ON THE NOTION OF CAUSE

In the following paper I wish, first, to maintain that the word "cause" is so inextricably bound up with misleading associations as to make its complete extrusion from the philosophical vocabulary desirable; secondly, to inquire what principle, if any, is employed in science in place of the supposed "law of causality" which philosophers imagine to be employed; thirdly, to exhibit certain confusions, especially in regard to teleology and determinism, which appear to me to be connected with erroneous notions as to causality.

All philosophers, of every school, imagine that causation is one of the fundamental axioms or postulates of science, yet, oddly enough, in advanced sciences such as gravitational astronomy, the word "cause" never occurs. Dr. James Ward, in his Naturalism and Agnosticism, makes this a ground of complaint against physics: the business of those who wish to ascertain the ultimate truth about the world, he apparently thinks, should be the discovery of causes, yet physics never even seeks them. To me it seems that philosophy ought not to assume such legislative functions, and that the reason why physics has ceased to look for causes is that, in fact, there are no such things. The law of causality, I believe, like much that passes muster among philosophers, is a relic of a bygone age, surviving, like the monarchy, only because it is erroneously supposed to do no harm.
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In order to find out what philosophers commonly understand by "cause," I consulted Baldwin's Dictionary, and was rewarded beyond my expectations, for I found the following three mutually incompatible definitions:—

"CAUSALITY. (1) The necessary connection of events in the time-series. . . .

"CAUSE (notion of). Whatever may be included in the thought or perception of a process as taking place in consequence of another process. . . .

"CAUSE AND EFFECT. (1) Cause and effect . . . are correlative terms denoting any two distinguishable things, phases, or aspects of reality, which are so related to each other that whenever the first ceases to exist the second comes into existence immediately after, and whenever the second comes into existence the first has ceased to exist immediately before."

Let us consider these three definitions in turn. The first, obviously, is unintelligible without a definition of "necessary." Under this head, Baldwin's Dictionary gives the following:—

"NECESSARY. That is necessary which not only is true, but would be true under all circumstances. Something more than brute compulsion is, therefore, involved in the conception; there is a general law under which the thing takes place."

The notion of cause is so intimately connected with that of necessity that it will be no digression to linger over the above definition, with a view to discovering, if possible, some meaning of which it is capable; for, as it stands, it is very far from having any definite signification.

The first point to notice is that, if any meaning is to be given to the phrase "would be true under all circumstances," the subject of it must be a propositional func-
tation, not a proposition.\textsuperscript{1} A proposition is simply true or false, and that ends the matter: there can be no question of "circumstances." "Charles I's head was cut off" is just as true in summer as in winter, on Sundays as on Mondays. Thus when it is worth saying that something "would be true under all circumstances," the something in question must be a propositional function, i.e. an expression containing a variable, and becoming a proposition when a value is assigned to the variable; the varying "circumstances" alluded to are then the different values of which the variable is capable. Thus if "necessary" means "what is true under all circumstances," then "if \( x \) is a man, \( x \) is mortal" is necessary, because it is true for any possible value of \( x \). Thus we should be led to the following definition:—

"NECESSARY is a predicate of a propositional function, meaning that it is true for all possible values of its argument or arguments."

Unfortunately, however, the definition in Baldwin's *Dictionary* says that what is necessary is not only "true under all circumstances" but is also "true." Now these two are incompatible. Only propositions can be "true," and only propositional functions can be "true under all circumstances". Hence the definition as it stands is nonsense. What is meant seems to be this: "A proposition is necessary when it is a value of a propositional function which is true under all circumstances, i.e. for all values of its argument or arguments." But if we adopt this definition, the same proposition will be necessary or contingent according as we choose one or other of its

\textsuperscript{1} A propositional function is an expression containing a variable, or undetermined constituent, and becoming a proposition as soon as a definite value is assigned to the variable. Examples are: "A is A," "\( x \) is a number." The variable is called the argument of the function.
terms as the argument to our propositional function. For example, "if Socrates is a man, Socrates is mortal," is necessary if Socrates is chosen as argument, but not if man or mortal is chosen. Again, "if Socrates is a man, Plato is mortal," will be necessary if either Socrates or man is chosen as argument, but not if Plato or mortal is chosen. However, this difficulty can be overcome by specifying the constituent which is to be regarded as argument, and we thus arrive at the following definition:

"A proposition is necessary with respect to a given constituent if it remains true when that constituent is altered in any way compatible with the proposition remaining significant."

We may now apply this definition to the definition of causality quoted above. It is obvious that the argument must be the time at which the earlier event occurs. Thus an instance of causality will be such as: "If the event \( e_1 \) occurs at the time \( t_1 \), it will be followed by the event \( e_2 \)." This proposition is intended to be necessary with respect to \( t_1 \), i.e. to remain true however \( t_1 \) may be varied. Causality, as a universal law, will then be the following: "Given any event \( e_1 \), there is an event \( e_2 \) such that, whenever \( e_1 \) occurs, \( e_2 \) occurs later." But before this can be considered precise, we must specify how much later \( e_2 \) is to occur. Thus the principle becomes:

"Given any event \( e_1 \), there is an event \( e_2 \) and a time-interval \( \tau \) such that, whenever \( e_2 \) occurs, \( e_2 \) follows after an interval \( \tau \)."

I am not concerned as yet to consider whether this law is true or false. For the present, I am merely concerned to discover what the law of causality is supposed to be. I pass, therefore, to the other definitions quoted above.
The second definition need not detain us long, for two reasons. First, because it is psychological: not the "thought or perception" of a process, but the process itself, must be what concerns us in considering causality. Secondly, because it is circular: in speaking of a process as "taking place in consequence of" another process, it introduces the very notion of cause which was to be defined.

The third definition is by far the most precise; indeed as regards clearness it leaves nothing to be desired. But a great difficulty is caused by the temporal contiguity of cause and effect which the definition asserts. No two instants are contiguous, since the time-series is compact; hence either the cause or the effect or both must, if the definition is correct, endure for a finite time; indeed, by the wording of the definition it is plain that both are assumed to endure for a finite time. But then we are faced with a dilemma: if the cause is a process involving change within itself, we shall require (if causality is universal) causal relations between its earlier and later parts; moreover, it would seem that only the later parts can be relevant to the effect, since the earlier parts are not contiguous to the effect, and therefore (by the definition) cannot influence the effect. Thus we shall be led to diminish the duration of the cause without limit, and however much we may diminish it, there will still remain an earlier part which might be altered without altering the effect, so that the true cause, as defined, will not have been reached, for it will be observed that the definition excludes plurality of causes. If, on the other hand, the cause is purely static, involving no change within itself, then, in the first place, no such cause is to be found in nature, and in the second place, it seems strange—too strange to be accepted, in spite of bare
logical possibility—that the cause, after existing placidly for some time, should suddenly explode into the effect, when it might just as well have done so at any earlier time, or have gone on unchanged without producing its effect. This dilemma, therefore, is fatal to the view that cause and effect can be contiguous in time; if there are causes and effects, they must be separated by a finite time-interval \( \tau \), as was assumed in the above interpretation of the first definition.

What is essentially the same statement of the law of causality as the one elicited above from the first of Baldwin's definitions is given by other philosophers. Thus John Stuart Mill says:

"The Law of Causation, the recognition of which is the main pillar of inductive science, is but the familiar truth, that invariability of succession is found by observation to obtain between every fact in nature and some other fact which has preceded it."\(^1\)

And Bergson, who has rightly perceived that the law as stated by philosophers is worthless, nevertheless continues to suppose that it is used in science. Thus he says:

"Now, it is argued, this law [the law of causality] means that every phenomenon is determined by its conditions, or, in other words, that the same causes produce the same effects."\(^2\)

And again:

"We perceive physical phenomena, and these phenomena obey laws. This means: (1) That phenomena \( a, b, c, d \), previously perceived, can occur again in the same shape; (2) that a certain phenomenon \( P \), which

\(^1\) Logic, Bk. III, Chap. V, §
\(^2\) Time and Free Will, p. 199.
appeared after the conditions \( a, b, c, d \), and after these conditions only, will not fail to recur as soon as the same conditions are again present."\(^1\)

A great part of Bergson's attack on science rests on the assumption that it employs this principle. In fact, it employs no such principle, but philosophers—even Bergson—are too apt to take their views on science from each other, not from science. As to what the principle is, there is a fair consensus among philosophers of different schools. There are, however, a number of difficulties which at once arise. I omit the question of plurality of causes for the present, since other graver questions have to be considered. Two of these, which are forced on our attention by the above statement of the law, are the following:—

(1) What is meant by an "event"?

(2) How long may the time-interval be between cause and effect?

