth.

The ultra-truth is not truth.

But it is not truth in the form of truth, and there can be no question of truth in its own form possessing correspondence or approximation to its character. Truth stands on its own ground, as a fulfilment under its own conditions of the nature of reality; and it can be tested as truth under these conditions and under no others, and therefore, as we have seen, by itself only and by nothing else in the universe. There is no meaning in the suggestion that 'the coherence-notion of truth *on its own admission* can never rise above the level of knowledge which at the best attains to the truth of correspondence'.

The coherence-doctrine is a theory, and so far is only truth. But coherence does not further and doubly fall short not merely by being only truth, but by resting its claim to be truth on imperfect correspondence. It rests its claim on the

[a] Joachim, p. 174. 'Since all human discursive knowledge remains thought "about" an Other, any and every theory of the nature of truth must itself be "about" truth as its Other; i. e. the coherence-notion of truth *on its own admission* can never rise above the level of knowledge which at the best attains to the "truth" of correspondence. Assuming that the coherence-notion of truth is sound, no theory of truth as coherence can itself be completely true,' &c.

working of reality within it, and not on any correspondence that may result from this; and to get away anything truer you would have to pass beyond truth into another form of reality. This may seem a needless subtlety; but it is important to avoid the implication that truth as such is something away and beyond, which the coherence-notion ought to correspond to, but does not quite succeed. If this is admitted we lose our immanent standard.

Our quasi-solid world.

5. One reservation, it seems to me, must be made upon the doctrine that thought is essentially discursive and relational. It points only to an anticipation of the fuller experience, and as I am quite aware, not to an achievement of it. But it appears to me suggestive, and more than that, I cannot see my way out of it.

It is nothing more than the recognition that the worlds we severally live in, with the spatial world of each of us, have been fundamentally transformed and reconstructed by thought working in and on perception and general experience. They are now, as for example our spatial world with its full properties and qualities, worlds all different and peculiar, and yet solid and individual in an appreciable degree, possessing up to a point existence and quality in one. The interest is, that if this is so—and I cannot open my eyes without finding it so—we have created for ourselves by thought originally discursive, a new immediacy, a new 'given', a new basis of feeling and object-matter of simple apprehension. Nothing is more various, more relative, more progressive and personal, than the so-called simple apprehension of objects which we roughly postulate to be the same. For if we are to admit such a thing as 'simple apprehension', we must take it as purely relative. Its object is a phase of our experience and not a stratum of it.[a] Our worlds are all different, and yet all apparently solid, and clothed in inseparable contents, which nevertheless are of our own discrimination and attribution. And these are not as a rule taken as predicates. They are taken as belongings of the quasi-subjects or rather quasi-substantive objects, although we can separate any of these contents and make them into predicates. The objects of our

[a] See below, chap. x, *passim*.

world, which are thus admitted as concrete subjects, are of course affirmed in the general judgment which sustains the everyday reality which we accept. But they are as I said just now not naturally subjects in the sense of dividing themselves according to an S P relation. The judgment which affirms them takes most naturally an impersonal or existential form.

When treated as subjects, they are not naturally taken as subjects of their nearest habitual predicates. These have qualified and clothed them, and are presupposed, not explicitly affirmed, in judgment. It is only in textbooks of Logic that we say 'Man has two legs'. 'The grass is green' and the like. All this belongs in usage to the solid starting-point, not to an S P judgment proper. But these starting-points, though relatively given, are really artificial, and in some degree different for every mind.

These relative data or quasi-individuals are indeed the so-called subjects which were to count as a plurality of things[a]. But the interesting point about them is their relativity. Thought has made them, and as may be seen in any criticism of their solidity, can unmake them. And to speak more obviously and without reference to abstruse speculation, we can see that it is always remaking them.

This is all I desired to point out; that a quasi-real world, apparently solid and individual, is always being deposited as part of the work of thought. I draw no general conclusion but this, that thought which can thus deposit an apparent solid individual, is not so far removed from the nature of the fuller experience as an exclusive study of the discursive S P judgment tends to make us suppose. This was the side of thought which e. g. to Green seemed characteristic and important.[b] I do not in the least care to enter into a verbal controversy whether it is more properly called thinking or something else. But that our discursive judgment itself is always building up a world which its operation then presupposes—the world in which each of us lives, and takes it as actual—this I do think is an important part of its character and a striking analogy between it and ultimate reality.

[a] p. 277 above.

[b] e.g. Works, iii. 144-5.

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6. One word more. This quasi-real world of our own making is always passing at its edges into the discursive S P process of science and synthetic judgment. And on this ground it may be objected to our view of coherence and correspondence; 'But here you have a real and immediate world, actual in your experience, and your synthetic judgments are about it. Does not this mean that your truth is correspondence—the right representation of your relatively real and solid world?' And I answer, 'emphatically, no.' For our 'given' solid immediate and real world, in which all these characters are merely apparent, is absolutely plastic,[a] as in all immediate judgment and every object of simple apprehension. It is just as likely that it may have to yield to Science or Speculation as that they may have to yield to it. Nothing in the whole field is a fixture to which all other elements have to correspond. Nothing is certain except the necessity that the whole should be coherent.

[a] This is not plasticity of ultimate Reality, but may perhaps have been mistaken for it.

CHAPTER X

The Relation of Mental States to Judgment and to Reality

It seems desirable, for the reason stated in the Preface, to conclude with a brief discussion of the sense in which, if at all, mental states enter into judgment and into the real world. The Mental States in question.

By mental states or facts in this connection I mean such as are taken to be concerned with judgment, and not volitions or emotions, unless of course these happen to be the content of judgment.

1. The view of the relation of mental states to Judgment [a] which has been adhered to in the present work consists of two principal considerations, Doctrine of the present work.

First, α, that no mental states in a human consciousness are mere mental states, but all contain matter that has been and may be significant; but secondly, β, therefore, that the difference between mental states and ideas with a meaning lies in the 'use' of the former.

α. In the first place, then, all sensational or perceptual contents, at least in a human consciousness, bear the stamp of some symbolic relations and hold their place in the systematic judgment which affirms our world. There are no ideas which are not directly or indirectly affirmed of reality, and therefore *a fortiori* none which are not symbolic or significant. All sense-content significant, and any of it may become a 'state' of mind.

In taking this view from the beginning,[b] I was strongly influenced by a fact almost too elementary to mention, but one which I am glad, nevertheless, to see plainly referred to in

[a] The view was suggested to me, of course, by Mr. Bradley's Principles of Logic. But he is absolutely without responsibility for my account or defence of it. I ought perhaps to refer to his footnote in Mind, N. S. 60. 445–6, which indicates that he has intentionally modified the expression of his views on ideas since his Logic was written.

