Remarkable progress in astronomy

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Astronomy Transformed: The Emergence of Radio Astronomy in Britain. By D. O. Edge and M. J. Mulkay. Pp. xvi+482. (Wiley-Interscience: New York and London, 1976.) \$31.75; £19.25.

HALF way through this book the authors state that they have completed their historical survey of the growth of radio astronomy. Their survey is primarily centred around the emergence of the new science in the UK covering the period from 1945 to about 1960-extended to 1963 to cover the discovery of quasars and, briefly, of pulsars in 1968. The authors state that they have chosen to base their description "around the development of research into discrete radio sources" and within this restricted timescale and framework they have pursued their aim with great determination. Supported by extracts from taped interviews with many of the participants, and by a most thorough series of references to the literature, a detailed account has been given of fifteen years of remarkable progress in astronomy.

In 1946, J. S. Hey published the evidence that a localised source of radio emission existed in the constellation of Cygnus. He and his colleagues had used the receiver section of an Army defence radar, and no-one could have foreseen the extent of the technical developments which were to follow during the next two decades leading to the discovery of thousands of discrete sources of radio emission. Edge and Mulkay provide a fair and largely unbiassed account of the succession of arguments and confrontations which by the end of their review period had led to a general consensus of opinion that the majority of these sources were extragalactic and that the measurements of their angular diameter and intensity distribution were of cosmological significance-even if the nature of the significance remained in dispute. After the pioneer work of Hey this story centres largely around the developments at Cambridge, Jodrell Bank and Sydney, and some of the participants will no doubt be surprised to be reminded how rapidly their opinions changed.

The meeting of the Royal Astronomical Society in October, 1951, was the occasion of a memorable exchange between Gold, Ryle and Hanbury Brown; and it is a pity that the full extract from this (like much other important material) has been relegated to appendices of notes and references which greatly increase the difficulty of a thorough study of the book. By 1951, although a few of the radio sources had been identified with extragalactic nebulae, Gold was almost alone in maintaining that the majority of the radio sources must be extragalactic. Even by 1957, when several thousand radio sources had been delineated, only eight had been identified optically; and three of these were associated with nebulosities in the Milky Way. By that stage the astronomical community was immersed in the contentious arguments about the differences between the Cambridge and Sydney radio source counts and whether they had relevance to the cosmological problem. Since Dr Edge was a graduate student in the Cambridge group for four of these remarkable years, he has been able to penetrate the details of a complex story, confused by the fact that, on the wavelengths then in use, the three strongest radio sources were near the galactic plane; but whereas two were supernova remnants in the Milky Way, the second strongest was a remote and peculiar extragalactic object.

The scope of the second half of the book is different. Here the authors investigate the relationships between the various groups of radio astronomers, the differing developments of the individual groups, the effect of radio astronomy on classical optical astronomy, and the extent to which the study of the emergence of radio astronomy contributes to the more general problems of the development of new areas of scientific inquiry. Parts of this will form compulsive reading for those who were in any way associated with these developments.

The bitter dispute over the radio source counts between the Cambridge and Sydney groups is summarised fairly. The remarkable secrecy maintained by Hewish and his colleagues over the pulsar discovery is described in relation to the problem of cooperation and competition, but the authors have balked the task of penetrating the Cambridge observational/theoretical conflict which has had such an influence on the present organisation of theoretical astronomy in the UK. In fact, their comment on this important matter is relegated to a footnote near the end of the book in which, referring to Hoyle, Gold and Bondi, they remark that the three "found themselves in Cambridge, but without any meaningful relationship to the small observational radio astronomy group, with whom they found dialogue difficult".

The most unsatisfactory feature of the book is the long chapter on The Social Structures of the Groups in which the authors "attempt to build up a picture of the evolution of the social structure and differentiation within the Cambridge and Jodrell Bank groups". They do this in a most peculiar manner-from "publication profiles, and co-authorship and citation statistics", and by quotation from anonymous members and ex-members of the two groups. The recollection of struggling research students of twenty to thirty years ago-however eminent they may be today-is scarcely a satisfactory means of making this investigation. In fact, I have difficulty in regarding this chapter seriously as a work of scientific or social investigation especially when after 57 pages the conclusion is reached that "the differences between the two groups can be adequately explained by postulating simply that Ryle and Lovell 'are two different people'. It is our view, however, that such a move is unnecessary". We are different people and it is those differences embraced within a framework of mutual understanding and collaboration about the problems of development in a society with limited resources which have enabled both of our groups to survive and develop.

This chapter suffers in comparison with the following chapter on Some Sociological Implications. This is by far the most important and valuable section of the book in which the innovation of radio astronomy is placed in the historical context and compared with the emergence of other new scientific disciplines. Particular comparisons are made with Ben-David's study of nineteenth-century innovations in medical science, of Mulkins' study of the orgin of molecular biology, and of the study by Dolby of the emergence of physical chemistry in the nineteenth century. This is a significant contribution to the scarce literature on a subject which should be of great concern to contemporary society, and is worthy of wider circulation than it is likely to obtain in this book. Clearly, Edge and Mulkay have condensed their information from an analysis of a great deal of published work and taped interviews; but further substantial sections could have been excised before publication, without detracting from a valuable historical narrative.

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