

observatories at Fleurs and Culgoora and encouraged the development of new instruments and observing techniques.

Among Ron's many contributions on the solar atmosphere (about 100 publications) he is credited with originating the concept of magnetic field reconnection, a powerful principle underlying modern flare theory.

He helped train solar astronomers who now occupy important research positions in Australia and overseas (including J. M. Beckers, R. J. Bray, L. E. Cram, D. G. Hall, J. T. Jeffries, R. E. Loughhead, Marie McCabe and P. R. Wilson) and served in an administrative capacity on various scientific bodies (Australian National Committees on the International Geophysical Year, the International Year of the Quiet Sun, and Solar Terrestrial Physics; National Committee for Astronomy, for Space Research and for International Relations; IAU Commission 12 On Solar Radiation).

Dr Giovanelli was elected a Fellow of the Australian Academy of Science in 1962. Following his retirement in 1974 he continued his work on the Sun and completed a book 'Secrets of the Sun' (he was very happy to see the proofs which arrived two days before his death).

Commemorative functions by Australian and overseas scientists paid tribute to Ron's work—'The R. G. Giovanelli Commemorative Colloquium' was held in Sydney (November 1984) and in Tucson, Arizona in January 1985.

For a comprehensive review of his life and work please refer to the 'Biographical Memoir, Ronald Gordon Giovanelli 1915-1984', by J. H. Piddington (Rec. Aust. Acad. Sci 6 (2) press 1985) from which the following paragraph is particularly appropriate.

'Giovanelli was so widely liked and admired that at his Commemorative Colloquium the President of the International Astronomical Union observed that "Ron Giovanelli helped build an International community of solar physicists because he was an enthusiastic worker and people liked him". This was true for most of the solar physicists in Europe, U.S.A., India and Japan, many of whom were personal friends and on a basis of family visits.'

K. V. Sheridan

Alec Little

A tribute by B. Y. Mills

Alec Little died suddenly of a heart attack on March 20, 1985, aged 60. He had been working at the Molonglo Radio Observatory to the end. As President of the Astronomical Society of Australia, Director of the Molonglo Radio Observatory and consultant to the CSIRO Division of Radiophysics for the Australia Telescope project, Alec was deeply involved in the Australian astronomical scene and had

played a major role in many developments. His cheerful enthusiasm, forthright personality and lack of any pretensions endeared him to all his colleagues and he will be missed for these personal qualities as much as for his unequalled skills as an instrumentalist devoted to the cause of astronomy.

Alec's career was an unusual one and perhaps possible only in that bygone era when, for a gifted individual, lack of formal qualifications was no bar to advancement in a scientific career. He was born and raised in Ashfield, a suburb of Sydney, and left school in 1940, at the age of fifteen. He immediately obtained a position as a messenger and later Junior Laboratory Assistant in the Division of Radiophysics of the then CSIR (later to become CSIRO). His subsequent progress makes an inspiring success story.

I first met Alec some two years later when he was still very much a junior technician, but one whose abilities were rapidly being recognised. In those war-time days, when the Division of Radiophysics was responsible for the Australian radar effort, a keen and gifted technician was much in demand and, by the end of the war, he was generally regarded as a young man who was going places. Thus Alec was a natural choice as one of the technicians when the Division branched out into a completely new field in 1945 to establish a 'valve laboratory' as a basis for post-war research activities involving vacuum techniques. My first brief professional association with Alec came at this time when he was responsible for the successful development of a high current pulsed electron gun required for my experiments with a resonant cavity X-ray tube—a far cry from astronomy for both of us!

The valve laboratory was abandoned as an unpromising research activity in 1947 and shortly thereafter Alec transferred to the much more promising radio astronomy group under the leadership of Joe Pawsey. This was just the kind of innovative and challenging work at which he excelled. By the time I also joined the group nearly a year later, he was already taking responsibility for the technical development of a new type of 'swept-lobe' interferometer intended for the instantaneous location of solar radio bursts; this was a project in collaboration with Ruby Payne-Scott. The interferometer was an outstanding success and produced the first direct evidence that the emitting regions were located above the photosphere and that some moved rapidly outwards. Indeed the instrument may be regarded as the precursor of the Culgoora radioheliograph. Thereafter Alec was much in demand for getting way-out projects off the ground and when I proposed the construction of a 'Cross' radio telescope in 1952, Joe Pawsey immediately assigned Alec to the project.

This was our first major association and one which really brought home to me Alec's exceptional abilities as an instrumentalist. The project naturally involved a great deal of interactive design and development but two key advances which permitted effective astronomy were due entirely to Alec—the development of simple and accurate test equipment for rapidly checking the electrical adjustment of individual dipoles and the invention of a very effective system for making absolute flux density measurements. The resulting flux density scale, unlike others of the times, has survived unchanged.