[b] See vol. i, p. 69 ff., and Knowledge and Reality, p. 142 ff., on ideas in fiction.

a very valuable recent argument.[a] It is the fact that for a human consciousness at all events, there is, in the main, no storehouse of mere unapplied psychical material, no sensations which are unattached subjective states, nothing psychical which is not stamped and figured within its own sensuous being by divisions, relations, intensities, all relative to its meaning as signifying some object of thought. There is in the main nothing psychical analogous to a painter's colours on the palette, before he uses them to represent objects. It is a question for psychology whether sensational states can ever escape the despotism of significance, and be a something in the mind which belongs to and suggests nothing more than itself.[b] I believe that if they could be proved to do so, it would be little more than a curiosity of research. These would be, so to speak, immediate, or mere mental states, because they had not attained objective determination; because they were, crudely speaking, *below* objective apprehension and nearer to what we might conjecture of some non-human consciousness, in which, however, lacking the contrast to the objective, they could not be distinctively 'subjective'. But it follows from the point of view we are now drawing out that the existence of immediacy, of mental states or psychical facts, does not depend on the reality of such limiting cases[c]. Immediacy is a character that may be assumed by any mental complex or object, however logically articulate or external and independent of mind it may appear under certain conditions. And no complex or object is altogether beyond it. Every one has its immediate mental aspect. Thus, on the one hand, there is no mental state to be applied in judg-

[a] Professor Stout in Mind, January 1911. The present chapter has been influenced by this very valuable article. Only, if I understand it right, it says that the sensational nuances are part of an immediate stratum, beyond which is the meaning to which thought is directed through them. Thus you get—so it seems to me—a dualism, which I wish to deny, between the shaped and nuanced sensation, and the object.

[b] As I have asserted to be exceptionally the case, i, p. 71. I suppose it may be possible to have a sensation without taking it as meaning anything but just itself. I do not believe it is a common experience, even, say, with pain or emotion; see below, p. 300, and cp. Hoernlé in Mind, 61, pp. 75–6.

[c] See the other alternative specified, i. 71, above.

ment, which is not already organised as part of a significant structure, an object of thought, to the nature of which, as we saw, its actual sensuous detail and constitution is subdued. On the other hand, there is nothing in this to prevent it from becoming completely and emphatically, what it always and necessarily is in some degree, a part of our psychical being, a particular mental state or occurrence, one with us in feeling and active in the total life of our mind. And as we are convinced that there is nothing or almost nothing absolutely and finally immediate or wholly below mediation and determination, and yet immediacy is certainly a large element in the mind, it follows that this, viz. psychical immediacy as one side of all ideas whatever, not only may be but must be a fact. Immediacy is not a stratum of our consciousness, but a phase which all or any of its objects participate in and may totally pass into. No doubt, what is an object of thought cannot in so far be an immediate state of ourself, and *vice versa*. But it is always in some degree both, and there is nothing in its being an object of thought ever so determinate and elaborate to prevent its falling back into an almost complete immediacy, in which case it carries within it the full detail of the content which it possessed as an object of thought. When we feel ourselves most at one with art or nature we are also furthest from being deprived of the qualities and distinctions of the content; rather we then live in them with the most sensitive completeness. It is the objective relation—the externality of the cognised object—which is then in abeyance so far as immediacy is complete. The content has really become all but a subjective state.

In a word, immediacy, or psychical existence, or being as a mental state, is a condition into which the whole mental content may pass, and into which it is capable of passing as a whole, the marks of thought and the stamp of objective relations being in no way obliterated by the transition. This is the old contention that sensation is full of the 'work of thought', as e.g. notably in the perception of distance, which is demonstrably not given in the peculiar sensation of the optic nerve, and yet is seen in a way prima facie indistinguishable from any visual sense-perception. We cannot separate

sensation from thought, and it is not sensation only that can become immediate. Immediacy, as was said above, is a phase and not a stratum of our experience, and mental states, and existence as a mental occurrence, are the same thing as immediacy.

The 'use' of contents as ideas.

β. Secondly then; it follows from this consideration that for practical purposes the difference between mental states, or particular existent mental contents or occurrences, and ideas with a meaning or universal thoughts of real objects (universal, because all real objects are universal, as persistent elements of reality) lies in the 'use' of the former. I will put what I mean as frankly as I know how, to assist, if possible, both readers and critics rather than to guard myself. There is, we have agreed, no great storehouse or constant new production of psychical states or psychical material such as to be primarily subjective, non-significant, mental existences or occurrences, waiting for objectification through a sort of christening and name-imposing process.[a] But, all the same, we proceed in judgment as if there were. Our world of known objects, of apprehension, sensation, perception, contains within it a mass of psychical stuff; and the fact that, as we have said, all this is stamped and appropriated *ab initio* does not in the least interfere with our treating it as a storehouse of such stuffs and using or appropriating it over again, and modified, in every new psychical production. I hear a noise in the room overhead. It is perfectly significant and I know exactly what it is; it is the patent roller-broom. But the fact that it is thus appropriated in judgment does not in the least prevent me from using it to think of a cab coming to the door. 'A cab sounds just like that,' and this change of application of its content necessarily implies the recognition in it of an immediate or existential side, a treatment of it as something which is an occurrence in my mind and can be used to qualify a subject quite other than that which it qualified before. In this use its previous structure and nuance are partly disregarded and partly modified.

Is this term 'use' a mere word? Can we not get nearer the fact which it indicates?

[a] Cp. explanation, Introd., p. 17 note.

Mr. Hoernlé [a] has warned psychologists against the idea that the complex of word-meaning is formed by mere association. I suppose we may generalise his remark, and say that mere association is not enough to develop meaning. It is different to think first of one thing and then of another, and to treat the one as a qualification or character of the other. No doubt this is true. But we have surely learned of late that every association is at bottom a pure connection of judgment, and where judgment affirms a character of a subject you certainly have meaning. This seems to give us the distinction we want. A content is 'used' when, in judgment, it qualifies a real world; when its nature, carrying us beyond its mental existence, makes us attend not to the latter, but to a quasi-independent subject, ultimately a condition under which that nature is true of reality. It is the work of thought as opposed to feeling; of what we know to what we are; if only we remember that thought adds no element to feeling, but merely re-organises its matter.

Thus we use our stores and our fresh production of psychical stuff, in their original and acquired content,[b] or any part of it, to qualify subjects independent of those whose stamp and figure it bears *ab initio* within itself. And this is possible because it is after all in one aspect and more or less completely a psychical existent, and as such is not tied down to any significant structure, although primarily appropriated by one or another.

And it should be observed as a general principle of judgment [c] that subject qualifies predicate no less than predicate subject; for the judgment is a brief expression of the same unity which is more fully uttered in inference, where premisses qualify conclusion just as conclusion qualifies premisses. This explains how a psychical content may appear to become more in meaning than it was as a content, when it is synthesised with a relatively [d] self-existent subject.

[a] Mind, 61, p. 76.

[b] See vol. i, p. 69, note, with reference to Professor Stout's paper in Aristotelian Proceedings, 1903.

[c] See Appendix to ii, chap. i, p. 41 note [c], and vol. i, p. 69. Cp. previous note.