(1) An "event," in the statement of the law, is obviously intended to be something that is likely to recur since otherwise the law becomes trivial. It follows that an "event" is not a particular, but some universal of which there may be many instances. It follows also that an "event" must be something short of the whole state of the universe, since it is highly improbable that this will recur. What is meant by an "event" is something like striking a match, or dropping a penny into the slot of an automatic machine. If such an event is to recur, it must not be defined too narrowly: we must not state with what degree of force the match is to be struck, nor what is to be the temperature of the penny. For if such considerations were relevant, our "event" would occur at

most once, and the law would cease to give information. An "event," then, is a universal defined sufficiently widely to admit of many particular occurrences in time being instances of it.

(2) The next question concerns the time-interval. Philosophers, no doubt, think of cause and effect as contiguous in time, but this, for reasons already given, is impossible. Hence, since there are no infinitesimal time-intervals, there must be some finite lapse of time \( \tau \) between cause and effect. This, however, at once raises insuperable difficulties. However short we make the interval \( \tau \), something may happen during this interval which prevents the expected result. I put my penny in the slot, but before I can draw out my ticket there is an earthquake which upsets the machine and my calculations. In order to be sure of the expected effect, we must know that there is nothing in the environment to interfere with it. But this means that the supposed cause is not, by itself, adequate to insure the effect. And as soon as we include the environment, the probability of repetition is diminished, until at last, when the whole environment is included, the probability of repetition becomes almost nil.

In spite of these difficulties, it must, of course, be admitted that many fairly dependable regularities of sequence occur in daily life. It is these regularities that have suggested the supposed law of causality; where they are found to fail, it is thought that a better formulation could have been found which would have never failed. I am far from denying that there may be such sequences which in fact never do fail. It may be that there will never be an exception to the rule that when a stone of more than a certain mass, moving with more than a certain velocity, comes in contact with a pane of glass of
less than a certain thickness, the glass breaks. I also do not deny that the observation of such regularities, even when they are not without exceptions, is useful in the infancy of a science: the observation that unsupported bodies in air usually fall was a stage on the way to the law of gravitation. What I deny is that science assumes the existence of invariable uniformities of sequence of this kind, or that it aims at discovering them. All such uniformities, as we saw, depend upon a certain vagueness in the definition of the "events." That bodies fall is a vague qualitative statement; science wishes to know how fast they fall. This depends upon the shape of the bodies and the density of the air. It is true that there is more nearly uniformity when they fall in a vacuum; so far as Galileo could observe, the uniformity is then complete. But later it appeared that even there the latitude made a difference, and the altitude. Theoretically, the position of the sun and moon must make a difference. In short, every advance in a science takes us farther away from the crude uniformities which are first observed, into greater differentiation of antecedent and consequent, and into a continually wider circle of antecedents recognised as relevant.

The principle "same cause, same effect," which philosophers imagine to be vital to science, is therefore utterly otiose. As soon as the antecedents have been given sufficiently fully to enable the consequent to be calculated with some exactitude, the antecedents have become so complicated that it is very unlikely they will ever recur. Hence, if this were the principle involved, science would remain utterly sterile.

The importance of these considerations lies partly in the fact that they lead to a more correct account of scientific procedure, partly in the fact that they remove
the analogy with human volition which makes the conception of cause such a fruitful source of fallacies. The latter point will become clearer by the help of some illustrations. For this purpose I shall consider a few maxims which have played a great part in the history of philosophy.

(1) "Cause and effect must more or less resemble each other." This principle was prominent in the philosophy of occasionalism, and is still by no means extinct. It is still often thought, for example, that mind could not have grown up in a universe which previously contained nothing mental, and one ground for this belief is that matter is too dissimilar from mind to have been able to cause it. Or, more particularly, what are termed the nobler parts of our nature are supposed to be inexplicable, unless the universe always contained something at least equally noble which could cause them. All such views seem to depend upon assuming some unduly simplified law of causality; for, in any legitimate sense of "cause" and "effect," science seems to show that they are usually very widely dissimilar, the "cause" being, in fact, two states of the whole universe, and the "effect" some particular event.

(2) "Cause is analogous to volition, since there must be an intelligible nexus between cause and effect." This maxim is, I think, often unconsciously in the imaginations of philosophers who would reject it when explicitly stated. It is probably operative in the view we have just been considering, that mind could not have resulted from a purely material world. I do not profess to know what is meant by "intelligible"; it seems to mean "familiar to imagination." Nothing is less "intelligible," in any other sense, than the connection between
an act of will and its fulfilment. But obviously the sort of nexus desired between cause and effect is such as could only hold between the "events" which the supposed law of causality contemplates; the laws which replace causality in such a science as physics leave no room for any two events between which a nexus could be sought.

(3) "The cause compels the effect in some sense in which the effect does not compel the cause." This belief seems largely operative in the dislike of determinism; but, as a matter of fact, it is connected with our second maxim, and falls as soon as that is abandoned. We may define "compulsion" as follows: "Any set of circumstances is said to compel A when A desires to do something which the circumstances prevent, or to abstain from something which the circumstances cause." This presupposes that some meaning has been found for the word "cause"—a point to which I shall return later. What I want to make clear at present is that compulsion is a very complex notion, involving thwarted desire. So long as a person does what he wishes to do, there is no compulsion, however much his wishes may be calculable by the help of earlier events. And where desire does not come in, there can be no question of compulsion. Hence it is, in general, misleading to regard the cause as compelling the effect.

A vaguer form of the same maxim substitutes the word "determine" for the word "compel"; we are told that the cause determines the effect in a sense in which the effect does not determine the cause. It is not quite clear what is meant by "determining"; the only precise sense, so far as I know, is that of a function or one-many relation. If we admit plurality of causes, but not of effects, that is, if we suppose that, given the cause, the effect must be such and such, but, given the effect, the
cause may have been one of many alternatives, then we may say that the cause determines the effect, but not the effect the cause. Plurality of causes, however, results only from conceiving the effect vaguely and narrowly and the cause precisely and widely. Many antecedents may "cause" a man's death, because his death is vague and narrow. But if we adopt the opposite course, taking as the "cause" the drinking of a dose of arsenic, and as the "effect" the whole state of the world five minutes later, we shall have plurality of effects instead of plurality of causes. Thus the supposed lack of symmetry between "cause" and "effect" is illusory.

(4) "A cause cannot operate when it has ceased to exist, because what has ceased to exist is nothing." This is a common maxim, and a still more common unexpressed prejudice. It has, I fancy, a good deal to do with the attractiveness of Bergson's "durée": since the past has effects now, it must still exist in some sense. The mistake in this maxim consists in the supposition that causes "operate" at all. A volition "operates" when what it wills takes place; but nothing can operate except a volition. The belief that causes "operate" results from assimilating them, consciously or unconsciously, to volitions. We have already seen that, if there are causes at all, they must be separated by a finite interval of time from their effects, and thus cause their effects after they have ceased to exist.

It may be objected to the above definition of a volition "operating" that it only operates when it "causes" what it wills, not when it merely happens to be followed by what it wills. This certainly represents the usual view of what is meant by a volition "operating," but as it involves the very view of causation which we are engaged in combating, it is not open to us as a definition. We
may say that a volition "operates" when there is some law in virtue of which a similar volition in rather similar circumstances will usually be followed by what it wills. But this is a vague conception, and introduces ideas which we have not yet considered. What is chiefly important to notice is that the usual notion of "operating" is not open to us if we reject, as I contend that we should, the usual notion of causation.

(5) "A cause cannot operate except where it is." This maxim is very widespread; it was urged against Newton, and has remained a source of prejudice against "action at a distance." In philosophy it has led to a denial of transient action, and thence to monism or Leibnizian monadism. Like the analogous maxim concerning temporal contiguity, it rests upon the assumption that causes "operate," i.e. that they are in some obscure way analogous to volitions. And, as in the case of temporal contiguity, the inferences drawn from this maxim are wholly groundless.

I return now to the question, What law or laws can be found to take the place of the supposed law of causality?

First, without passing beyond such uniformities of sequence as are contemplated by the traditional law, we may admit that, if any such sequence has been observed in a great many cases, and has never been found to fail, there is an inductive probability that it will be found to hold in future cases. If stones have hitherto been found to break windows, it is probable that they will continue to do so. This, of course, assumes the inductive principle, of which the truth may reasonably be questioned; but as this principle is not our present concern, I shall in this discussion treat it as indubitable. We may then say, in the case of any such frequently observed sequence, that
the earlier event is the *cause* and the later event the *effect*.