During this early radio astronomy period Alec had not been idle in his spare time. He had first enrolled as a part-time student at the Sydney Technical College where, in 1946, he obtained his Higher Electrical Trade Certificate and, in 1950, a Diploma in Applied Physics. Then he continued as a part-time student of Applied Physics at the University of New South Wales, where he graduated B.Sc with first Class Honours in 1955. His spare time was not entirely devoted to study, however, and in 1951 he married Adele LeLaen, whom he had met when she was a war-time employee of Radiophysics. Adele and their two daughters survive him.

In keeping with his role in the radio astronomy group, Alec left the 'Cross' project as soon as it was going well and he had collaborated in a number of observational programs. His next assignment was to take an important part in experiments to detect correlations between individual light photons, this time in collaboration with R. Q. Twiss. These successful experiments were vital to confirming the fundamental theory of the stellar intensity interferometer which was a new concept, anathema to many theoreticians of the time. After one or two essays into other new projects Alec, who had now advanced to Research Officer, obtained leave to spend two years at Stanford University as a Research Associate. This visit had been organised by Ron Bracewell, who had left Radiophysics for Stanford some years before. While at Stanford Alec obtained his M.Sc for research into parametric amplifiers for low noise radio astronomy receivers.

Meanwhile, I had joined the School of Physics of Sydney University with the aim of constructing a giant 'cross-type' radio telescope. My first priority was to induce Alec to join me in this project; we had worked together very well before and I could think of no one better qualified to cope with some of the enormous problems I could foresee. With the help of Harry Messel who visited him at Stanford, Alec was convinced that this was where his future lay. He returned from America to take up a lectureship in the School of Physics in 1961 and never looked back. The Molonglo Radio Observatory was established and the radio telescope constructed, but this time Alec was not whisked off to another project. He was soon appointed Director of the Observatory (1968) and later, Associate Professor (1975). He took part in many research programs until, a few years ago, he had the major responsibility for converting the 'Cross' to the 'MOST'; without Alec this conversion could not have been contemplated. During this period Alec was also associated with instrumentation for the Fleurs synthesis telescope, for which he developed a low noise receiving system.

As time went on Alec became increasingly involved in administrative duties but he always maintained a mastery of techniques. This was never better shown than during the week he died when he brilliantly solved a small but nagging instrumental problem which had been plaguing us for years. This, his last contribution, is described elsewhere in the present volume.

When he first joined the University, Alec quickly learnt that being a lecturer involved a lot more than being a CSIRO scientist. There were students to teach! In typical fashion Alec threw himself whole-heartedly into the teaching process and has

earned the liking and respect of a whole generation of Physics students. It is only in the last two years that he had to restrict his teaching activities because of an appointment as consultant for the Australia Telescope project. In this position he became deeply involved in the application of optical fibre techniques for the transmission of data between the antennas, yet another of the large number of techniques he had mastered.

With this part-time appointment to CSIRO Alec's career came full circle. However, his major commitment remained with the Molonglo Radio Observatory and his death has brought to a sudden halt a number of investigations into possible future improvements and extensions of the radio telescope. We will have to be satisfied for the present with maintenance of the status quo, but even that will not be easy because only Alec had a working knowledge of all the complexities of the system.

Alec's interests in astronomy were wide. He was a keen supporter of the Astronomical Society of Australia and had been Treasurer for five years, from December 1969 to May 1975, Vice-President from May 1981 until May 1983 and finally President from May 1983. He was also Secretary of the Donovan Trust, administered by the Society, from 1971 until 1984. From 1960 he had been a member of the International Astronomical Union. In his professional capacity his contributions to astronomy were immense, ranging from his early experimental work on new types of radio astronomy systems to his later directing of the Molonglo Radio Observatory and responsibility for many observing programs. For many years he was also the Australian representative on Commission 5, for radio astronomy, in URSI (Union Radio Scientifique Internationale). But he will best be remembered as an outstanding instrumentalist.

Alec was a 'hands-on' instrumentalist of the old school; he enjoyed working at the bench, which he regarded as an essential adjunct to theoretical design. If things went wrong in the laboratory he was always ready to plunge into a series of tests and modifications until the problem was identified and the best possible results achieved. If things went wrong in the field he was equally ready to go out with the technicians, in the worst weather if necessary, and personally take part in repairs. He led by example.

Alec was truly a remarkable man—astronomer, physicist, engineer and master technician; his like is not easily to be found.