[d] No finite subject is more than relatively self-existent. On the

The term 'use' in short, implies the distinction between the existence and the content of a mental state. When we take a character out of one complex and apply it to qualify another we may be said to 'use' it. It is a case of the law of thought by which the nature of an existent carries us beyond it. In being 'used' it becomes part of the clothing, so to speak, of a determinate subject in the world which judgment sustains; and in becoming this it is penetrated by new relations, and takes on a new stamp and new articulations in response to the nature of the subject which stands ready to receive it. 'The coat is rough,' 'The road is rough,' 'The sea is rough,' 'The man is rough.' In each of these predications the common content which has become one with the word—say 'unevenness'—has taken on from its subject a special nuance and articulation. But what is one with the content is itself a variable amount, and is affected by usage and by the nuances and articulations which it is in the habit of taking on. The psychical existent or immediate is not a part of our mental formation but a phase of it. What is acquired enters into it as much as what is given, if indeed there is any sense in speaking of the given when it is impossible, finally and in principle, to draw a line between the given and the acquired. *Any* content of apprehension or comprehension may become a state of our mind.

The result of our discussion amounts to this.

All mental states are phases into which our objective apprehension under certain conditions may fall. All our objective apprehension is something which is capable of taking the shape of a mental state, i.e. of becoming immediate. I may add as to the former point that none of the cases commonly alleged as cases admittedly of mental states or states of the self, e. g. the experience of pain and pleasure, are wholly free from objective reference. A great part of the horror of pain depends upon this; that something seems to be devouring you, or growing within you, or crushing you, or piercing you, or tearing you. The mental state in virtue of its content passes

fresh determinations acquired by a content in use see Professor Stout, Ar. Proc., 1903. And on the self-transcendence of the existent, cp. Hoernlé, p. 75, who finds a difficulty in it.

into affirmation, as affirmation in virtue of its existence passes over into the mental state. You cannot find a kind of experience which is necessarily a mental state and no more; nor can you find one which necessarily involves an apprehended object and no less. It is a fundamental error of principle to look for either. Immediacy is a phase and not a stratum of experience.

The Real not arrived at by subtraction.

2. Having thus discussed the relation of states of the self to judgment, it remains to draw the consequences of this relation in its bearing on the real world—to take a test case, though not the most important case, on physical reality.

The full detail of such a discussion as Mr. Prichard has recently devoted to Kant's Theory of Knowledge, goes beyond the purpose of a treatise on systematic Logic. I am only anxious to explain the attitude to the ideal construction of reality which underlies the present work, and for that purpose I shall refer to some of Mr. Prichard's arguments.

I place in the forefront of my observations a principle, which I take to be fundamental, and to which I have already more than once referred. The significance of judgment and knowledge as of experience in all its forms lies always on ahead, and not behind; that is to say, in attempting to discern the real reality which justifies any experience you must go forward from it to the more concrete and more complete, and not retire upon something from which an element has been withdrawn. This is the well-known principle that the truth is the whole; the same is true of the reality; and it is in approximation to the whole, and not by disruption of the organism of experience into two opposing sides, that truth and reality corroborate one another. So far as the Realist movement of to-day is a reaction towards naïve realism, it is a contradiction of this fundamental principle—an outcome of theoretical timidity and pessimism, which prefers in a difficult situation to seek safety in retrogression rather than success in advance. For the moment, I believe that this character is uppermost in it. But it must be, of course, at this time of day, naïve realism with a difference; and I hope to indicate in passing that of necessity it carries elements within it which point to a real philosophical reform.

I will briefly observe on three points in which current

theory seems to affect the notion of apprehension and comprehension by the mind in relation to reality.

I understand it to be maintained:

a. That external objects, spatial and physical objects, are not in any sense or degree states of the mind; for in the first place, there is no need that they should be so in order to be known; and in the second place, if they were so, they could *ex hypothesi* not be known as apart from the knowing self; and it is an axiom that they are so known. And as a sub-contention to remove the apparent contradiction of the main doctrine, it is urged that knowledge is an activity *sui generis* and cannot be explained.

β. It would follow that the present writer is wrong in attaching considerable value to subjective idealism as a propaedeutic [a] and a partial truth.

γ. It is dangerous to say that judgment sustains the world,[b] and untrue to say that *we* relate Predicate to Subject; that inference is a process of ideal construction, or that we ideally construct reality.[c]

In my view, all these opinions depend on the one central fallacy pointed out above, that to find the reality independent of experience you must have recourse to a reality apart from experience.

Knowledge involves Mental States. Reality lies ahead, not behind.

a. We have seen that all judgment and its elements, not to mention sensation and feeling, are in certain aspects always, and in certain phases completely, states of the self.

(1) But it is urged that the objects thus known or the experiences thus experienced are not dependent for their qualities, for elements of their real being, upon judgment, sensation, and feeling; and therefore, though all these involve mental states, yet the objects known or the phases experienced in them have none of their reality in these states.

I note at starting the extraordinary contention which this view makes necessary, that colours, sounds, smells, tastes, and sensations of touch are not qualities of things; [d] and with this, the attempt to show that because we know space to have

[a] Essentials, p. 20. [b] Caird, Proc. Brit. Academy, vol. I, p. 106. [c] Prichard, 242–5.

[d] Prichard, 86–7. To be on all fours with the other cases it should be what you feel in sensations of touch.

three dimensions, though we can never see it so, therefore we know space as it is independent of perception. This latter argument precisely illustrates the tendency which I call going backward instead of forward to look for reality. To know what space is involves perceptions of more than one kind, not merely visual, and, on the top of that, inference, i.e. a mode of conception which resolves the contradictions of perception. And because the knowledge of the nature of space involves the work of a percipient *plus* that of an intelligence, i.e. because the apprehended nature of space is a reconciled perception, going beyond the possibilities of actual perception into the realm of thought, we are told that the properties of Space do not involve a percipient at all.[a] The fact is that they imply an intelligent percipient (if this needs to be formulated as though a percipient could be not intelligent); and that, just as the contradictions of perception have forced us to go beyond perception to something not presented in any actual perception, so the further employment of intelligence, in removing the contradictions of its primary constructions, may force us to assume as reality something which excludes the ultimate reality of any space at all. You can only correct a perception by going forward in the positive process of removing contradictions. You destroy all positive reality if you attempt to go back by simple subtraction to a point anterior to perception and say that the the real is, what it is when perception is withdrawn—a predicate in this case involving, though not wholly given in, perception. We see here the abstractions to which we are driven if we refuse to look for the self-existent reality in the inclusive whole which the effort to think things completely forces us to assume. If we turn back in search of independence gained by omission, we cannot avoid committing arbitrary acts of abstraction like the foregoing at every step.

Truth in 'Mind can only apprehend itself'.

