Scientific Knowledge and Philosophic Thought
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FOUR

The Particular
& the General
If human beings are to have any understanding of their circumstances, they must reduce the multitude of their separate experiences to some kind of order. This they do, in the first place, by classifying objects according to their similarities. Thereby they arrive at a series of generalizations which, by defining the properties of objects of a particular type, enable them to recognize instances of these when they meet them again.

But the number of individual properties in nature is limited. Consequently, a variety of different objects may have one in common. Thus, there are many that are white, many that are solid, many heavy, many rounded, many warm, and so on. No particular object, however, possesses only one property. All have several. Ice, for example, is a transparent, colorless solid that is markedly cold to the touch. If held in the hand, it melts and turns to water. Glass also is solid and transparent and, un-
less tinted, colorless. But it is no colder than its surroundings, nor does it melt at body temperature. Again, apples and pears are solid objects and, if of the same size, about equally heavy. Each, however, has a different shape and taste. In none of these instances does any single property alone provide a certain identification of the object in question. For this, all are required. It seems, therefore, that the similarities with which men are concerned when classifying objects relate, not so much to single properties, but to particular combinations of these.

Now, the question as to whether an object possesses a particular combination of properties is as much a matter of fact as whether it possesses any one of them. As such it is one that can only be settled by observation. Similarly, the question whether several objects possess the same group of properties is one that can only be answered in the same way. In other words, observation supplies us with information, not only about the presence or absence of a particular property in a particular object but also about the particular combination of properties it possesses. All we then have to do is to put this into words in order to obtain an approximate idea of its distinguishing characteristics. We are then in a position to recognize such an object in the future and, on the basis of the extended experience thereby acquired, to arrive at a generalization about objects of this particular kind.

It would seem, therefore, that, at the level of the classification of objects at least, the process of gen-

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eralization depends, not on thought, but on factual observation.

II

But observation of an object in isolation tells us no more than that it exists. Seen in relation to something else, however, it may be revealed to have certain implications. For example, if I apply a light to a pile of sticks, I expect this to catch fire and, shortly, to see smoke arising from it. If I see a rapidly traveling billiard ball make contact with a free-standing stationary one, I expect the latter to start moving. If I put a pan of water on the stove, I expect that, sooner or later, its contents will boil and turn into steam.

Why do I expect these things? Obviously, because previous experience (my own and that of others) has led me to do so. Without this there would be nothing to prevent my thinking that one could have smoke without a fire, that billiard balls would start moving of their own accord, or that water would boil in the absence of heat. As it is, observation has shown me that this is not so. For any of the above particular things to come about, it must have been preceded by another equally particular thing.

Thus, the order in which things succeed each other in nature is as much a matter of fact as the existence of the things themselves. So, just as in the

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case of the combination of properties which characterizes a particular object, observation supplies men with information, ready-made, about what will happen if one kind of object comes into contact with another. Again, all they have to do is to put this into words in order to obtain an idea which will enable them to recognize such a sequence in future. Then, in the light of this further experience, they can formulate a generalization that applies to all sequences of this kind. Thus equipped they can now infer, on seeing the first item in a sequence, what would follow if it were to come in contact with the second. Equally, on seeing the second, what must have preceded it. In short, they can now generalize regarding the implications of the objects in question.

This is the basis for man’s belief in cause and effect. David Hume put the matter succinctly when he said that, as a result of experience, man comes to believe that “like objects placed in like circumstances will always produce like effects.” Unfortunately, however, he had by then become committed to the view that, because we could not logically exclude the possibility that the course of nature might change, we were not justified in believing that an object seen today would produce the same effects as on a previous occasion. If, however, the fact that men are alive to make observations shows that no such change has occurred, there is clearly no substance in this objection. Consequently, men are justified in thinking that any gen-

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eralization they make regarding the implications of a particular thing will, insofar as it reflects factual observations, continue to be true as long as human beings exist.

III

It would seem, therefore, that, within the limits of our experience, we can formulate two kinds of generalization. The first, "Descriptive Generalizations," which necessarily precedes the other, relates to the combination of properties which characterizes a particular type of object; the second, which for reasons that appear in the next chapter we can call "Explanatory," concern the effects of different objects on each other. Both derive from factual observation, and thought only enters into their formation insofar as it is required to put into words what has been observed.

But if generalizations derive from factual experience, it follows that they can be no more valid, and no more comprehensive, than the observations on which they are based. Accordingly, it is of prime importance to man that his observations should be, not only free from error, but also complete. The question of the extent to which this is possible is, consequently, central to any inquiry into human understanding.

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