Several considerations, however, make such special sequences very different from the traditional relation of cause and effect. In the first place, the sequence, in any hitherto unobserved instance, is no more than probable, whereas the relation of cause and effect was supposed to be necessary. I do not mean by this merely that we are not sure of having discovered a true case of cause and effect; I mean that, even when we have a case of cause and effect in our present sense, all that is meant is that on grounds of observation, it is probable that when one occurs the other will also occur. Thus in our present sense, A may be the cause of B even if there actually are cases where B does not follow A. Striking a match will be the cause of its igniting, in spite of the fact that some matches are damp and fail to ignite.

In the second place, it will not be assumed that *every* event has some antecedent which is its cause in this sense; we shall only believe in causal sequences where we find them, without any presumption that they always are to be found.

In the third place, *any* case of sufficiently frequent sequence will be causal in our present sense; for example, we shall not refuse to say that night is the cause of day. Our repugnance to saying this arises from the ease with which we can imagine the sequence to fail, but owing to the fact that cause and effect must be separated by a finite interval of time, *any* such sequence *might* fail through the interposition of other circumstances in the interval. Mill, discussing this instance of night and day, says:—

"It is necessary to our using the word *cause*, that we should believe not only that the antecedent always *has*
been followed by the consequent, but that as long as the present constitution of things endures, it always *will* be so.”¹

In this sense, we shall have to give up the hope of finding causal laws such as Mill contemplated; any causal sequence which we have observed may at any moment be falsified without a falsification of any laws of the kind that the more advanced sciences aim at establishing.

In the fourth place, such laws of probable sequence, though useful in daily life and in the infancy of a science, tend to be displaced by quite different laws as soon as a science is successful. The law of gravitation will illustrate what occurs in any advanced science. In the motions of mutually gravitating bodies, there is nothing that can be called a cause, and nothing that can be called an effect; there is merely a formula. Certain differential equations can be found, which hold at every instant for every particle of the system, and which, given the configuration and velocities at one instant, or the configurations at two instants, render the configuration at any other earlier or later instant theoretically calculable. That is to say, the configuration at any instant is a function of that instant and the configurations at two given instants. This statement holds throughout physics, and not only in the special case of gravitation. But there is nothing that could be properly called “cause” and nothing that could be properly called “effect” in such a system.

No doubt the reason why the old “law of causality” has so long continued to pervade the books of philosophers is simply that the idea of a function is unfamiliar to most of them, and therefore they seek an unduly simplified statement. There is no question of repetitions of the “same cause producing the “same” effect; it

¹ *Loc. cit.*, § 6.
is not in any sameness of causes and effects that the constancy of scientific law consists, but in sameness of relations. And even "sameness of relations" is too simple a phrase; "sameness of differential equations" is the only correct phrase. It is impossible to state this accurately in non-mathematical language; the nearest approach would be as follows: "There is a constant relation between the state of the universe at any instant and the rate of change in the rate at which any part of the universe is changing at that instant, and this relation is many-one, i.e. such that the rate of change in the rate of change is determinate when the state of the universe is given." If the "law of causality" is to be something actually discoverable in the practice of science, the above proposition has a better right to the name than any "law of causality" to be found in the books of philosophers.

In regard to the above principle, several observations must be made—

(1) No one can pretend that the above principle is a priori or self-evident or a "necessity of thought." Nor is it, in any sense, a premiss of science: it is an empirical generalisation from a number of laws which are themselves empirical generalisations.

(2) The law makes no difference between past and future: the future "determines" the past in exactly the same sense in which the past "determines" the future. The word "determine," here, has a purely logical significance: a certain number of variables "determine" another variable if that other variable is a function of them.

(3) The law will not be empirically verifiable unless the course of events within some sufficiently small volume
will be approximately the same in any two states of the universe which only differ in regard to what is at a considerable distance from the small volume in question. For example, motions of planets in the solar system must be approximately the same however the fixed stars may be distributed, provided that all the fixed stars are very much farther from the sun than the planets are. If gravitation varied directly as the distance, so that the most remote stars made the most difference to the motions of the planets, the world might be just as regular and just as much subject to mathematical laws as it is at present, but we could never discover the fact.

(4) Although the old "law of causality" is not assumed by science, something which we may call the "uniformity of nature" is assumed, or rather is accepted on inductive grounds. The uniformity of nature does not assert the trivial principle "same cause, same effect," but the principle of the permanence of laws. That is to say, when a law exhibiting, e.g. an acceleration as a function of the configuration has been found to hold throughout the observable past, it is expected that it will continue to hold in the future, or that, if it does not itself hold, there is some other law, agreeing with the supposed law as regards the past, which will hold for the future. The ground of this principle is simply the inductive ground that it has been found to be true in very many instances; hence the principle cannot be considered certain, but only probable to a degree which cannot be accurately estimated.

The uniformity of nature, in the above sense, although it is assumed in the practice of science, must not, in its generality, be regarded as a kind of major premiss, without which all scientific reasoning would be in error. The assumption that all laws of nature are permanent has, of
course, less probability than the assumption that this or that particular law is permanent; and the assumption that a particular law is permanent for all time has less probability than the assumption that it will be valid up to such and such a date. Science, in any given case, will assume what the case requires, but no more. In constructing the *Nautical Almanac* for 1915 it will assume that the law of gravitation will remain true up to the end of that year; but it will make no assumption as to 1916 until it comes to the next volume of the almanac. This procedure is, of course, dictated by the fact that the uniformity of nature is not known *a priori*, but is an empirical generalisation, like "all men are mortal." In all such cases, it is better to argue immediately from the given particular instances to the new instance, than to argue by way of a major premiss; the conclusion is only probable in either case, but acquires a higher probability by the former method than by the latter.

In all science we have to distinguish two sorts of laws: first, those that are empirically verifiable but probably only approximate; secondly, those that are not verifiable, but may be exact. The law of gravitation, for example, in its applications to the solar system, is only empirically verifiable when it is assumed that matter outside the solar system may be ignored for such purposes; we believe this to be only approximately true, but we cannot empirically verify the law of universal gravitation which we believe to be exact. This point is very important in connection with what we may call "relatively isolated systems." These may be defined as follows:—

A system relatively isolated during a given period is one which, within some assignable margin of error, will behave in the same way throughout that period, however the rest of the universe may be constituted.
A system may be called "practically isolated" during a given period if, although there might be states of the rest of the universe which would produce more than the assigned margin of error, there is reason to believe that such states do not in fact occur.

Strictly speaking, we ought to specify the respect in which the system is relatively isolated. For example, the earth is relatively isolated as regards falling bodies, but not as regards tides; it is practically isolated as regards economic phenomena, although, if Jevons' sun-spot theory of commercial crises had been true, it would not have been even practically isolated in this respect.

It will be observed that we cannot prove in advance that a system is isolated. This will be inferred from the observed fact that approximate uniformities can be stated for this system alone. If the complete laws for the whole universe were known, the isolation of a system could be deduced from them; assuming, for example, the law of universal gravitation, the practical isolation of the solar system in this respect can be deduced by the help of the fact that there is very little matter in its neighbourhood. But it should be observed that isolated systems are only important as providing a possibility of discovering scientific laws; they have no theoretical importance in the finished structure of a science.

The case where one event A is said to "cause" another event B, which philosophers take as fundamental, is really only the most simplified instance of a practically isolated system. It may happen that, as a result of general scientific laws, whenever A occurs throughout a certain period, it is followed by B; in that case, A and B form a system which is practically isolated throughout that period. It is, however, to be regarded as a piece of good fortune if this occurs; it will always be due to special
circumstances, and would not have been true if the rest of the universe had been different though subject to the same laws.

The essential function which causality has been supposed to perform is the possibility of inferring the future from the past, or, more generally, events at any time from events at certain assigned times. Any system in which such inference is possible may be called a "deterministic" system. We may define a deterministic system as follows:—

A system is said to be "deterministic" when, given certain data, \( e_1, e_2, \ldots, e_n \), at times \( t_1, t_2, \ldots, t_n \) respectively, concerning this system, if \( E_t \) is the state of the system at any time \( t \), there is a functional relation of the form

\[
E_t = f(e_1, t_1, e_2, t_2, \ldots, e_n, t_n, t).
\] (A)

The system will be "deterministic throughout a given period" if \( t \), in the above formula, may be any time within that period, though outside that period the formula may be no longer true. If the universe, as a whole, is such a system, determinism is true of the universe; if not, not. A system which is part of a deterministic system I shall call "determined"; one which is not part of any such system I shall call "capricious."

The events \( e_1, e_2, \ldots, e_n \) I shall call "determinants" of the system. It is to be observed that a system which has one set of determinants will in general have many. In the case of the motions of the planets, for example, the configurations of the solar system at any two given times will be determinants.