(2) Now we can see the explanation of the doctrine which we find ascribed to a mere assumption.[b] It is held, we are told, that the mind can only apprehend what belongs to its own being, and that this is a gratuitous assumption. It is, if taken in one sense, a false assumption, but it is, as against

[a] Prichard, p. 91.

[b] Prichard, p. 118.

the opposite error, not at all gratuitous. It starts from the obvious fact, now coming to be admitted even by realists,[a] that the object apprehended, say, in sense-perception or in thought, forms an integral part of our mental life and emotions, contributes influence to it, and derives predicates from it. But so long as this obvious fact is denied by a realism which so far remains naïve (owing as I must believe to a very simple and popular fallacy which I will point out directly), any philosophy which respects the facts while bluffed into accepting this denial, must necessarily say that the objects of apprehension are simply psychical states and nothing more. Subjective Idealism is the nemesis of realism. What is wanted is to go forward, amending and expanding the experience which progressively approximates to giving us things as they are, under the full conditions which enable them to be what they are. The reality thus attained altogether transcends at once our particular mental states and the thin abstractions which form the realist's actual world. We need no assumption that the mind can only apprehend what belongs to its own being. We need only to recognise the obvious fact that what it apprehends at least participates in its own nature, a fact which the realist is forced to admit, both by the degree in which be truncates reality when he withdraws from it what he believes to belong to the mind ; [b] and by the degree in which the remainder which he is forced to leave to it still distinctly exhibits a living logical nature far transcending what can be ascribed to a physical object as physical. Thus, he tells us, 'gold' is by itself and apart from mind 'a connection of universals'—i.e. it obeys the law of the self-transcendence of finite experience and embodies in itself a complex of conations.[c] And if we refuse to recognise this fact

[a] Who, so far as they admit it, are no longer naïve realists.

[b] Prichard, pp. 116–8.

[c] (Prichard, pp. 242–4). We shall see, too, below that inferential connection is to be a character of external reality *per se*. Unless it is so, it is nonsense to speak of merely discovering connections. You can only *discover* conjunctions of fact. Necessary connections must be inferred by intelligence, unless they infer themselves. I am perfectly certain that the present so-called realism, which does not yet understand whether it is naïve or not, will have to hark back to an

in our theory of the reality beyond our particular mind, it must compel us falsely to concentrate the real into mere states of the finite centres themselves.

What explanation means, viz. complete thinking.

(3) I note the same retrogressive impulse in the idea that explaining a thing means explaining it away, i. e. deriving it from what is not itself.[a] To explain a thing, surely, is to think it in terms of the whole. A good explanation makes more, not less, of what it explains. It draws the outline of its full individuality—which only its relation to the whole can exhibit —and calls attention to the law of its being. Even an aesthetic product can be enhanced in value by good explanation. But I fully agree that it is impossible to have a theory of cognition, if that means a theory of cognition apart from a theory of reality, because to omit either is to omit what is essential to the full individuality of the other.

Fallacy that Independent of =apart from.

(4) And now we come to the supposed axiom of independent reality, and what I take to be the fallacy on which it rests. 'Knowledge unconditionally presupposes that the reality known exists independently of the knowledge of it, and that we know it as it exists in this independence.'[b] If we construe 'independence' as = 'being apart from' I am quite sure that this statement is false. Knowledge has no such presupposition. We have no such conviction. The presupposition of knowledge, and our conviction, may be stated[c] in the first place briefly: 'So far as we know things, we know them as they are;' and then more precisely, 'Knowledge presupposes that the system of judgments in which it consists can maintain itself against any contradiction, and that the reality known is unmodified by knowledge except in the direction of being revealed as more completely itself.' Thus the axiom as first stated rests on a plain fallacy *a dicto secundum quid ad dictum simpliciter*. The nature of reality is not differentially depen-

outrageous form of Hegel's extreme doctrine, that every 'thing' is a judgment and a syllogism.

[a] Prichard, p. 124.

[b] Prichard, p. 118. 'Independent' seems to = 'apart from', p. 119.

[c] A difference of opinion about the statement of essential functions of knowledge is not at all a surprising thing. The functions are relative to the whole, and our view of them depends on our view of it. Cp. vol. ii, p. 229.

dent on knowledge; but it is a fallacy to go from that to the statement, 'Reality is what it is apart from knowledge,' unless, as seems to be partly the case,[a] you are relying on the contrast between knowledge and other forms of experience. It is a plain fallacy to say that because the difference between *a*, *b*, and *c* is not due to *x*, therefore *a*, *b*, and *c* can be what they are if *x* is withdrawn.

And it does not suffice to suggest that to the special nature of any reality may be annexed the additional characteristic of being known.[b] The point is that the nature common to every reality—say, for instance, the admitted fact that it is a connection of universals,[c] involves its sharing the life and characteristics of experience. If it is argued that you must go to the special nature of every reality to determine whether or no it is dependent on mind (or, to put it more truly, and in a way that avoids subjective idealism, 'whether it participates in the life of experience'), the answer is that that question has long been considered and the result is not doubtful. The admission that the secondary qualities have special natures dependent upon mind is enough by itself to break down the principle that qualities of things must be independent of perception.[d] And if independence breaks down here, it cannot be maintained with apprehension and with knowledge. The nature of reals is fatal to the axiom that we know things as they are apart from cognition. The essence of this axiom is to look for reality in abstraction and isolation; rightly to accept the thing-in-itself as being what we know it to be; but without a shadow of justification or probability to assume that the being of the thing in itself is compatible with isolation instead of demanding as a condition of its existence the full context and interconnection of experiential life.

(5) This inclination is natural, because it promises to

[a] Prichard, p. 118. Of course we do not say that knowledge is the only form in which Reality can appear, nor the most adequate. But we do say that reality is inseparable from experience, and that is enough to negative the contention that it is what it is apart from mind. The only plausible case of being apart from knowledge is that in which, like pain, it is plainly not apart from mind, but another kind of experience takes the place of knowledge.

[b] Prichard, p. 116.

[c] See above, p. 304.

[d] Prichard, p. 120 ff., cp. 86 ff.

common-sense a simple ultimate real, ensuring facility of treatment and finality in apprehension. But the anticipation of facility and finality in contact with the real is, I am certain, fundamentally vicious, and any theory which is guided by it stands *ipso facto* self-condemned. We have noted the involuntary recognition of this truth by the modern realist.[a] But as recognised under his dualistic assumption it becomes false. It tends to ascribe a psychical character to things apart from the mind. But what we want, and what an undistorted view of the presupposition of knowledge affords us, is not a psychical character of things apart from the mind, but a logical character of reality as revealed through the mind —self-revelation being essential and inherent in the real, whose nature apart from it is self-contradictory.

A simple real must duplicate mental being.

