mechanical models of the aether (medium with rotational elasticity, vortex rings, wheels with bands, etc.) which had been prevalent between 1860 and 1890. Whittaker⁷ considered that it was "chiefly under the influence of Larmor [that] it came generally to be recognized that the aether is an immaterial medium *sui generis*, not composed of identifiable elements having definite locations in absolute space".

Larmor's contributions to electro-magnetic and electron theory are fully reported in Whittaker's "History". Here I have been concerned with a different task: to show that Larmor saw far beyond the typical problems of 1900 to issues that are still unresolved. This was possible, I believe, because a radical theoretical analysis, applied with judgment, can sometimes lead beyond contemporary theories and help to open up new problems the solution of which may lie well ahead.

Certainly the main theme of Larmor's book, the relation of basic discreteness to macroscopic continuity, is far from exhausted to-day. There is no golden rule for discovering the new ideas which will prove fertile in relation to this problem, for example,

in nuclear processes. But there is a rational method of preparing the ground: to analyse the known facts, and the hitherto successful theories, with as little prejudice as possible in terms of basic principles which appear worthy of confidence. It would be of great value to-day to be able to identify issues lying as far ahead as those Larmor recognized in 1900.

¹ See Bohr, N., *Phil. Mag.*, 27, 506 (1914) (see p. 519).

² See Larmor's "Mathematical and Physical Papers" (2 vols., 1929). For several additional historical surveys.

³ I have already discussed Larmor's originality in this respect; see "On the History of Natural Lengths", *Annals of Science*, 10, 20 (1954).

⁴ For an analysis of this characteristic of twentieth century physics see Whyte, L. L., *Z. Phys.*, 58, 809 (1929), "The Presence of a Universal Constant with the Dimensions of a Length". To ensure that I had understood "Larmor's principle" correctly, I sent him a copy of this paper. For his reply (Sept. 27, 1929), see *Brit. J. Phil. Sci.*, 4, 337 (1954).

⁵ Particularly after the discovery of h . For references to papers dealing with it before Bohr, see Bohr, N., *Phil. Mag.*, 26, 1 (1913), especially p. 6.

⁶ Larmor adopts this term from Kelvin (1884). For references and an improved definition of 'chirality' (not assuming, as Larmor does, any unique axis or helical properties), see Whyte, L. L., *Nature*, 182, 198 (1958).

⁷ Whittaker, E. T., *loc. cit.*, 1, 303. See also, Larmor, J., *Brit. Assoc. Reports* (1900), p. 618.

OBITUARIES

Dr. Andrew McKellar

ASTROPHYSICISTS have learned with great regret of the death, at the early age of fifty, of a well-known and very popular colleague, Dr. Andrew McKellar, assistant director of the Dominion Astrophysical Observatory, Victoria, B.C. McKellar was first brought into contact with astronomy as a summer student at the Dominion Astrophysical Observatory about thirty years ago, when he was an undergraduate at the University of British Columbia, Vancouver. He proceeded from there to the University of California, Berkeley, where he gained his Ph.D. and laid the foundations of the spectroscopic technique which later served him so well. After two years in the spectroscopic laboratories of the Massachusetts Institute of Technology as a National Research Council Fellow, he returned to Victoria, to become a permanent member of the staff, and spent the rest of his life there.

McKellar was the first to identify molecules in the interstellar gas, a matter of great importance for problems of interstellar matter, especially in relation to the equilibrium between gas and dust. These questions are part of larger problems involving the formation of stars from interstellar matter, about which so much is said and so little understood. McKellar's identification of these molecules was far more than an achievement of the obvious; the molecules are unsaturated, their bands in the conditions of interstellar space are reduced to one or two lines only, and these are usually quite faint.

McKellar was also one of the leading authorities on molecular bands in stellar spectra. He did a great deal of exploratory work in the red and near infra-red, discovering and identifying hitherto unrecognized bands. His most noteworthy achievement in this field, however, was to show that the ratio of abundance of the carbon isotopes carbon-12 and -13, while

about 90 in some stars (as on Earth) is about $3\frac{1}{2}$ in certain R stars, a significant fact for nuclear physicists and all who are interested in the origin of the elements. While working in the red region he also found that some carbon stars contain considerable quantities of lithium, an element which is normally present in stars only in very small quantities, presumably because it is easily destroyed by nuclear processes in stellar interiors.

Among other work, McKellar made important contributions in the rather difficult field of spectroscopy of comets. He was one of the first to aluminize a large telescope mirror. He took a leading part in the design of spectroscopic equipment at the Dominion Astrophysical Observatory. He was also a leader of the small group concerned with unusual eclipsing binaries such as ζ Aurigae, 31 Cygni, VV Cephei, where a comparatively small hot star is eclipsed by a large and cool supergiant. Absorption lines due to the atmosphere of the cool star appear near the beginning and end of eclipse and can be used to study the outer structure of the supergiant. Apart from the Sun, this is our only fairly direct means of exploring a stellar atmosphere. The results suggest an irregular field of huge and variable prominences, quite unlike the stratified layers of conventional theory.

Perhaps the most important feature of McKellar's work was his ability to obtain significant results without burdening astronomical literature with over-lengthy papers and irrelevant detail. He himself with characteristic modesty attributed this to economy of effort imposed by a very long illness, which he knew must eventually prove fatal. His many friends will miss "Andy's" quiet humour and charm, and will mourn an astronomer who had the gift of courage as well as of scientific insight. He leaves a widow and a son and daughter.

R. O. REDMAN