We may take another illustration from the hypothesis of psycho-physical parallelism. Let us assume, for the purposes of this illustration, that to a given state of brain
a given state of mind always corresponds, and vice versa, i.e. that there is a one-one relation between them, so that each is a function of the other. We may also assume, what is practically certain, that to a given state of a certain brain a given state of the whole material universe corresponds, since it is highly improbable that a given brain is ever twice in exactly the same state. Hence there will be a one-one relation between the state of a given person’s mind and the state of the whole material universe. It follows that, if \( n \) states of the material universe are determinants of the material universe, then \( n \) states of a given man’s mind are determinants of the whole material and mental universe—assuming, that is to say, that psycho-physical parallelism is true.

The above illustration is important in connection with a certain confusion which seems to have beset those who have philosophised on the relation of mind and matter. It is often thought that, if the state of the mind is determinate when the state of the brain is given, and if the material world forms a deterministic system, then mind is “subject” to matter in some sense in which matter is not “subject” to mind. But if the state of the brain is also determinate when the state of the mind is given, it must be exactly as true to regard matter as subject to mind as it would be to regard mind as subject to matter. We could, theoretically, work out the history of mind without ever mentioning matter, and then, at the end, deduce that matter must meanwhile have gone through the corresponding history. It is true that if the relation of brain to mind were many-one, not one-one, there would be a one-sided dependence of mind on brain, while conversely, if the relation were one-many, as Bergson supposes, there would be a one-sided dependence of brain on mind. But the dependence involved is, in any case, only
logical; it does not mean that we shall be compelled to do things we desire not to do, which is what people instinctively imagine it to mean.

As another illustration we may take the case of mechanism and teleology. A system may be defined as "mechanical" when it has a set of determinants that are purely material, such as the positions of certain pieces of matter at certain times. It is an open question whether the world of mind and matter, as we know it, is a mechanical system or not; let us suppose, for the sake of argument, that it is a mechanical system. This supposition—so I contend—throws no light whatever on the question whether the universe is or is not a "teleological" system. It is difficult to define accurately what is meant by a "teleological" system, but the argument is not much affected by the particular definition we adopt. Broadly, a teleological system is one in which purposes are realised, i.e. in which certain desires—those that are deeper or nobler or more fundamental or more universal or what not—are followed by their realisation. Now the fact—if it be a fact—that the universe is mechanical has no bearing whatever on the question whether it is teleological in the above sense. There might be a mechanical system in which all wishes were realised, and there might be one in which all wishes were thwarted. The question whether, or how far, our actual world is teleological, cannot, therefore, be settled by proving that it is mechanical, and the desire that it should be teleological is no ground for wishing it to be not mechanical.

There is, in all these questions, a very great difficulty in avoiding confusion between what we can infer and what is in fact determined. Let us consider, for a moment, the various senses in which the future may be "determined." There is one sense—and a very important
one—in which it is determined quite independently of scientific laws, namely, the sense that it will be what it will be. We all regard the past as determined simply by the fact that it has happened; but for the accident that memory works backward and not forward, we should regard the future as equally determined by the fact that it will happen. "But," we are told, "you cannot alter the past, while you can to some extent alter the future." This view seems to me to rest upon just those errors in regard to causation which it has been my object to remove. You cannot make the past other than it was—true, but this is a mere application of the law of contradiction. If you already know what the past was, obviously it is useless to wish it different. But also you cannot make the future other than it will be; this again is an application of the law of contradiction. And if you happen to know the future—e.g. in the case of a forthcoming eclipse—it is just as useless to wish it different as to wish the past different. "But," it will be rejoined, "our wishes can cause the future, sometimes, to be different from what it would be if they did not exist, and they can have no such effect upon the past." This, again, is a mere tautology. An effect being defined is something subsequent to its cause, obviously we can have no effect upon the past. But that does not mean that the past would not have been different if our present wishes had been different. Obviously, our present wishes are conditioned by the past, and therefore could not have been different unless the past had been different; therefore, if our present wishes were different, the past would be different. Of course, the past cannot be different from what it was, but no more can our present wishes be different from what they are; this again is merely the law of contradiction. The facts seem to be merely (1) that wishing generally
depends upon ignorance, and is therefore commoner in regard to the future than in regard to the past; (2) that where a wish concerns the future, it and its realisation very often form a "practically independent system," i.e. many wishes regarding the future are realised. But there seems no doubt that the main difference in our feelings arises from the accidental fact that the past but not the future can be known by memory.

Although the sense of "determined" in which the future is determined by the mere fact that it will be what it will be is sufficient (at least so it seems to me) to refute some opponents of determinism, notably M. Bergson and the pragmatists, yet it is not what most people have in mind when they speak of the future as determined. What they have in mind is a formula by means of which the future can be exhibited, and at least theoretically calculated, as a function of the past. But at this point we meet with a great difficulty, which besets what has been said above about deterministic systems, as well as what is said by others.

If formulae of any degree of complexity, however great, are admitted, it would seem that any system, whose state at a given moment is a function of certain measurable quantities, must be a deterministic system. Let us consider, in illustration, a single material particle, whose co-ordinates at time \( t \) are \( x_t, y_t, z_t \). Then, however, the particle moves, there must be, theoretically, functions \( f_1, f_2, f_3 \), such that

\[
\begin{align*}
x_t &= f_1(t), \\
y_t &= f_2(t), \\
z_t &= f_3(t).
\end{align*}
\]

It follows that, theoretically, the whole state of the material universe at time \( t \) must be capable of being exhibited as a function of \( t \). Hence our universe will be deterministic in the sense defined above. But if this be
true, no information is conveyed about the universe in stating that it is deterministic. It is true that the formulæ involved may be of strictly infinite complexity, and therefore not practically capable of being written down or apprehended. But except from the point of view of our knowledge, this might seem to be a detail: in itself, if the above considerations are sound, the material universe must be deterministic, must be subject to laws.

This, however, is plainly not what was intended. The difference between this view and the view intended may be seen as follows. Given some formula which fits the facts hitherto—say the law of gravitation—there will be an infinite number of other formulæ, not empirically distinguishable from it in the past, but diverging from it more and more in the future. Hence, even assuming that there are persistent laws, we shall have no reason for assuming that the law of the inverse square will hold in future; it may be some other hitherto indistinguishable law that will hold. We cannot say that every law which has held hitherto must hold in the future, because past facts which obey one law will also obey others, hitherto indistinguishable but diverging in future. Hence there must, at every moment, be laws hitherto unbroken which are now broken for the first time. What science does, in fact, is to select the simplest formula that will fit the facts. But this, quite obviously, is merely a methodological precept, not a law of Nature. If the simplest formula ceases, after a time, to be applicable, the simplest formula that remains applicable is selected, and science has no sense that an axiom has been falsified. We are thus left with the brute fact that, in many departments of science, quite simple laws have hitherto been found to hold. This fact cannot be regarded as having any a priori ground, nor can it be used to support inductively the opinion that
the same laws will continue; for at every moment laws hitherto true are being falsified, though in the advanced sciences these laws are less simple than those that have remained true. Moreover it would be fallacious to argue inductively from the state of the advanced sciences to the future state of the others, for it may well be that the advanced sciences are advanced simply because, hitherto, their subject-matter has obeyed simple and easily ascertainable laws, while the subject-matter of other sciences has not done so.

The difficulty we have been considering seems to be met partly, if not wholly, by the principle that the time must not enter explicitly into our formulae. All mechanical laws exhibit acceleration as a function of configuration, not of configuration and time jointly; and this principle of the irrelevance of the time may be extended to all scientific laws. In fact we might interpret the "uniformity of nature" as meaning just this, that no scientific law involves the time as an argument, unless, of course, it is given in an integrated form, in which case lapse of time, though not absolute time, may appear in our formulae. Whether this consideration suffices to overcome our difficulty completely, I do not know; but in any case it does much to diminish it.

It will serve to illustrate what has been said if we apply it to the question of free will.

(1) Determinism in regard to the will is the doctrine that our volitions belong to some deterministic system, i.e. are "determined" in the sense defined above. Whether this doctrine is true or false, is a mere question of fact; no a priori considerations (if our previous discussions have been correct) can exist on either side. On the one hand, there is no a priori category of causality, but merely certain observed uniformities. As a matter
of fact, there are observed uniformities in regard to volitions; thus there is some empirical evidence that volitions are determined. But it would be very rash to maintain that the evidence is overwhelming, and it is quite possible that some volitions, as well as some other things, are not determined, except in the sense in which we found that everything must be determined.

(2) But, on the other hand, the subjective sense of freedom, sometimes alleged against determinism, has no bearing on the question whatever. The view that it has a bearing rests upon the belief that causes compel their effects, or that nature enforces obedience to its laws as governments do. These are mere anthropomorphic superstitions, due to assimilation of causes with volitions and of natural laws with human edicts. We feel that our will is not compelled, but that only means that it is not other than we choose it to be. It is one of the demerits of the traditional theory of causality that it has created an artificial opposition between determinism and the freedom of which we are introspectively conscious.