(6) And in the proposition that the real is for knowledge the same that it is apart from knowledge I note an old elementary difficulty which seems to me insuperable. How can you separate the cognitive apprehension of an object from the operation of the organ of sense upon it? Grant, for the sake of argument, that if, *per impossibile*, you could compare a mind's cognitive consciousness of a perceived object with the full report of the living and healthy organ of sense directed upon it but minus consciousness, you would find that the bare addition of cognitive consciousness had not falsified the report, and therefore that the cognition had in no way modified the apprehension of the full object; the full object being the object of perception plus the modification effected in its physical operation by the organ of sense. Then (omitting *ex hypothesi* the fact that in the absence of consciousness apprehension would not have taken place at all) under the impossible condition which I have granted you would be entitled to say that the intervention of cognitive consciousness left the object—the full object—precisely as it would be apart from such intervention.[b]

If Independent = apart from, different physical objects are the same for apprehension.

[a] Professor Alexander's contention, e. g. Ar. Proc., 1908-9, that what are commonly called psychical objects are physical, cannot be carried through without a *rapprochement* between what are commonly called physical objects and the psychical. The comment of the text seems to me to apply to his view.

[b] I omit for the sake of argument such matters as the influence of

But this, I take it, is not by any means the case which is in question when we are told that the object of knowledge is for knowledge the same that it is apart from knowledge. In this doctrine I presume we are comparing the object as perceived through the organ of sense plus cognitive consciousness with the same as it is when withdrawn, not merely from the operation of cognitive consciousness, but from that of the organ of sense as well. But that the object should be the same under these two conditions, of being known after transmission through a sense-organ, and of neither being known nor transmitted through a sense-organ, is surely a physical impossibility. A physical object cannot be the same when a complex physical condition is superadded to it and when that condition is withdrawn. And the superadding of this complex physical condition is in every case inseparable from the apprehension of the object; therefore it cannot conceivably be the same when apprehended and apart from apprehension.[a]

For us this has no difficulty. We do not doubt that the thing really is as it is apprehended, because its reality for us is its full self-maintenance under the completed conditions of experience. But it seems to me absolutely fatal to the axiom of knowledge which was criticised above. You may throw overboard, as appeared to be practically done by the view in question, the secondary qualities,[b] but you cannot in the full sense of the axiom secure even the primaries. And I must insist that with the abandonment of the secondary qualities the axiom is absolutely surrendered. If the real world apart from knowledge has no secondary qualities, it has hardly anything of what we care for. It is not recognisable as our world at all.

It may be argued that the nervous disturbance, or whatever the result of the sense organ's operation may be, is not the

apperception, and allow the hypothesis that cognition should bring no modifying influences with it to the report of the organ of sense.

[a] Note that in one place the theory we are discussing makes the real qualities of a thing exist independently not merely of knowledge but of perception and sentience (p. 86). Thus sentience cannot be appealed to as presenting the complete physical object as it is apart from knowledge. The real must be apart from sentience no less than from knowledge. But cp. 306 sup. and reff. [b] Prichard, p. 86.

object of perception, and we are never so much as aware of it. That is a very good argument against saying that what we perceive are neural tremors and nothing more. But it is wholly irrelevant to the point that a vibrating violin-string is not sonorous in the absence of a hearing ear, and a candle is not a source of light in the absence of a seeing eye. These are simple physical facts; and they suffice to overthrow the doctrine that objects are the same for cognitive apprehension that they are apart from it.[a]

In conclusion, then, the true axiom of knowledge is that we can know things as they really are. And that means, that we know them in their full self-maintenance. There is no axiom that warrants us in arguing directly from the reality of full experience to the reality of abstraction, and if we adopt this procedure we must do it on the special ground that what we exclude is *ad hoc* irrelevant, a contention which always leaves us exposed to some degree of risk.

And as to mental states, our conclusion so far is certainly not that the reality which we know either must or does consist solely of the mental states of particular minds. But, we urge, this proposition is false only because it would identify the real with a particular phase or character of mental being, and with that, moreover, as it is in each mind taken apart. Our conclusion is, therefore, that the stuff of our mental states does really and truly characterise and belong to external objects, although, as characterising such objects, it ceases to be a mere mental state. It follows that the nature of external objects is continuous with that of the stuff of mind, and is physical, i.e. has variations relative to those of other objects, as well as psychical. Physical or spatial objects are just as we know them, and truly have the characters which our knowledge (so far as it is knowledge, i.e. so far as it is consistent

[a] Professor Stout's doctrine as stated in Mind, 77. 12–13, seems to me not to be open to this objection, because, while holding that in presentation we have a glimpse of matter as it really is, yet in answer to the further question, '*What* matter?' he replies, as I understand, 'the matter of our body, and of other things only as affecting that,' not, as I read him, the matter of other things in so far as they do not affect that of our body. I should not have thought that in this latter point Mr. Moore would agree with him, as implied on p. 9.

with itself and with experience) attributes to them. The stuff of mental states, therefore, enters into them, and though the stuff of each particular mind is only a very small contribution to the real world, yet it is a contribution, and is capable, in principle, of furnishing some element which no other particular mind supplies.

Objects then are only not mental states of particular minds first because they are not states of mind, but interdependent with minds and characterised by the stuff which is also experienced in states of mind; and secondly because if they were states of mind it would not be the states of any particular mind but the states of all minds. It follows that the destruction of a single mind with its states neither destroys the objects apprehended by it, nor again makes no difference to their existence. It diminishes, in principle, their amount of reality, and presumably moreover, in doing so, deprives them of some character which no other mind sustains in them, and the loss of which therefore is a genuine loss of being to the object. So far mental states of particular minds are the material of objective reality, not merely as themselves psychical facts, but as facts which are necessary to the nature of real objects.

The object of perception *is* conditionally 'for me'.

(7) The same tendency to seek truth by omission is exemplified in the desire to treat perception as essentially less than judgment, and to deny it the right to use the word 'is'; setting down the expression 'is for me' as a contradiction in terms.[a]

'The assertion that something *is* so and so implies that it is so and so in itself whether it be perceived or not, and therefore the assertion that something is so and so to us as perceiving though not in itself, is a contradiction in terms.' The truth about this seems to me quite simple. Everything is what it is under conditions. It is itself under full, normal, or typical conditions, the distinction of which from any partial or transient conditions is a matter of degree—of convenience for science or for common sense. We cannot possibly attain a right conception of 'itself' by the withdrawal of all conditions. That is the fallacy signalised above.

[a] Prichard, pp. 72 ff., 99 ff.

In perception, as in any other judgment, you may fail to be aware of the conditions to which your judgment is subject. In that case, judging unconditionally of what is conditional, you fall into error. But if you name the conditions, or indicate by a phrase of relation like 'for me' that you are aware of conditions though you cannot or will not mention them, the predication 'is' becomes appropriate at once. Everything is what it is under conditions, and what it is 'in itself' is only distinguished by being under conditions which you accept as normal. The thing which looks pink to a colour-blind man *is* pink to him.[a] The condition of its being pink is present; that of its being blue is absent, and if it were not pink under the existing condition it would have to be other in itself than it is. The unconditional judgment of knowledge, interpreted as about the thing apart from knowledge, is false precisely in the same way as the judgment of perception is apt to be. An unconditional judgment must be false unless you interpret it to mean 'presupposing the normal or typical conditions'.

