A SCIENTIST WHO KEPT HIS FAITH

Tribute to Sir Arthur Eddington

(From a talk by G. T. RAILTON, broadcast last week from 2YA)

ARTHUR STANLEY EDDINGTON, whose death was announced last week at the age of 62, was known among scientists for his outstanding contributions to astrophysics and the study of relativity. To the public, he became known first for reconciling the average man to relativity and later for reconciling religion with science; though as we shall see he actually said that science and religion were different things.

Not only was he one of the original propounders of relativity and one of the most popular expounders of this subject, but he was also one of the few original workers in this field of research. He led the expedition which went to West Africa in 1919 to test the Einstein Theory by observing the total eclipse of the sun. *Space, Time and Gravity,* published the next year, is one of the classical works on relativity, and he has always been Einstein's chief supporter in the Battle of Relativity.

For 25 years or so he devoted his great mathematical ability to problems well beyond the average scientist-in-the-street, but in 1928 he published his *Nature of the Physical World.* This immediately revealed his gift for lucid exposition and his graceful prose which has won him the gratitude of the common reader. He had begun to translate the deep abstractions of science into those popular terms which we understand, or think we do. *The Nature of the Physical World* did more to let the public know what relativity is about than any other single publication.

The scheme of natural law developed by Newton provided a pattern into which all subsequent developments seemed to fit. Great changes of outlook were possible within the framework of his scheme: the wave theory of light supplanted the corpuscular theory; heat was changed from substance to energy of motion; electricity from a continuous fluid to lines of strain in the ether. All these changes were allowed for in the elasticity of his original scheme. His laws were so lucid, so powerful, so easy of transformation into the mathematical shape necessary for calculation, and so close did the conclusions fit the facts, that for two centuries or so the civilised world had come to consider them as being final in all respects. But even in his own lifetime there occurred the first successful experiment which carried in it the germ of those facts which have shown that even this great man had not reached the absolute truth. Many people had tried to find whether the transmission of light was instantaneous or not, but it was not until 1670 that it was shown that the light from a heavenly body takes an appreciable time to reach us. Now it may be said that around this fact of the gradual propagation of light have clustered all the doubts and confusions which have entailed the recasting of our ideas on the laws of Newton.

Classical physics also recognised three major conservation laws—the conservation of matter; the conservation of mass; and the conservation of energy. Of these the conservation of matter was the oldest. The atomistic philosophy of Democritus supposed that all matter was made up of uncreatable, unalterable, and indestructible atoms. True, in the course of time, chemistry showed that some of these unalterable atoms could be changed, but these were henceforth called "molecules" and the name atom was reserved for those bits that couldn't be broken any further. Throughout the later half of the 19th century these conservation laws held sway. They were so well established that they were used as if they governed the whole of creation; and on them was based the philosophy of the day.

Old Ideas Shaken

Just about the close of the century, Sir J. J. Thomson began to break up atoms, and even though he was only able to detach small fragments it was enough to shake the old ideas regarding conservation of matter. Later Lord Rutherford showed that all atoms are built up of electrons and protons and that matter was nothing more than a collection of particles charged with electricity. Thus the old conservation laws as well as Newton's laws of nature, or indeed we can say the whole scheme of classical physics and philosophy, was breaking down.

Two new trains of thought were appearing however. In 1900 Max Planck brought forward the suggestion that the course of nature proceeded by tiny jumps and jerks. This idea was at first ridiculed, but it has developed into the modern "Quantum Theory" which forms one of the great dominating principles of modern physics.

Then in 1905 Einstein propounded a new law of nature in this form: "Nature is such that it is impossible to determine absolute motion by any experiment whatsoever." This was the first formulation of the Principle of Relativity.

We see then that this Theory of Relativity and the Quantum Theory were just coming into being about the time that Sir Arthur Eddington began his astronomical work, and during the 25 years or so before he commenced his popular writings, he devoted his mathematical ability to formulating a new concept of physics and philosophy from the contemporary works of Einstein, Planck, de Sitter, Lamaitre, and all those experimental and observational physicists of the first quarter of this century. For example he took data from Dr. Hubble regarding the nebulae and used the results of experiments by Professor Fowler on helium atoms; and in solving the problems which fluctuate continually from the excessively great to the excessively small, from the star to the atom and back to the star, Eddington has given us an unequalled story of progress—rich in variety.

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