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Obituaries

JOHN ANTHONY CARROLL

In 1942 the Admiralty, impressed by some of his work on radar, invited the Professor of Natural Philosophy in the University of Aberdeen to become Assistant (to Sir Charles Wright) Director of Scientific Research. Carroll stayed at the Admiralty, in a sequence of ascending capacities, until he retired in 1964 as Chief Scientist (Royal Navy) and a full member of the Board of Admiralty. The Royal Navy's gain was, unfortunately, a severe loss to astronomy to which Carroll had already made outstanding contributions. Although he maintained his interest in both theoretical and observational astronomy, and in instrument design, and attended meetings whenever he could, his duties prevented him from developing the research on which he was engaged in Aberdeen.

John Anthony Carroll was born on 1899 January 8. In 1916, from the King's School at Chester, he won an open scholarship in mathematics and physics at Sidney Sussex College, Cambridge. But the exigencies of war prevented him taking up residence; he was instead fortunate to be sent to the Royal Aircraft Establishment at Farnborough, where many of the foremost scientists of the day (including G.I.Taylor and G.P. Thomson) were working. He there was introduced to applied science and experimental methods; and his first papers, published by the Advisory Committee on Aeronautics, were written before he became an undergraduate.

At the end of the war, in 1919 January, he went up to Cambridge, where his record—firsts in Part II of both the mathematical tripos (b*), in 1921, and the natural sciences (physics) tripos, in 1922, followed by his appointment as an Isaac Newton Student—foreshadowed an astronomical career. As a Research Fellow of his college he was able to study for some time under A.Fowler at Imperial College, and later to spend nearly two years at the Californian Institute of Technology (with R.A. Millikan and I.S.Bowen) and at Mount Wilson Observatory (with W.S. Adams), where he pursued his spectroscopic interests and acquired experience in high-vacuum techniques. This background of theoretical and laboratory spectroscopy, which gave rise to his early papers published by the Royal Society, was invaluable when he later applied it to astronomy; his paper (*Phil. Trans. R. Soc.*, Vol. **225**, 357, 1925) on vacuum spark spectra was the substance of the thesis for which he was awarded his PhD. Earlier, in 1924, he had been appointed as Assistant

(to H.F.Newall) Director of the Solar Physics Observatory and, in 1925, as University Lecturer in Astrophysics; he held both appointments until he succeeded G.P.Thomson as Professor of Natural Philosophy in Aberdeen in 1930.

Carroll's work in Cambridge emphasized the value of his background to astronomical applications; the ten, or so, papers in *Monthly Notices*, in this period, show a transition from techniques to specific astronomical problems. In particular, the spectroscopic determination of stellar rotation, through its effect on line profiles, gave rise to papers of both theoretical and observational importance—research which was continued after his move to Aberdeen. He did not neglect the instrumental aspect as his (then) advanced design of the Cambridge photoelectric recording microphotometer showed. His first paper in *Monthly Notices*, on the intensity of absorption lines produced by a grating, was purely theoretical, but with Baxandall and Stratton, he was soon engaged on line identifications in stellar spectra. Perhaps the most important paper in this period (*Monthly Notices*,Vol. **90,** 588, 1930) was concerned with the mechanics of the emission of the bright hydrogen lines in gaseous nebulae, in which he took issue with H.H.Plaskett's interpretation of his (Plaskett's) observational results. His interest in eclipses was a natural consequence of his training; his first expedition, in 1923 in California, had been ruined by fog, but he participated in two others while at Cambridge—those of 1927 June 29 in Norway and 1929 May 9 in Malaya. Reports of both expeditions were published in *Monthly Notices*, but Carroll, who had designed and built an original instrument for detecting motions in the corona and who was in operational charge of all the instruments, was unlucky: the Norwegian expedition was clouded out, and the only positive result in 1929 was to confirm that his instrument worked satisfactorily. Incidentally, he was again unlucky when, from Aberdeen, he joined the Cambridge expedition to Canada for the eclipse of 1932 August 31—and was clouded out.