Subjective Idealism insists on vital continuity of universe.

β. I am therefore constant in the opinion [b] that Subjective Idealism is a valuable propaedeutic to philosophy and especially to Logic. I understand it to mean that we know nothing but states of our own minds. It is not actually true, but it is truth of a higher order than that of naïve realism. Naïve realism I understand to deny that qualities which depend on minds can be qualities of objects; for it is essential to it that objects should be what they are apart from minds. This doctrine conditions reality by the withdrawal from experience, and so cuts the universe in two. Subjective Idealism is its nemesis. The latter urges that the qualities of reality are continuous with the psychical, and then, if and because you say that reality can have no psychical qualities, it repudiates the dead reality so offered, and limits the real world to what is admittedly self-maintaining in the context of a vital whole.

Thus it insists on the fundamental truths of the continuity of nature throughout the real, and the dependence of its being in some degree on every particular mind. It is this continuity and this dependence—the life and wholeness of things—which appear more especially distasteful to realism, and which it

[a] Ibid., p. 72 note. [b] Essentials, 19 ff.

avoids by the *ignava ratio* of withdrawing reality from any essential participation in the whole of sentience and intelligence. Against this logical quietism—profoundly connected, I am convinced, with the timidity and pessimism of the day—the subjective Idealist raises an audaciously exaggerated protest. Whatever the object of knowledge may ultimately be, he contends, it can only attain or sustain what is worth calling reality in and through a share in the full and continuous life of feeling, sensation, and intelligence. His error is to confine the life in question to the particular mind, and to reduce the real world to a mere combination of its states. But this error means not that he is too idealistic, but that he is not idealistic enough. He accepts the false doctrine which tells us that a real world independent of knowledge must be complete apart from knowledge, and rightly rejects a real world so defined. He cannot therefore suggest the only solution which can satisfy the logical need, a real world furnishing out of its self-dependent being a content to knowledge and experience, but of a nature continuous with theirs, and one in which self-revelation is inherent. Nothing but this can satisfy the logical and metaphysical postulate that truth and reality lie in approximation to the whole. And this postulate, which is one with the law of contradiction, lies at the root of Logic. Anything ultimately atomic, or independent, or non-plastic—any truth or reality not relative in respect of its qualities to its degree of participation in the whole, is irreconcilable with this postulate, and with a system of Logic resting on the conception of logical stability. [a]

It is this fundamental principle that Subjective Idealism maintains, when it treats the real world, however erroneously, as a mere outgrowth or complex of mental states, and as dependent for its being on particular minds. It thus emphasises what I may call the arduousness of reality, both of its theoretical conception and of its detailed apprehension. Its conception demands to be maintained always on the level of the life of mind; that is, when we think of what we mean by reality we have also to think of feeling, sentience, and intelligence in their various grades of perfection as actually involved and

[a] Cf. p. 288 above.

operative in sustaining the real in corresponding degrees. And its detailed apprehension in the same way depends for its completeness, not on mere adjustment to a hard datum, but on the degree in which the whole is brought to bear upon the given. Therefore there can be no simple apprehension (except in the arbitrary sense that we may accept a certain level of insight as satisfactory *ad hoc*), and no such thing as a receptive attitude to data. The most obvious of perceptions involves the beginning of a critical process, progressive, arduous, and never finally accomplished. All this is the logical lesson of subjective idealism; and therefore in spite of its failure to apply its doctrine to the self-dependent real object, I welcome it as a logical propaedeutic.

Sustaining and constructing world.

γ. 'When an idealist speaks of the judgment by which we sustain the world,[a] however adequate may be his explanation of such language, it is apt to excite a suspicion that his theories, if they were completely worked out, would lead to the individual being regarded as his own universe and his own God.'[b]

'When it is said that our world, or the world *for us*, is due to our activity of thinking, and so in some sense *made* by us, all that should be meant is that our *apprehending* the world as whatever we apprehend it to be presupposes activity on our part'—'Nothing is implied to be made. If anything is said to be made, it must be not our world, but our activity of apprehending the world.' 'Again, in judgment we cannot be said to relate predicate to subject. . . . We must say that in judgment we recognise real elements as related or combined.' 'Again, when we infer, we do not construct, ideally or otherwise.' 'Ideal construction is a contradiction in terms, unless it refers solely to mental imagining, in which case it is not inference.' . . . '—Inference would cease to be inference, if by it we made and did not apprehend a necessity of connection.'[c] 'The very nature of knowing presupposes that the thing known is already made, or, to speak more accurately, already exists.'[d]

[a] Cp. e. g. vol. i, p. 84 above.

[b] E. Caird, 'Idealism and the Theory of Knowledge,' Proceedings of British Academy, vol. i.

[c] Prichard, pp. 242-5.

[d] Ibid., p. 235.

The points raised in the statements here quoted are primarily metaphysical, and as such go beyond the scope of this work. But they are greatly affected by a precise consideration of what we actually do in judgment and inference, and so far it seems necessary to offer some explanation in regard to them. And if this explanation involves a word or two of indication as to where we stand, in a philosophical logic, with reference to the subject-matter of metaphysic, perhaps at the close of a logical treatise such an indication is permissible. The underlying question seems to be whether in cognition we are co-operating in the self-maintenance of reality, as ourselves organs within it; or are apprehending *ab extra* something finished and complete apart from us. Of these types of view it is the former that has prevailed in my treatment. I am aware that it needs careful statement, and will endeavour to state it with due precision in what follows.

How much then is meant and implied by saying (1) that our judgment sustains the universe, and (2) that in judgment and inference we make or construct reality? [a]

Judgment involves a *world* and *one* world.

(1) The expression in question was primarily employed to emphasise the idea of a total affirmative attitude to our world as distinct from the isolated judgment or proposition as commonly regarded in logic, *qua* selected and detached in abstract thought or in language.

There were two things, as it seemed, to be insisted on, in conceiving such an affirmation as the genuine type of judgment. One was the overwhelming impression, conveyed alike by thought and by perception, of an affirmative and not merely receptive attitude in presence of our whole connected world. Everything, it seemed, had on it the stamp of meaning; and everything that had on it the stamp of meaning was *ipso facto* affirmed as soon as our thought rested, or our eyes were opened, on a whole including it. The point was not in any new account of affirmation; but that whatever we meant by affirmation in the fullest sense as applied to a definite judgment is true of our attitude to the world as a whole with all its inter-connected detail. The example which seemed

[a] Cp. with citations above, i. 42.

peculiarly insistent was the field of vision. It contained, as it seemed, innumerable judgments of magnitude and spatial inter-relation and other properties and relations, all affirmed at a stroke and so to speak as a solid whole on the simple opening of one's eyes. If the experiment is made of denying any one of them, any property or relation appearing within the field of vision, we discover beyond a doubt that we have affirmed it, seeing that we must either defend it by argument or admit that we were in error.