(3) Besides the general question whether volitions are determined, there is the further question whether they are mechanically determined, i.e. whether they are part of what was above defined as a mechanical system. This is the question whether they form part of a system with purely material determinants, i.e. whether there are laws which, given certain material data, make all volitions functions of those data. Here again, there is empirical evidence up to a point, but it is not conclusive in regard to all volitions. It is important to observe, however that even if volitions are part of a mechanical system, this by no means implies any supremacy of matter over mind. It may well be that the same system which is
susceptible of material determinants is also susceptible of mental determinants; thus a mechanical system may be determined by sets of volitions, as well as by sets of material facts. It would seem, therefore, that the reasons which make people dislike the view that volitions are mechanically determined are fallacious.

(4) The notion of necessity, which is often associated with determinism, is a confused notion not legitimately deducible from determinism. Three meanings are commonly confounded when necessity is spoken of:

(a) An action is necessary when it will be performed however much the agent may wish to do otherwise. Determinism does not imply that actions are necessary in this sense.

(b) A propositional function is necessary when all its values are true. This sense is not relevant to our present discussion.

(c) A proposition is necessary with respect to a given constituent when it is the value, with that constituent as argument, of a necessary propositional function, in other words, when it remains true however that constituent may be varied. In this sense, in a deterministic system, the connection of a volition with its determinants is necessary, if the time at which the determinants occur be taken as the constituent to be varied, the time-interval between the determinants and the volition being kept constant. But this sense of necessity is purely logical, and has no emotional importance.

We may now sum up our discussion of causality. We found first that the law of causality, as usually stated by philosophers, is false, and is not employed in science. We then considered the nature of scientific laws, and found that, instead of stating that one event A is always followed
by another event $B$, they stated functional relations between certain events at certain times, which we called determinants, and other events at earlier or later times or at the same time. We were unable to find any a priori category involved: the existence of scientific laws appeared as a purely empirical fact, not necessarily universal, except in a trivial and scientifically useless form. We found that a system with one set of determinants may very likely have other sets of a quite different kind, that, for example, a mechanically determined system may also be teleologically or volitionally determined. Finally we considered the problem of free will: here we found that the reasons for supposing volitions to be determined are strong but not conclusive, and we decided that even if volitions are mechanically determined, that is no reason for denying freedom in the sense revealed by introspection, or for supposing that mechanical events are not determined by volitions. The problem of free will versus determinism is therefore, if we were right, mainly illusory, but in part not yet capable of being decisively solved.
THE object of the following paper is to consider what it is that we know in cases where we know propositions about "the so-and-so" without knowing who or what the so-and-so is. For example, I know that the candidate who gets most votes will be elected, though I do not know who is the candidate who will get most votes. The problem I wish to consider is: What do we know in these cases, where the subject is merely described? I have considered this problem elsewhere\(^1\) from a purely logical point of view; but in what follows I wish to consider the question in relation to theory of knowledge as well as in relation to logic, and in view of the above-mentioned logical discussions, I shall in this paper make the logical portion as brief as possible.

In order to make clear the antithesis between "acquaintance" and "description," I shall first of all try to explain what I mean by "acquaintance." I say that I am acquainted with an object when I have a direct cognitive relation to that object, i.e. when I am directly aware of the object itself. When I speak of a cognitive relation here, I do not mean the sort of relation which constitutes judgment, but the sort which constitutes presentation. In fact, I think the relation of subject and

\(^1\) See references later.
object which I call acquaintance is simply the converse
of the relation of object and subject which constitutes
presentation. That is, to say that S has acquaintance
with O is essentially the same thing as to say that O is
presented to S. But the associations and natural exten-
sions of the word acquaintance are different from those of
the word presentation. To begin with, as in most cog-
nitive words, it is natural to say that I am acquainted
with an object even at moments when it is not actually
before my mind, provided it has been before my mind,
and will be again whenever occasion arises. This is the
same sense in which I am said to know that $2 + 2 = 4$
even when I am thinking of something else. In the second
place, the word acquaintance is designed to emphasise,
more than the word presentation, the relational character
of the fact with which we are concerned. There is, to my
mind, a danger that, in speaking of presentation, we
may so emphasis the object as to lose sight of the sub-
ject. The result of this is either to lead to the view
that there is no subject, whence we arrive at materialism;
or to lead to the view that what is presented is part of
the subject, whence we arrive at idealism, and should
arrive at solipsism but for the most desperate contortions.
Now I wish to preserve the dualism of subject and object
in my terminology, because this dualism seems to me a
fundamental fact concerning cognition. Hence I prefer
the word acquaintance, because it emphasises the need of
a subject which is acquainted.

When we ask what are the kinds of objects with which
we are acquainted, the first and most obvious example is
sense-data. When I see a colour or hear a noise, I have
direct acquaintance with the colour or the noise. The
sense-datum with which I am acquainted in these cases
is generally, if not always, complex. This is particularly
obvious in the case of sight. I do not mean, of course, merely that the supposed physical object is complex, but that the direct sensible object is complex and contains parts with spatial relations. Whether it is possible to be aware of a complex without being aware of its constituents is not an easy question, but on the whole it would seem that there is no reason why it should not be possible. This question arises in an acute form in connection with self-consciousness, which we must now briefly consider.

In introspection, we seem to be immediately aware of varying complexes, consisting of objects in various cognitive and conative relations to ourselves. When I see the sun, it often happens that I am aware of my seeing the sun, in addition to being aware of the sun; and when I desire food, it often happens that I am aware of my desire for food. But it is hard to discover any state of mind in which I am aware of myself alone, as opposed to a complex of which I am a constituent. The question of the nature of self-consciousness is too large, and too slightly connected with our subject, to be argued at length here. It is difficult, but probably not impossible, to account for plain facts if we assume that we do not have acquaintance with ourselves. It is plain that we are not only acquainted with the complex "Self-acquainted-with-A," but we also know the proposition "I am acquainted with A." Now here the complex has been analysed, and if "I" does not stand for something which is a direct object of acquaintance, we shall have to suppose that "I" is something known by description. If we wished to maintain the view that there is no acquaintance with Self, we might argue as follows: We are acquainted with acquaintance, and we know that it is a relation. Also we are acquainted with a complex in which we perceive that acquaintance
is the relating relation. Hence we know that this complex must have a constituent which is that which is acquainted, i.e. must have a subject-term as well as an object-term. This subject-term we define as "I." Thus "I" means "the subject-term in awarenesses of which I am aware." But as a definition this cannot be regarded as a happy effort. It would seem necessary, therefore, either to suppose that I am acquainted with myself, and that "I," therefore, requires no definition, being merely the proper name of a certain object, or to find some other analysis of self-consciousness. Thus self-consciousness cannot be regarded as throwing light on the question whether we can know a complex without knowing its constituents. This question, however, is not important for our present purposes, and I shall therefore not discuss it further.

The awarenesses we have considered so far have all been awarenesses of particular existents, and might all in a large sense be called sense-data. For, from the point of view of theory of knowledge, introspective knowledge is exactly on a level with knowledge derived from sight or hearing. But, in addition to awareness of the above kind of objects, which may be called awareness of particulars, we have also (though not quite in the same sense) what may be called awareness of universals. Awareness of universals is called conceiving, and a universal of which we are aware is called a concept. Not only are we aware of particular yellows, but if we have seen a sufficient number of yellows and have sufficient intelligence, we are aware of the universal yellow; this universal is the subject in such judgments as "yellow differs from blue" or "yellow resembles blue less than green does." And the universal yellow is the predicate in such judgments as "this is yellow," where "this" is a particular sense-datum. And universal relations, too,
are objects of awarenesses; up and down, before and after, resemblance, desire, awareness itself, and so on, would seem to be all of them objects of which we can be aware.

In regard to relations, it might be urged that we are never aware of the universal relation itself, but only of complexes in which it is a constituent. For example, it may be said that we do not know directly such a relation as before, though we understand such a proposition as "this is before that," and may be directly aware of such a complex as "this being before that." This view, however, is difficult to reconcile with the fact that we often know propositions in which the relation is the subject, or in which the relata are not definite given objects, but "anything." For example, we know that if one thing is before another, and the other before a third, then the first is before the third; and here the things concerned are not definite things, but "anything." It is hard to see how we could know such a fact about "before" unless we were acquainted with "before," and not merely with actual particular cases of one given object being before another given object. And more directly: A judgment such as "this is before that," where this judgment is derived from awareness of a complex, constitutes an analysis, and we should not understand the analysis if we were not acquainted with the meaning of the terms employed. Thus we must suppose that we are acquainted with the meaning of "before," and not merely with instances of it.

