Liverpool; Dr. Joseph Tait, resident secretary in Scotland, Pharmaceutical Society; Mr. D. R. Wilson, bacteriologist, Moredun Institute, Animal Diseases Research Association, Gilmerton, Edinburgh.

The Council of the Royal Society of Edinburgh has awarded the Keith Prize for the period 1939–41 jointly to Prof. E. T. Copson, University College, Dundee, and to Prof. W. H. McCrea, Queen's University, Belfast, for their papers in the *Proceedings* of the Society within the period of the award, and in recognition of their valuable contributions to the theory of Riemannian space and general relativity.

The Neill Prize for the period 1939–41 has been awarded jointly to Dr. P. C. Koller, Institute of Animal Genetics, University of Edinburgh, for his contributions to cytology; and to Dr. W. J. McCallien, Department of Geology, University of Glasgow, for his contributions to the tectonic geology of the Scottish Highlands.

Philosophy of the Physical Sciences

IN his recent presidential address to the Royal Society of Edinburgh on "Some Disputed Questions in the Philosophy of the Physical Sciences", Prof. E. T. Whittaker discussed the problem raised by the Greeks and at the present time vigorously debated by Eddington, Jeffreys, Milne, Jeans, Dingle and others, on the respective shares of reason and observation in the discovery of the laws of Nature. He recalled that the Greeks considered that geometry could be built up completely apart from observation, but that Aristotle at least (and much later Aquinas) held that other sciences must be built on experience. Later progress showed that geometry also must be regarded as a branch of experimental knowledge, and from the time of Newton until now, the principle that science rests fundamentally on observation and experiment has been unchallenged. Now, however, certain thinkers—notably Milne and Eddington—hold that the laws of Nature can be derived without recourse to observation. Prof. Whittaker points out that many important branches of physics can be deduced from single "postulates of impotence"; for example, the whole of relativity theory follows from the postulate that it is impossible to detect absolute motion. Such postulates are not the direct result of experiment, though they are generalizations from experiment. Milne's "cosmological principle" is in form a postulate of impotence, but it is assumed without experimental support. Eddington's "epistemological principles", however, are different, but Prof. Whittaker is not convinced that they have any basis outside experience. His verdict on Eddington's claim is: "Not Proven".

The concentration into postulates of impotence of the experimental contribution to physical laws is a very suggestive generalization, and it is an interesting conjecture that the whole of physical law might ultimately be derived by reason from a single postulate of impotence. At the same time it would be a mistake to suppose that anything significant can come out of a pure negation. A postulate of impotence is indebted to experience not only for failure to violate it but also for an indication of the positive thing which in the stated circumstances it denies. The impossibility of spontaneous passage of heat from cold to hot bodies implies the fact of experience that heat can pass between bodies; the denial of absolute motion would be without meaning if we had no experience of relative motion; and so on. It is a pity that Prof. Whittaker's address was prepared before Eddington's recent change of front. In the "Philosophy of Physical Science" he wrote: "For the truth of the conclusions of physical science, observation is the supreme Court of Appeal" (p. 9), and accepted the statement that physics is "the rational correlation of experience" (p. 185). In NATURE of October 25, 1941, however, he stated, in reply to the objection that the supreme Court of Appeal might decide against the rationally derived laws, that "the fundamental ('inviolable') laws are not assertions about experience". It appears, therefore that Prof. Whittaker has been analysing a superseded claim.

Science as a Force of Freedom

THE value of science as a force of freedom was emphasized by Mr. G. B. Lal in a recent address to the New History Society, New York. The power of science is unique. Great men of science have world-wide influence. But they have achieved such influence without the use of the slightest violence or fraud. People have killed each other for religion; but not for science. In science there is a peculiar and most important pattern of freedom. Science develops only when the scientific worker has enough social power to enable him to do his work utterly unhampered. Also, every development in science releases new forms of social energy. Most people respect science because of its practical importance, as shown by the machines of scientific inventors, the conquest of diseases, the piling up of profits in industries, the production of military weapons, rapid transportation and communication. But the most important thing about science is its method. The scientific method is the most efficient use of human intelligence for the discovery of truth.

Physics of a Transmission Line

PROF. W. M. THORNTON has published a thought-provoking paper with the above title (*J. Inst. Elec. Eng.*, **88**, Pt. II, No. 6, Dec., 1941) in which he deals with the fundamental and, in part, unknown field of electromagnetic study underlying the many technical and economic problems entailed in the design, construction and operation of electric transmission lines. He pays special attention to the electromagnetic mechanism by which electric and magnetic stresses in space combine so that the energy of electric strain passes continuously along the insulating medium around the wires. Remarking that this, the Poynting flux flow, is the least known of the physical actions in transmission, Prof. Thornton discusses the transfer of potential energy along a transmission line by strain of the insulation, extending the theory to the supply of energy to electric lamps, heaters and rotating machinery. Following a lucid explanation of Poynting's theorem, physical analogies are given to the resistance, inductance and capacitance of a transmission line, resistance being regarded as the coefficient of dissipation of energy, inductance as inertia, and capacitance as elasticity; an invisible shaft of energy which would be perfectly rigid in the absence of inductance and capacitance rotates about the conductors of a three-phase system at the supply frequency.

Suggesting that there may still be engineers who regard the purity of the copper of their machines or cables as more important than insulation quality, the paper proceeds to a discussion of the function of