And the second matter was the underlying wholeness and unity of this enormous world of affirmation.[a] Everything in it is affirmed, but affirmed subject to being a part in the whole, and the consciousness of this reservation is essential to the affirmation. Every detail is asserted as in its way true and real, but only in its way, being modified by a huge co-ordinate affirmation, shading off into an undefined underlying unity, merely implied, but none the less affirmed.[b]

This world of our affirmation, with its double aspect of innumerable detail and implied unity, seemed to be the world we practically lived in, and undoubtedly to be dependent upon our energy and capacity not for the nature of its content, but for being, so far as we had to do with it, more or less of itself. This was the primary sense in which our judgment could be said to sustain our world. Its point was that our world was all in judgment, none of it in mere reception ; and the amount of it so to speak, depended on—was coincident with—the amount of our particular mind.

This is the meaning of ' sustaining our world ' with which logic is concerned. It is merely an expansion of the customary application of the term ' judgment ', demanded by consistency. It has the strictly logical advantage of putting in a strong light the unimportance of grammatical subject and predicate, which can hardly be found in the judgment so described, the ultimate subject being as always Reality ; and also of emphasising the abstract and conditional character of the detached judgments which we make explicit as fragments,

[a] See i. 84 above, and Essentials, p. 33 ff., and cp. Stout, Mind, 77, pp. 5 and 6.

[b] Cp. Essentials, loc. cit.

attempting to compensate for their abstractness by precision of connection.

But if this meaning is challenged on metaphysical grounds, and we are asked how far *we*, we as finite fragmentary minds, can be said really to sustain the universe, we have not to disown anything that we have said. We are only driven a little nearer to metaphysic ; and the answer is that we sustain the universe not only for ourselves, in the sense that it is through our own experience, and under its limitations, that we have to play our part in it, but in the more metaphysical sense that supposing a given mind and its states not to be,[a] the universe would actually be the poorer, however inappreciably, by certain elements of its self-revelation peculiar to the experience of that finite mind.[b]

The former of the above views is all that strictly belongs to Logic, if we are at all to distinguish Logic from Metaphysics. What Logic aimed at [c] was to show by what characters, exhibited in the structure of cognition, the object of cognition is revealed as more or less of itself and as possessing more or less of reality or logical stability.

Metaphysic would have a return game to play. It would show that finite minds which for Logic sustain the universe, are ultimately organs moulded by it and through which it sustains itself. Both points of view are true, and it is the test of a philosophy to succeed in combining them.[d]

Both Realists

(2) To say that before we know or apprehend an object it must exist, or its making must be finished, complete and apart

[a] We must not say ' to perish ', or ' cease to be '. That would raise the question whether such events were not mere appearance—whether anything could be lost to the universe.

[b] Not merely by lack of the mind as a member of the whole, as by lack of an unconscious creature, but by lack of its view of the whole.

[c] i. 3 above.

[d] In this respect the relations of Logic and Metaphysic are not unlike the relations of morality and religion. In morality, too, the ' individual ' seems to sustain the weight of the world. All is on his shoulders ; he acts out of himself ; all turns upon what he does next. So it does, and the point of view is a true one. But if we go on to ask what the ' individual ' is, and how far he is really and truly an isolated and independent creature, then we get into the provinces of society and religion, which modify without annihilating the purely moralist point of view.

from the knowing or apprehending, is a very simple and natural version of the presupposition of knowledge which we referred to above.[a] It will serve, indeed, as a first approximation to the true relation between knowledge and 'making' which I hope to suggest. It assumes, I repeat, a reality given as self-complete, and that apart from the apprehensive organ or process. We, the knowing mind, stand outside a reality which is complete without us; without us, at least, *qua* cognitive subjects. And I believe that to be consistent it would be necessary to add, without us as sentient beings either.

and Pragmatists put us outside reality.

It may help us to discern the true relation of the process and object in question, if we first turn to the extreme opposite of the above theory of apprehension, an opposite with which I, quite as much as the new realists, am at war. It might be expressed by saying that in knowledge we create, and create not only truth but reality. We make it, that is, *out of* nothing, and by means of nothing. We do not make it by the law of the universe or of our minds or of the two together or of anything at all, out of anything that was given. Against any idea of this type the reproach would be flung—'Then *tout est donné*.'

This view presupposes a modifiable ultimate reality, outside which, in some strange fashion, we stand, with a miraculous power of adding new determinations to it in virtue of no existing nature, either of it or of our own.[b] It is strange and suggestive that both the one-sided attitudes necessarily place the mind outside the reality; in the former case that the mind may not dictate to the real; in the latter, that the real may not dictate to the mind.

Now we can discern what our attitude must be. We have rejected all ideas which make truth depend on copying or correspondence. But again, we hold continuity and intelligibility to be destroyed if pure creation is possible—if, that is, ultimate reality is modifiable; if, that is, once more, the real is modifiable otherwise than by its own law.

[a] p. 305.

[b] It does not matter, I think, whether these consequences are accepted by the theorists in question or not. The test is the rejection of continuity.

For us, the universe is undoubtedly the object of apprehension and knowledge, prior to them and determining them. But it is not an object given and complete as a whole apart from apprehension and knowledge, still less, of course, from experience.[a] And the relation of apprehension to it is neither copying on the one hand, nor creation on the other. These are fit expressions for the working of a mind from the outside upon a hard and self-complete real, or upon one unfinished and incapable of self-determination respectively. But for us the mind is a constituent of a living and self-determining real. We might apply to its activity the term apprehension, with explanations, or perhaps even the term creation, again with explanations. But it will be best to look first at the nature of our object, and to judge for ourselves how the relation of knowledge to it should really be described.

Nature of object of Cognition.

(3) The object of cognition, then, is not a simple object. It is not all given; and it is not given as a whole. If we try to get at it on the assumption that it is given, we find it eluding us, and extending into an infinite succession or extension of particulars in space and time. And with all our trying we find in the end that even these particulars are not directly given. Now strictly speaking nothing but a given fact can be 'apprehended'. Therefore it is clear that our universe, *qua* object of cognition, cannot be in the strict sense 'apprehended'. To know it as we presume it to be, that is, as a whole and a system, we must 'apprehend' what is not given; and this qualification of the object at once modifies the idea of apprehension. It is just as when we read in Plato and Aristotle about 'imitation'. It seems simple enough at first, to imitate a given object directly. But then we find that one can 'imitate' a moral character with paint-brush or chisel, or even, perhaps, one can imitate what is not but ought to be. Such qualification of the object must expand the meaning of the verb; and so in knowledge the nature of our object changes the meaning of apprehension and cognition.

[a] If this latter point is to be taken as admitted by the new realists, it appears to me that the whole question is decided. It is impossible seriously to admit into the reality of the existent universe some forms of experience, and exclude others, *prima facie* of a completer kind.