There are thus at least two sorts of objects of which we are aware, namely, particulars and universals. Among particulars I include all existents, and all complexes of which one or more constituents are existents, such as this-before-that, this-above-that, the-yellowness-of-this.
Among universals I include all objects of which no particular is a constituent. Thus the disjunction "universal-particular" includes all objects. We might also call it the disjunction "abstract-concrete." It is not quite parallel with the opposition "concept-percept," because things remembered or imagined belong with particulars, but can hardly be called percepts. (On the other hand, universals with which we are acquainted may be identified with concepts.)

It will be seen that among the objects with which we are acquainted are not included physical objects (as opposed to sense-data), nor other people's minds. These things are known to us by what I call "knowledge by description," which we must now consider.

By a "description" I mean any phrase of the form "a so-and-so" or "the so-and-so." A phrase of the form "a so-and-so" I shall call an "ambiguous" description; a phrase of the form "the so-and-so" (in the singular) I shall call a "definite" description. Thus "a man" is an ambiguous description, and "the man with the iron mask" is a definite description. There are various problems connected with ambiguous descriptions, but I pass them by, since they do not directly concern the matter I wish to discuss. What I wish to discuss is the nature of our knowledge concerning objects in cases where we know that there is an object answering to a definite description, though we are not acquainted with any such object. This is a matter which is concerned exclusively with definite descriptions. I shall, therefore, in the sequel, speak simply of "descriptions" when I mean "definite descriptions." Thus a description will mean any phrase of the form "the so-and-so" in the singular.

I shall say that an object is "known by description" when we know that it is "the so-and-so," i.e. when we
KNOWLEDGE BY ACQUAINTANCE

know that there is one object, and no more, having a certain property; and it will generally be implied that we do not have knowledge of the same object by acquaintance. We know that the man with the iron mask existed, and many propositions are known about him; but we do not know who he was. We know that the candidate who gets most votes will be elected, and in this case we are very likely also acquainted (in the only sense in which one can be acquainted with some one else) with the man who is, in fact, the candidate who will get most votes, but we do not know which of the candidates he is, i.e. we do not know any proposition of the form "A is the candidate who will get most votes" where A is one of the candidates by name. We shall say that we have "merely descriptive knowledge" of the so-and-so when, although we know that the so-and-so exists, and although we may possibly be acquainted with the object which is, in fact, the so-and-so, yet we do not know any proposition "a is the so-and-so," where a is something with which we are acquainted.

When we say "the so-and-so exists," we mean that there is just one object which is the so-and-so. The proposition "a is the so-and-so" means that a has the property so-and-so, and nothing else has. "Sir Joseph Larmor is the Unionist candidate" means "Sir Joseph Larmor is a Unionist candidate, and no one else is." "The Unionist candidate exists" means "some one is a Unionist candidate, and no one else is." Thus, when we are acquainted with an object which we know to be the so-and-so, we know that the so-and-so exists, but we may know that the so-and-so exists when we are not acquainted with any object which we know to be the so-and-so, and even when we are not acquainted with any object which, in fact, is the so-and-so.
Common words, even proper names, are usually really descriptions. That is to say, the thought in the mind of a person using a proper name correctly can generally only be expressed explicitly if we replace the proper name by a description. Moreover, the description required to express the thought will vary for different people, or for the same person at different times. The only thing constant (so long as the name is rightly used) is the object to which the name applies. But so long as this remains constant, the particular description involved usually makes no difference to the truth or falsehood of the proposition in which the name appears.

Let us take some illustrations. Suppose some statement made about Bismarck. Assuming that there is such a thing as direct acquaintance with oneself, Bismarck himself might have used his name directly to designate the particular person with whom he was acquainted. In this case, if he made a judgment about himself, he himself might be a constituent of the judgment. Here the proper name has the direct use which it always wishes to have, as simply standing for a certain object, and not for a description of the object. But if a person who knew Bismarck made a judgment about him, the case is different. What this person was acquainted with were certain sense-data which he connected (rightly, we will suppose) with Bismarck's body. His body as a physical object, and still more his mind, were only known as the body and the mind connected with these sense-data. That is, they were known by description. It is, of course, very much a matter of chance which characteristics of a man's appearance will come into a friend's mind when he thinks of him; thus the description actually in the friend's mind is accidental. The essential point is that he knows that the various descriptions all apply to the
same entity, in spite of not being acquainted with the entity in question.

When we, who did not know Bismarck, make a judgment about him, the description in our minds will probably be some more or less vague mass of historical knowledge — far more, in most cases, than is required to identify him. But, for the sake of illustration, let us assume that we think of him as "the first Chancellor of the German Empire." Here all the words are abstract except "German." The word "German" will again have different meanings for different people. To some it will recall travels in Germany, to some the look of Germany on the map, and so on. But if we are to obtain a description which we know to be applicable, we shall be compelled, at some point, to bring in a reference to a particular with which we are acquainted. Such reference is involved in any mention of past, present, and future (as opposed to definite dates), or of here and there, or of what others have told us. Thus it would seem that, in some way or other, a description known to be applicable to a particular must involve some reference to a particular with which we are acquainted, if our knowledge about the thing described is not to be merely what follows logically from the description. For example, "the most long-lived of men" is a description which must apply to some man, but we can make no judgments concerning this man which involve knowledge about him beyond what the description gives. If, however, we say, "the first Chancellor of the German Empire was an astute diplomatist," we can only be assured of the truth of our judgment in virtue of something with which we are acquainted — usually a testimony heard or read. Considered psychologically, apart from the information we convey to others, apart from the fact about the actual
Bismarck, which gives importance to our judgment, the thought we really have contains the one or more particulars involved, and otherwise consists wholly of concepts. All names of places—London, England, Europe, the earth, the Solar System—similarly involve, when used, descriptions which start from some one or more particulars with which we are acquainted. I suspect that even the Universe, as considered by metaphysics, involves such a connection with particulars. In logic, on the contrary, where we are concerned not merely with what does exist, but with whatever might or could exist or be, no reference to actual particulars is involved.

It would seem that, when we make a statement about something only known by description, we often intend to make our statement, not in the form involving the description, but about the actual thing described. That is to say, when we say anything about Bismarck, we should like, if we could, to make the judgment which Bismarck alone can make, namely, the judgment of which he himself is a constituent. In this we are necessarily defeated, since the actual Bismarck is unknown to us. But we know that there is an object B called Bismarck, and that B was an astute diplomatist. We can thus describe the proposition we should like to affirm, namely, "B was an astute diplomatist," where B is the object which was Bismarck. What enables us to communicate in spite of the varying descriptions we employ is that we know there is a true proposition concerning the actual Bismarck, and that, however we may vary the description (so long as the description is correct), the proposition described is still the same. This proposition, which is described and is known to be true, is what interests us; but we are not acquainted with the proposition itself, and do not know it, though we know it is true.
It will be seen that there are various stages in the removal from acquaintance with particulars: there is Bismarck to people who knew him, Bismarck to those who only know of him through history, the man with the iron mask, the longest-lived of men. These are progressively further removed from acquaintance with particulars, and there is a similar hierarchy in the region of universals. Many universals, like many particulars, are only known to us by description. But here, as in the case of particulars, knowledge concerning what is known by description is ultimately reducible to knowledge concerning what is known by acquaintance.

The fundamental epistemological principle in the analysis of propositions containing descriptions is this: *Every proposition which we can understand must be composed wholly of constituents with which we are acquainted.* From what has been said already, it will be plain why I advocate this principle, and how I propose to meet the case of propositions which at first sight contravene it. Let us begin with the reasons for supposing the principle true.

The chief reason for supposing the principle true is that it seems scarcely possible to believe that we can make a judgment or entertain a supposition without knowing what it is that we are judging or supposing about. If we make a judgment about (say) Julius Cæsar, it is plain that the actual person who was Julius Cæsar is not a constituent of the judgment. But before going further, it may be well to explain what I mean when I say that this or that is a constituent of a judgment, or of a proposition which we understand. To begin with judgments: a judgment, as an occurrence, I take to be a relation of a mind to several entities, namely, the entities which compose what is judged. If, e.g. I judge
that A loves B, the judgment as an event consists in the existence, at a certain moment, of a specific four-term relation, called judging, between me and A and love and B. That is to say, at the time when I judge, there is a certain complex whose terms are myself and A and love and B, and whose relating relation is judging. My reasons for this view have been set forth elsewhere,¹ and I shall not repeat them here. Assuming this view of judgment, the constituents of the judgment are simply the constituents of the complex which is the judgment. Thus, in the above case, the constituents are myself and A and love and B and judging. But myself and judging are constituents shared by all my judgments; thus the distinctive constituents of the particular judgment in question are A and love and B. Coming now to what is meant by “understanding a proposition,” I should say that there is another relation possible between me and A and love and B, which is called my supposing that A loves B.² When we can suppose that A loves B, we “understand the proposition” A loves B. Thus we often understand a proposition in cases where we have not enough knowledge to make a judgment. Supposing, like judging, is a many-term relation, of which a mind is one term. The other terms of the relation are called the constituents of the proposition supposed. Thus the principle which I enunciated may be re-stated as follows: Whenever a

¹ Philosophical Essays, “The Nature of Truth.” I have been persuaded by Mr. Wittgenstein that this theory is somewhat unduly simple, but the modification which I believe it to require does not affect the above argument [1917].

