undoubtedly includes an inquiry into the ultimate nature of reality. But that inquiry lies in the province of metaphysics, and is not necessarily involved in the pursuit of natural science. Metaphysics uses the results of natural science, as of all other branches of learning, as evidence bearing on her own deeper and more difficult questions. But it does not follow that natural science must solve metaphysical problems before being of use to man and enlarging the sphere of his knowledge. We need not ask whether the reality is represented accurately by our conven- tional model, whether indeed there be any reality at all, before using that model to introduce order into what would otherwise be mental confusion, and to enable us to make systematic and progressive use of natural resources. It is true that the possibility of constructing consistent schemes of scientific concepts is an argument in favour of the existence of a definite reality underly­ing phenomena resembling in some respects the pictures of it we draw. But metaphysicians are not agreed that it is a conclusive argument. The difficulty of making a scientific picture of the ultimate nature of reality may be illustrated by an example. Our first conception of a wooden stick involves the ideas of a certain long-shaped form, of smoothness, of hardness, of weight, of a certain brown colour, perhaps of some amount of elasticity. A microscope reveals a structure much more detailed than we imagined, and our mental model of the stick ceases to be smooth. It becomes co-ordinated with those of a number of other bodies which we know to be parts of trees, and study, as regards growth and structure, by the help of botany. From the results of observa­tion and experiment, physics teaches us that the properties of the stick can only be represented satisfactorily by imagining that the substance of it is not infinitely divisible, that it consists of discontinuous particles or molecules. Again, chemistry assures us that the molecules of the stick are made up of still smaller parts or atoms, which separate from each other when, for instance, the stick is burned, and afterwards can arrange themselves into new molecules. When we pursue our inquiries into the nature of these atoms, we find that they can be resolved, partly at any rate, into much smaller particles or corpuscles in con­tinual motion within the atom. These corpuscles themselves have been identified with isolated units of negative electricity or electrons, the vibrations of which within the atom sort out the electromagnetic radiation which falls on them and allow to reach our eyes those waves only which give us the sensation of brown colour. At present pioneers are attempting to explain electrons in terms of centres of elastic strain in a hypothetical aether. But we have travelled far from our original conception of the nature of the stick, and, should the problem last stated be solved, we should only find ourselves faced by the next one, the nature of the aether. But what constitutes reality? Where, in the endless chain of explanations discovered or to be discovered, can we stop and say: “ Here is the true picture of what the stick *is" ?* But this impossibility does not prevent us from getting the full use of each conception in turn when used for its particular purpose. To the schoolboy, the effective and deterrent con­ception of the stick is that of a hard, elastic, long-shaped solid. The botanist regards it as built up by the action of vegetable cells, which he refers to a particular kind of tree. To the chemist the stick is made up of atoms of carbon, hydrogen and oxygen, each with definite properties and arranged in certain combina­tions. The physicist sees these atoms composed of whirling electrons, each an ultimate electric unit not capable of further explanation, or possibly a centre of strain in an all-pervading aether of unknown nature. Each idea is useful in turn, and each corresponds truly with certain properties of the stick, corre­sponds with the stick itself in certain of its aspects.

Such considerations show us the meaning of the subdivisions into which science has been arranged for convenience of study and research. They represent different aspects of nature, different sections, as it were, cut through the solid model which stands for the sum of all our scientific knowledge of the universe.

A nerve-impulse may be regarded from a psychological aspect when we deal with the thought which accompanied it; from a physiological aspect when we examine its relation to other

changes in the body. But modern methods have co-ordinated it also with definite chemical and electrical changes, and are said sometimes to have “ explained ” the nerve-impulse in physical terms.

But, as always, an “ explanation ” proves to be simply a restatement of a phenomenon in terms of other phenomena which previously are familiar to the mind, and therefore appear to be better understood. Nevertheless, from our present point of view, no one of these possible aspects of the phenomenon—of the nerve- impulse—is essentially more fundamental than any other. To the psychologist the nerve-impulse is expressed in terms of thought, to the physicist by physical changes. The fact that a thought is accompanied by movement of matter or electricity does not make the thought less a fundamental conception.

But perhaps the best illustration is to be sought in the relation between the physical concepts of matter and electricity. As we have seen, J. J. Thomson discovered corpuscles which were common constituents of all matter, with masses smaller than those of any known atoms. One of these corpuscles represents a unit of negative electricity. An atom with a corpuscle in excess is an atom negatively electrified, an atom with one corpuscle less than the normal number is an atom positively electrified. In this scheme electricity is described in terms of matter. But these corpuscles have been identified with the hypothetical electrons of Lorentz and Larmor, who consider matter to be composed of such isolated units of electricity. Such electrons, it has been shown, would possess mass by virtue of their electromagnetic properties. In this theory the idea of mechanical mass is eliminated altogether, and mass, and therefore matter, explained in terms of electricity. The view has been held by some that a mechanical explanation of a phenomenon is fundamental, and that a phenomenon so explained in terms of mechanical conceptions is fully understood. This idea may be traced to the familiarity with mechanical conceptions of our everyday experience. The mind obtains its concept of matter from the resistance which that matter manifests to forces tending to set it in motion when at rest, or to change its state of motion when travelling. This fundamental property of inertia is the measure of mass, and we reach the concept of mass by our muscular sense of the force needed to set mass in motion. Force seems to be a direct sense perception, though mathematically it is better to define force in terms of acceleration and mass—since mass is found normally to keep constant throughout a series of physical changes. The familiarity we feel, then, with the con­ception of matter is based on our familiarity with the conception of force. Our minds form this conception from their experience of a direct sense perception of muscular effort. This seems to be the basis of the whole feeling that mechanical conceptions are more fundamental than any others, and that, for instance, it is more intelligible to explain electricity in terms of mechanics than vice versa. But the fact that we have a special muscular sense is an accident of our bodies. It is possible that the electric fish, or torpedo, has a special electric sense, and that to such a fish- philosopher the perception of electromotive force is more real than that of mechanical force. Such a being might well argue that it is intelligible and satisfactory to explain the mysterious concept of mass, which he only reaches through the other equally mysterious concept of mechanical force, in terms of the familiar concept of electricity, well known to every torpedo from his direct sense perception of electromotive force. This instance may serve to show that it is quite as correct philosophically to explain matter in terms of electricity, as to explain electricity in terms of mass. The object of science is to find connexions between phenomena and thus to correlate them. At present a greater simplification may be reached by reducing all possible phenomena to mechanical conceptions than in any other way, but that only shows that the mechanical aspect of nature gives us a fuller view than any other at present known, not that mechanics is philo­sophically the most fundamental science.

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