CHRISTIANITY AND THE PROBLEM OF ORIGINS

BY

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In principle the philosophers of antiquity do not after all appear to have been so wrong-headed in postulating some single universal element as the essence of all things, even though they were mistaken in the substances to which they variously assigned this dignity. Of the presocratic Ionian philosophers, for example, THALES believed that water was the elementary substance of the material order, for since it was known to exist under different conditions not only in fluid but also in gaseous and solid forms it therefore seemed to be qualified to play the part of the universal material. ANAXIMENES, however, judged air to be the primordial substance, explaining the different densities of things, from wind and fire to stones, as the result of the differing degrees of rarefaction or condensation of the air from which they were supposedly formed. ANAXIMANDER, another early Ionian, also maintained that there is a primitive stuff of things, but that it was "neither water nor any other of the so-called elements, but a nature different from them and infinite, from which arise all the heavens and the worlds within them", and which he called "the limitless" (τὸ ἄπειρον). The Ephesian sage HERACLITUS thought that he had discovered the primary substance in fire, which consumes all things and appears to change them into itself. Then EMPEDOCLES of Sicily propounded the view that there are four distinct elements, namely, earth, air, fire, and water, which by their intermixture give rise to all is in the world. This view met with the approval of ARISTOTLE.

I say that these ancient seekers after wisdom would seem not to have been *in principle* mistaken in believing that there was some elemental substance of which all things that exist in our world are compounded, for the amazing advances in scientific knowledge of our day appear to have put an end to the atomistic and monadic speculations of all the past centuries, and we may accept the confident assurance of contemporary physicists that the basic element of the physical world is in fact hydrogen.

But though this discovery may be regarded as the end of a chapter in the history of science (in the fundamental sense of that term), it is very far from being the end of this particular book. Indeed, it has brought us to the threshold of a completely new chapter, replete with fresh mysteries to be investigated, which is opening up before us a vista of the structure of our physical universe full of hitherto unimagined wonder. For a considerable time now it has been known that the uncountable variety of entities, both animate and inanimate, with which we are surrounded may be simplified to the extent that they are composed in varying degrees of complexity of a comparatively small number of chemically irreducible elements or

"atoms" (as they were hopefully but mistakenly called), and that these atoms in combination with each other form molecules. More recent research, however, has shown that atoms themselves have a structure of energy which is described in terms of a central nucleus and its encircling electrons, and that in the binding together of atoms to form molecules, and again of different molecules to each other, electro-magnetic forces play a decisive part. Each atomic nucleus in turn is composed of one or more protons and neutrons, of which each proton is in fact the hydrogen nucleus. We have, indeed, as WERNER HEISENBERG, the distinguished Director of the Max Planck Institute for Atomic Physics in Göttingen, has pointed out, "reached a description of matter in which, instead of the many different chemical elements, only three fundamental units occur: the proton, the neutron, and the electron. All matter consists of atoms and therefore is constructed from these three fundamental building stones" (*Physics and Philosophy*, London, 1959, p. 137).

But there remains what HEISENBERG calls "the final problem", namely, the question of the unity of matter. "Are these fundamental building stones – proton, neutron, and electron – final indestructible units of matter, atoms in the sense of Democritus, without any relation except for the forces that act between them or are they just different forms of the same kind of matter?" he asks. "Can they again be transmuted into each other and possibly into other forms of matter as well?" The answer to this question is being sought through experiments in the field of cosmic radiation and by means of the big accelerating machines (cyclitrons) which are now being built. These experiments have already resulted in the discovery of new elementary particles which are so unstable that they have an existence of only an infinitesimal fraction of time, but which otherwise are similar in their properties to the old stable particles. According to O. R. FRISCH, the Jacksonian Professor of Natural Philosophy in the University of Cambridge, today we recognize no less than thirty fundamental particles. At least half of these displayed such unexpected and complex properties when they were first discovered that they came to be nicknamed "the strange particles". FRISCH anticipates that there are yet more particles awaiting discovery: "perhaps ... still stranger particles, with properties undreamt of so far". He is convinced that these sub-atomic particles are truly fundamental and that the very idea of compositeness must be left behind if we wish to understand them. "There are various indications", he says, "that the laws of geometry itself are breaking down when we come to those sub-microscopic dimensions, and I think that some radically new way of thinking will be needed before those fundamental particles can be really understood" (*The Listener*, London, Vol. LXIII, Jan. 21, 1960, pp. 119 ff., *Exploring the Sub-Atomic World;* Jan. 28, 1960, pp. 173 ff., *The Strange Particles;* Feb. 4, 1960, pp. 217 ff., *Strangeness and Parity).*

"These results", as HEISENBERG says, "seem at first sight to lead away from the idea of the unity of matter, since the number of fundamental units of matter seems to have again increased to values comparable to the number of different chemical elements. But this would not be a proper interpretation. The experiments have at the same time shown that the particles can be created from other particles or simply from the kinetic energy of such particles, and they can again disintegrate into other particles.