² Cf. Meinong, Ueber Annahmen, passim. I formerly supposed, contrary to Meinong’s view, that the relationship of supposing might be merely that of presentation. In this view I now think I was mistaken, and Meinong is right. But my present view depends upon the theory that both in judgment and in assumption there is no single Objective, but the several constituents of the judgment or assumption are in a many-term relation to the mind.
relation of supposing or judging occurs, the terms to which the supposing or judging mind is related by the relation of supposing or judging must be terms with which the mind in question is acquainted. This is merely to say that we cannot make a judgment or a supposition without knowing what it is that we are making our judgment or supposition about. It seems to me that the truth of this principle is evident as soon as the principle is understood; I shall, therefore, in what follows, assume the principle, and use it as a guide in analysing judgments that contain descriptions.

Returning now to Julius Cæsar, I assume that it will be admitted that he himself is not a constituent of any judgment which I can make. But at this point it is necessary to examine the view that judgments are composed of something called "ideas," and that it is the "idea" of Julius Cæsar that is a constituent of my judgment. I believe the plausibility of this view rests upon a failure to form a right theory of descriptions. We may mean by my "idea" of Julius Cæsar the things that I know about him, e.g. that he conquered Gaul, was assassinated on the Ides of March, and is a plague to schoolboys. Now I am admitting, and indeed contending, that in order to discover what is actually in my mind when I judge about Julius Cæsar, we must substitute for the proper name a description made up of some of the things I know about him. (A description which will often serve to express my thought is "the man whose name was Julius Cæsar." For whatever else I may have forgotten about him, it is plain that when I mention him I have not forgotten that that was his name.) But although I think the theory that judgments consist of ideas may have been suggested in some such way, yet I think the theory itself is fundamentally mistaken. The
view seems to be that there is some mental existent which may be called the "idea" of something outside the mind of the person who has the idea, and that, since judgment is a mental event, its constituents must be constituents of the mind of the person judging. But in this view ideas become a veil between us and outside things—we never really, in knowledge, attain to the things we are supposed to be knowing about, but only to the ideas of those things. The relation of mind, idea, and object, on this view, is utterly obscure, and, so far as I can see, nothing discoverable by inspection warrants the intrusion of the idea between the mind and the object. I suspect that the view is fostered by the dislike of relations, and that it is felt the mind could not know objects unless there were something "in" the mind which could be called the state of knowing the object. Such a view, however, leads at once to a vicious endless regress, since the relation of idea to object will have to be explained by supposing that the idea itself has an idea of the object, and so on ad infinitum. I therefore see no reason to believe that, when we are acquainted with an object, there is in us something which can be called the "idea" of the object. On the contrary, I hold that acquaintance is wholly a relation, not demanding any such constituent of the mind as is supposed by advocates of "ideas." This is, of course, a large question, and one which would take us far from our subject if it were adequately discussed. I therefore content myself with the above indications, and with the corollary that, in judging, the actual objects concerning which we judge, rather than any supposed purely mental entities, are constituents of the complex which is the judgment.

When, therefore, I say that we must substitute for "Julius Cæsar" some description of Julius Cæsar, in order
to discover the meaning of a judgment nominally about him, I am not saying that we must substitute an idea. Suppose our description is "the man whose name was Julius Cæsar." Let our judgment be "Julius Cæsar was assassinated." Then it becomes "the man whose name was Julius Cæsar was assassinated." Here Julius Cæsar is a noise or shape with which we are acquainted, and all the other constituents of the judgment (neglecting the tense in "was") are concepts with which we are acquainted. Thus our judgment is wholly reduced to constituents with which we are acquainted, but Julius Cæsar himself has ceased to be a constituent of our judgment. This, however, requires a proviso, to be further explained shortly, namely, that "the man whose name was Julius Cæsar" must not, as a whole, be a constituent of our judgment, that is to say, this phrase must not, as a whole, have a meaning which enters into the judgment. Any right analysis of the judgment, therefore, must break up this phrase, and not treat it as a subordinate complex which is part of the judgment. The judgment "the man whose name was Julius Cæsar was assassinated" may be interpreted as meaning "one and only one man was called Julius Cæsar, and that one was assassinated." Here it is plain that there is no constituent corresponding to the phrase "the man whose name was Julius Cæsar." Thus there is no reason to regard this phrase as expressing a constituent of the judgment, and we have seen that this phrase must be broken up if we are to be acquainted with all the constituents of the judgment. This conclusion, which we have reached from considerations concerned with the theory of knowledge, is also forced upon us by logical considerations, which must now be briefly reviewed.

It is common to distinguish two aspects, meaning and
denotation, in such phrases as "the author of Waverley." The meaning will be a certain complex, consisting (at least) of authorship and Waverley with some relation; the denotation will be Scott. Similarly "featherless bipeds" will have a complex meaning, containing as constituents the presence of two feet and the absence of feathers, while its denotation will be the class of men. Thus when we say "Scott is the author of Waverley" or "men are the same as featherless bipeds," we are asserting an identity of denotation, and this assertion is worth making because of the diversity of meaning.¹ I believe that the duality of meaning and denotation, though capable of a true interpretation, is misleading if taken as fundamental. The denotation, I believe, is not a constituent of the proposition, except in the case of proper names, i.e. of words which do not assign a property to an object, but merely and solely name it. And I should hold further that, in this sense, there are only two words which are strictly proper names of particulars, namely, "I" and "this."²

One reason for not believing the denotation to be a constituent of the proposition is that we may know the proposition even when we are not acquainted with the denotation. The proposition "the author of Waverley is a novelist" was known to people who did not know that "the author of Waverley" denoted Scott. This reason has been already sufficiently emphasised.

A second reason is that propositions concerning "the so-and-so" are possible even when "the so-and-so" has no denotation. Take, e.g. "the golden mountain does not exist" or "the round square is self-contradictory."

¹ This view has been recently advocated by Miss E. E. C. Jones. "A New Law of Thought and its Implications," Mind, January, 1911, I should now exclude "I" from proper names in the strict sense, and retain only "this" [1917].
If we are to preserve the duality of meaning and denotation, we have to say, with Meinong, that there are such objects as the golden mountain and the round square, although these objects do not have being. We even have to admit that the existent round square is existent, but does not exist. Meinong does not regard this as a contradiction, but I fail to see that it is not one. Indeed, it seems to me evident that the judgment "there is no such object as the round square" does not presuppose that there is such an object. If this is admitted, however, we are led to the conclusion that, by parity of form, no judgment concerning "the so-and-so" actually involves the so-and-so as a constituent.

Miss Jones contends that there is no difficulty in admitting contradictory predicates concerning such an object as "the present King of France," on the ground that this object is in itself contradictory. Now it might, of course, be argued that this object, unlike the round square, is not self-contradictory, but merely non-existent. This, however, would not go to the root of the matter. The real objection to such an argument is that the law of contradiction ought not to be stated in the traditional form "A is not both B and not B," but in the form "no proposition is both true and false." The traditional form only applies to certain propositions, namely, to those which attribute a predicate to a subject. When the law is stated of propositions, instead of being stated concerning subjects and predicates, it is at once evident that propositions about the present King of France or the round square can form no exception, but are just as incapable of being both true and false as other propositions.

Miss Jones argues that "Scott is the author of

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Waverley asserts identity of denotation between Scott and the author of Waverley. But there is some difficulty in choosing among alternative meanings of this contention. In the first place, it should be observed that the author of Waverley is not a mere name, like Scott. Scott is merely a noise or shape conventionally used to designate a certain person; it gives us no information about that person, and has nothing that can be called meaning as opposed to denotation. (I neglect the fact, considered above, that even proper names, as a rule, really stand for descriptions.) But the author of Waverley is not merely conventionally a name for Scott; the element of mere convention belongs here to the separate words, the and author and of and Waverley. Given what these words stand for, the author of Waverley is no longer arbitrary. When it is said that Scott is the author of Waverley, we are not stating that these are two names for one man, as we should be if we said "Scott is Sir Walter." A man's name is what he is called, but however much Scott had been called the author of Waverley, that would not have made him be the author; it was necessary for him actually to write Waverley, which was a fact having nothing to do with names.