The professorship of Natural Philosophy in Aberdeen is almost unique in its scope, as it comprises both applied mathematics and experimental physics; but astronomy was then in the Department of Mathematics so that, although Carroll continued with his personal research he was not free to develop a school of astrophysics. He planned the observation of spectra of Algol at Aberdeen, since this povided the critical test for his methods for the spectroscopic determination of stellar rotation. He also wrote papers on such diverse subjects as the distribution of sunspots, and a modification of Michelson's stellar interferometer. But his main interest was the design of the echelon spectrograph and its use at a total solar eclipse. Despite considerable difficulties, both financial and logistic, he organized an expedition to observe the

total solar eclipse of 1936 June 19 in Omsk, Siberia. It was perhaps the first time that an attempt had been made, in the field, to obtain complete and accurate temperature control as practised in the laboratory—an essential requirement if observations of the flash spectrum, through a transmission echelon immersed in a liquid of high refractive index, were to yield good results. As it turned out, the observations were successful, but the small size (37 mm—the largest then available) of the aperture of the echelon resulted in the spectra being too faint for useful measurement of the flash lines; in his report on the eclipse (*Nature*, Vol. **138,** 349, 1936) Carroll emphasized that the results provided accurate data to enable, and to justify, the design of a larger instrument.

In addition to a very rapid objective-prism spectrograph, designed for exploratory work in the infrared region of the coronal spectrum, the other main instrument was an objective interferometer of 13 cm aperture for the study of the corona in its own monochromatic green radiation. Good results were obtained with the infrared instrument, but those with the interferometer were accidentally obscured, in spite of indications of otherwise excellent performance. The expedition was technically a great success, in spite of the extreme conditions; but the full observational results do not appear to have been published.

Carroll's work at the Admiralty had no direct relation to astronomy, but as Assistant Director of Scientific Research he was called upon to use his experience, particularly in the instrumental field, to the full. One of us had occasion to work closely with him in initiating and running the Admiralty Computing Service, in which the experience and practice of astronomical computation—very little else then existed—was diverted to the varied demands of the Admiralty research establishments. His grasp of the physical problems and the practical applications, together with his excellent relations with the establishments, was a vital factor in ensuring that a relatively high proportion of the computations undertaken were of real use. However, as Deputy Controller and Chief Scientist, his duties were more on an advisory and policy level.

During this period he continued to serve on the Joint Permanent Eclipse Committee, and was responsible for arranging for assistance to several eclipse expeditions from the resources of the armed services. Unfortunately, the expedition to observe the eclipse of 1947 in Brazil, partly organized by Carroll to use the echelon spectrograph, had to be abandoned after the aircraft carrying some of the observers, and the optical parts of the instruments, crashed at Dakar with the deaths of Alan Baxter and J.H.Strong. Apart from review papers, his only paper of astronomical significance appears to have been his note in *Nature*, in 1955, on 'An Absolute Scale of Time' depending on the randomness of radioactive decay; this seems to have been overlooked in recent philosophical discussions.

After his retirement in 1964, he was appointed Gresham Professor of Astronomy and, reverting to his first interest in mathematics, set himself up as a mathematical coach and consultant—in which capacity he dealt with a number of intriguing problems, mainly in the field of probability (as applied to gaming!). His last astronomical meeting was the Woolley Symposium on the Galaxy in 1971 August, which he introduced in his typically felicitous manner (*Quarterly Journal*, Vol. **13**, 132, 1972).

Carroll was an early Member of the International Astronomical Union and was a regular participant in the General Assemblies; he served as President of Commission 9 (Instruments) from 1938 to 1948. He was an editor of *The Observatory* from 1926 to 1931. After election as a Fellow of the Society on 1925 January 9, he served on the Council in 1930–32, 1937–40 and 1943–44. He was elected FRSE while at Aberdeen, and his services to the country were recognized in 1953 by the award of the KBE.

Sir John Carroll died on 1974 May 2, after two years of failing health following a heart attack in 1972. Although largely unknown to the younger generations of astronomers, he will be remembered by those who worked with him, as colleagues or students, for his friendliness, helpfulness and his engaging personality. The strength of his character was often disguised by his quiet delivery, coupled with both wit and humour, that was equally effective in the lecture room, at scientific meetings, in his dealings with his staff and, one must assume, with the Admirals. He is survived by his second wife and by three children, one by his first marriage.

D.H. and F.M.SADLER