If you are to 'apprehend' an object by far the greater part of which has to be got at by inference, and all of which is continuously transformed as apprehension proceeds, you can only interpret the term apprehend in a way which has something to do with making. I suggest as the key to the required meaning some such word as 'elicit'. Your object of knowledge has in a great measure to be elicited from the given. For the object is a whole, but not a given whole, and is always beyond itself, and is offering more to your apprehension than is already there for you to apprehend.

If we are substantially agreed on this character of the object, it becomes a verbal question whether we say that we construct [a] reality, that we *relate* a predicate to a subject in judging, that we *make* an inference, or that we *apprehend* the given and fragmentary facts with such modifications as logical necessity requires, and so again *apprehend* the necessity with which a predicate, not given, belongs to its subject, or a conclusion, *ex hypothesi* not given, belongs to its premises, or by which one factor of reality, given *per se*, conditions and is conditioned by another, also given only *per se*. In the latter case it is fairly certain that some corners of the given will have to be cut off through the operation of the conditioning necessity.

Now strictly, I repeat, it is misleading to say 'I apprehend' anything but a fact or a given conjunction of facts. If you say 'I apprehend' the product of two numbers of five places each, I think it would be held that you must be a calculating

[a] I have myself commented on the term 'construct' as properly expressing only the auxiliary employment of mental imagery in inference (ii. 33), and there is a verbal inconsistency between that passage and the earlier one which speaks of the construction of reality, i. 42. What I meant to urge was that the metaphor from physical construction does not really explain the construction of reality. It is the latter that is the true construction, and the former derives its significance from it. You only construct even physically if you follow a principle and make what you meant. Mental construction is mere imagining only if you slide from the relevant to the irrelevant content. But if, being in possession of a mass of conflicting evidence concerning, say, a historical event, you frame a conception which harmonises a great part and explains the contradictions of the rest—the typical process by which we learn what reality is—I hardly see what to call the process if not construction.

boy. But if we like to say 'apprehend' in the sense that possessing the given and the law of its system, and operating on it accordingly, we are able to apprehend it with modifications which belong to it, of course we may say so. But any distinctive implication as to the priority of the *special* object of apprehension appears in that case to have vanished.

Thus it may be urged that all critical systems which support and elucidate 'facts' by bringing them into a coherent whole —e. g. the facts of history [a]—all 'laws of nature' and appreciations of necessary connection, all intelligibility by which the given itself is known and framed in inter-connections and inter-dependences which are not and cannot be given, are ultimately 'found' in the universe and not 'made', and so are 'apprehended' and not 'constructed'. But surely this is to go back to the naïve empiricism which so much pains and labour have been spent in transcending. If anything at all has been made clear in the history of philosophy, it is surely that as we get to truth, especially of the higher orders, we get away from facts. It is not a contention especially of philosophical idealism. It is as true for Mill and Jevons and Mr. Bertrand Russell [b] as for Lotze, Green, and Bradley, not to speak of earlier philosophers. No working Logic can be put together upon any other basis.

Now of course the predications in question are presupposed to be true of the universe. It is their general presupposition and prior object. But it, if you omit from it mind as a constituent, does not furnish a given object of apprehension which corresponds to them or which they can be said to copy. You may say our higher knowledge is a shorthand for innumerable facts. That is, of course, extreme empiricism, and leads to the denial that the universe is a whole. But this position is so far sound, that *if* you contend that judgments to be true must reproduce facts that are simply found, then our higher knowledge must be mere shorthand, or false. If these higher

[a] Cp. Mr. F. H. Bradley's Presuppositions of Critical History.

[b] That is to say, so far as I can follow, all Mr. Russell's higher truths, viz. those of Logic and Mathematics, are truths of implication and in no way deal directly with particulars. Mr. Russell would not, I presume, assent to the consequences which I suggest.

truths are 'found' in the universe, they are only found as the statue is in the marble, that is, in such a way that the process has more to do with the result than the matrix material. In the controversy about the relations of knowledge and practice it has become clear beyond dispute not only that practice, besides making the product always finds the real, but that knowledge, besides finding the real, always modifies the given. To know the truth of anything, you always go further afield. Even if you ask, 'Is the sensation of touch A a sensation of touch?' you mean to ask about it something further, e.g. 'Is something more to be detected than I have apprehended, which will be decisive that what I feel is a sensation of touch?'[a] This is the beginning of construction—ideal construction—which rests on the fact that all finite reality goes beyond itself, and is completer and completer in more and always more of its connections. By this ideal construction it has—to borrow a phrase from another context—its own nature progressively communicated to it.

But do we 'make' the construction? Is it not there as a whole, though unknown to us at first, and we apprehend it? Does not making exclude knowledge? The answer has been offered in the whole preceding argument, and it is for the reader to judge. What seems to us is, that we certainly do not create the construction, but no less certainly do not in any natural sense 'apprehend' it. It is true—conditionally true—of our universe; and in that sense, is 'there' before we make it. But it is not given before we make it, and this does not apply to individuals because of fortuitous ignorance, but to the whole nature of what can be given compared with what can only be inferred. If we rule out of the universe the living power of mind which alone can complete the given into a coherent whole, a systematic construction, modifying the facts with a view to their inter-connection, could never come to be given at all. It has not only less—less irrelevancy—but more—more relevancy—than what can be given or found, and can never be adequately described as found or given. A necessary connection even between two given terms is a reciprocal inferential relation,[b] implying a system beyond

[a] Cp. Nettleship, Remains, i. 180 ff. [b] Cp. e.g. vol. ii, p. 8 above.

either, and not present in the apprehension of each alone or of both together.

It is only by a misapprehension, as I have tried to point out, that such an interpretation of knowledge seems to conflict with its presupposition. Knowledge is an essential form of the self-revelation of the universe; experience as a whole is *the* essential form. In knowledge, the universe reveals itself in a special shape which reposes on its nature as a whole, and is *pro tanto* proof against contradiction. It is, like the whole wealth of life and of history, elicited from a relatively given by the forming and interpreting activity of mind, which in this activity is an organ of the universe itself. Plainly, if you hold that to be a part of the universe disqualifies knowledge from being true (because without it or prior to it the universe is not completely there) you must, as I said, to make knowledge capable of truth make it external and additional to the universe.

But the detail which it presents in the form of cognition *is* true of the universe, although falling within it, because the universe, *qua* object of cognition, in its self-maintenance against self-contradiction in that form shows that it must take the detailed shape which it does take and no other, and to know is to endow it with that form, making the given more and more of itself.

And in Logic we study the character of the universe or the reality with reference to the degrees of stability, which, if we postulate *bona fide* employment, attach to the various frameworks at different stages of the structure arising from its self-utterance in that form.

The ' driving force of Idealism ', as I understand it, is not furnished by the question how mind and reality can meet in knowledge, but by the theory of logical stability, which makes it plain that nothing can fulfil the conditions of self-existence except by possessing the unity which belongs only to mind. External objects, therefore, are fragmentary and dependent.

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