If, then, we are asserting identity of denotation, we must not mean by denotation the mere relation of a name to the thing named. In fact, it would be nearer to the truth to say that the meaning of "Scott" is the denotation of "the author of Waverley." The relation of "Scott" to Scott is that "Scott" means Scott, just as the relation of "author" to the concept which is so called is that "author" means this concept. Thus if we distinguish meaning and denotation in "the author of Waverley," we shall have to say that "Scott" has meaning but not denotation. Also when we say "Scott is the
author of Waverley," the meaning of "the author of Waverley" is relevant to our assertion. For if the denotation alone were relevant, any other phrase with the same denotation would give the same proposition. Thus "Scott is the author of Marmion" would be the same proposition as "Scott is the author of Waverley." But this is plainly not the case, since from the first we learn that Scott wrote Marmion and from the second we learn that he wrote Waverley, but the first tells us nothing about Waverley and the second nothing about Marmion. Hence the meaning of "the author of Waverley," as opposed to the denotation, is certainly relevant to "Scott is the author of Waverley."

We have thus agreed that "the author of Waverley" is not a mere name, and that its meaning is relevant in propositions in which it occurs. Thus if we are to say, as Miss Jones does, that "Scott is the author of Waverley" asserts an identity of denotation, we must regard the denotation of "the author of Waverley" as the denotation of what is meant by "the author of Waverley." Let us call the meaning of "the author of Waverley" M. Thus M is what "the author of Waverley" means. Then we are to suppose that "Scott is the author of Waverley" means "Scott is the denotation of M." But here we are explaining our proposition by another of the same form, and thus we have made no progress towards a real explanation. "The denotation of M," like "the author of Waverley," has both meaning and denotation, on the theory we are examining. If we call its meaning M', our proposition becomes "Scott is the denotation of M'." But this leads at once to an endless regress. Thus the attempt to regard our proposition as asserting identity of denotation breaks down, and it becomes imperative to find some other analysis. When this analysis has been
completed, we shall be able to reinterpret the phrase "identity of denotation," which remains obscure so long as it is taken as fundamental.

The first point to observe is that, in any proposition about "the author of Waverley," provided Scott is not explicitly mentioned, the denotation itself, i.e. Scott, does not occur, but only the concept of denotation, which will be represented by a variable. Suppose we say "the author of Waverley was the author of Marmion," we are certainly not saying that both were Scott—we may have forgotten that there was such a person as Scott. We are saying that there is some man who was the author of Waverley and the author of Marmion. That is to say, there is some one who wrote Waverley and Marmion, and no one else wrote them. Thus the identity is that of a variable, i.e. of an indefinite subject, "some one." This is why we can understand propositions about "the author of Waverley," without knowing who he was. When we say "the author of Waverley was a poet," we mean "one and only one man wrote Waverley, and he was a poet"; when we say "the author of Waverley was Scott" we mean "one and only one man wrote Waverley, and he was Scott." Here the identity is between a variable, i.e. an indeterminate subject ("he"), and Scott; "the author of Waverley" has been analysed away, and no longer appears as a constituent of the proposition.¹

The reason why it is imperative to analyse away the phrase "the author of Waverley" may be stated as follows. It is plain that when we say "the author of Waverley is the author of Marmion," the is expresses

¹ The theory which I am advocating is set forth fully, with the logical grounds in its favour, in Principia Mathematica, Vol. I, Introduction, Chap. III; also, less fully, in Mind, October, 1903.
identity. We have seen also that the common denotation, namely Scott, is not a constituent of this proposition, while the meanings (if any) of "the author of Waverley" and "the author of Marmion" are not identical. We have seen also that, in any sense in which the meaning of a word is a constituent of a proposition in whose verbal expression the word occurs, "Scott" means the actual man Scott, in the same sense (so far as concerns our present discussion) in which "author" means a certain universal. Thus, if "the author of Waverley" were a subordinate complex in the above proposition, its meaning would have to be what was said to be identical with the meaning of "the author of Marmion." This is plainly not the case; and the only escape is to say that "the author of Waverley" does not, by itself, have a meaning, though phrases of which it is part do have a meaning. That is, in a right analysis of the above proposition, "the author of Waverley" must disappear. This is effected when the above proposition is analysed as meaning: "Some one wrote Waverley and no one else did, and that some one also wrote Marmion and no one else did." This may be more simply expressed by saying that the propositional function "\( \alpha \) wrote Waverley and Marmion, and no one else did" is capable of truth, i.e. some value of \( \alpha \) makes it true, but no other value does. Thus the true subject of our judgment is a propositional function, i.e. a complex containing an undetermined constituent, and becoming a proposition as soon as this constituent is determined.

We may now define the denotation of a phrase. If we know that the proposition, "\( \alpha \) is the so-and-so" is true, i.e. that \( \alpha \) is so-and-so and nothing else is, we call \( \alpha \) the denotation of the phrase "the so-and-so." A very great many of the propositions we naturally make about "the
so-and-so" will remain true or remain false if we sub-
stitute $a$ for "the so-and-so," where $a$ is the denotation 
of "the so-and-so." Such propositions will also remain 
true or remain false if we substitute for "the so-and-so" 
any other phrase having the same denotation. Hence, 
as practical men, we become interested in the denotation 
more than in the description, since the denotation decides 
as to the truth or falsehood of so many statements in 
which the description occurs. Moreover, as we saw 
earlier in considering the relations of description and 
acquaintance, we often wish to reach the denotation, and 
are only hindered by lack of acquaintance: in such cases 
the description is merely the means we employ to get as 
near as possible to the denotation. Hence it naturally 
comes to be supposed that the denotation is part of the 
proposition in which the description occurs. But we 
have seen, both on logical and on epistemological grounds, 
that this is an error. The actual object (if any) which is 
the denotation is not (unless it is explicitly mentioned) a 
constituent of propositions in which descriptions occur; 
and this is the reason why, in order to understand such 
propositions, we need acquaintance with the constituents 
of the description, but do not need acquaintance with its 
denotation. The first result of analysis, when applied to 
propositions whose grammatical subject is "the so-and-
so," is to substitute a variable as subject; i.e. we obtain 
a proposition of the form: "There is something which 
alone is so-and-so, and that something is such-and-such." 
The further analysis of propositions concerning "the so-
and-so" is thus merged in the problem of the nature of 
the variable, i.e. of the meanings of some, any, and all. 
This is a difficult problem, concerning which I do not 
intend to say anything at present.

To sum up our whole discussion: We bega-ray by dis-
tistinguishing two sorts of knowledge of objects, namely, knowledge by acquaintance and knowledge by description. Of these it is only the former that brings the object itself before the mind. We have acquaintance with sense-data, with many universals, and possibly with ourselves, but not with physical objects or other minds. We have descriptive knowledge of an object when we know that it is the object having some property or properties with which we are acquainted; that is to say, when we know that the property or properties in question belong to one object and no more, we are said to have knowledge of that one object by description, whether or not we are acquainted with the object. Our knowledge of physical objects and of other minds is only knowledge by description, the descriptions involved being usually such as involve sense-data. All propositions intelligible to us, whether or not they primarily concern things only known to us by description, are composed wholly of constituents with which we are acquainted, for a constituent with which we are not acquainted is unintelligible to us. A judgment, we found, is not composed of mental constituents called "ideas," but consists of an occurrence whose constituents are a mind¹ and certain objects, particulars or universals. (One at least must be a universal.) When a judgment is rightly analysed, the objects which are constituents of it must all be objects with which the mind which is a constituent of it is acquainted. This conclusion forces us to analyse descriptive phrases occurring in propositions, and to say that the objects denoted by such phrases are not constituents of judgments in which such phrases occur (unless these objects are explicitly

¹ I use this phrase merely to denote the something psychological which enters into judgment, without intending to prejudge the question as to what this something is.
mentioned). This leads us to the view (recommended also on purely logical grounds) that when we say "the author of Marmion was the author of Waverley," Scott himself is not a constituent of our judgment, and that the judgment cannot be explained by saying that it affirms identity of denotation with diversity of meaning. It also, plainly, does not assert identity of meaning. Such judgments, therefore, can only be analysed by breaking up the descriptive phrases, introducing a variable, and making propositional functions the ultimate subjects. In fact, "the so-and-so is such-and-such" will mean that "x is so-and-so and nothing else is, and x is such-and-such" is capable of truth. The analysis of such judgments involves many fresh problems, but the discussion of these problems is not undertaken in the present paper.