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BOOK REVIEWS

***JENAM 2003. Radio Astronomy From Karl Jansky to Mictrojansky,* edited by L.I. Gurvits, S. Frey and S. Rawlings (PA de Courtaboeuf, EDP Sciences, 2005; EAS Publication Series, Volume 15), pp. x + 489, ISBN 2-86883-735-2 (hardback), €72.**

Radio astronomy has made enormous strides since Karl Jansky dramatically expanded our multiwavelength horizons seventy-five years ago. In August 2003 JENAM (the annual Joint European National Astronomy Meeting) held a symposium on "Radio Astronomy at 70: from Karl Jansky to microjansky" in Budapest to highlight advances in modern radio astronomy, and this book contains a set of invited review papers presented at that meeting (other papers having already been published in *Baltic Astronomy*, Vol. 14, No. 3, 2005).
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This book is primarily of interest to astrophysicists, and contains excellent reviews of the CMB, extragalactic radio sources, deep field surveys, AGNs, extragalactic radio supernovae, Galactic and extragalactic magnetic fields, Galactic and extragalactic neutral hydrogen, radio emission from stars, pulsars, recombination lines, the ISM and Galactic masers; chapters on radio astrometry and on twenty-first century developments in instrument (including the Planck Mission, ALMA, LOFAR, the SKA, and space VLBI); accounts of the interface between radio astronomy and X-ray and gamma-ray astronomy; Gilmore's short yet illuminating 'outsider's' view on radio astronomy; and a final chapter where Parijskij indulges in a little crystal ball-gazing in his "Radio astronomy: the next 70-year step".

However, three historical chapters launch this book, and these will be of immediate interest to readers of this journal. In the first, F. Graham-Smith discusses "The early history of radio astronomy in Europe", and although his canvass spans England, France, Germany, Hungary, the Netherlands, Norway and Russia, a mere thirteen pages is far too short a space to paint a detailed picture. Although it was pleasing to see photographs of some of the pioneers of European radio astronomy (e.g. Hachenberg, Hanbury Brown, Hey, Lovell, Ryle), I found the text rather superficial, based as it was (in large part) on data drawn from a small number of relatively well-known books. I have to admit that I came away feeling frustrated—Graham-Smith is a famous figure in British radio astronomy, and I was expecting much more.

Fortunately, the two following chapters provided better fare. In the first of these, Alastair Gunn discusses how the study of high-energy cosmic rays "... led to the establishment of Jodrell Bank as one of radio astronomy's founding institutions." In his text, Gunn uses published and archival sources to weave an intriguing tale of science, personalities and politics, extending from wartime radar research to early meteor work at Jodrell Bank, the development of the 218-ft transit instrument, and eventually the 250-ft radio telescope.

Bernard Burke's 30-page chapter on "Early years of radio astronomy in the U.S." provides further, welcome, intellectual sustenance. Jansky and Reber are well-documented by others (Sullivan, 1984, and Kellermann, 2005, respectively), so after quickly disposing of them, Burke introduces us to his early years in radio astronomy at the Carnegie Institution's Department of Terrestrial Magnetism, well-known for the 22 MHz 'Mills Cross' that he and Franklin used to discover Jovian decametric emission. Drawing in his personal knowledge of the U.S. 'scene', Burke then discusses the January 1954 'Washington Conference', which ultimately led to the formation of the NRAO. Along the way, personalities and politics entered the fray, including the power struggle between Merle Tuve and Lloyd Berkner that is deemed to have delayed the establishment of the NRAO by up to a year. Burke then highlights developments by the early radio astronomy groups at Caltech, Harvard and the Naval Research Laboratory, before returning once more to the NRAO and the sagas surrounding the design and construction of the 140-ft and 300-ft radio telescopes. At the time, Burke was serving on the NRAO Advisory Committee, and he found the experience "... both painful and educational." (page 41)! After a diversionary tale about the discovery of quasars (involving both Palomar and Parkes observations), Burke returns to his main theme and summarizes the Lincoln Lab's development of its Haystack 120-ft dish, before discussing early research into the CMB by Penzias, Wilson and Dicke, and the lost Washington opportunity: had fate played a different hand, Burke believes that Hagen's NRL group would have discovered the CBM back in the 1950s. Burke then brings his chapter to an end by discussing the concept of aperture synthesis, the torturous steps that led ultimately to the construction of the VLA, and early attempts at VLBI. All in all, I found this a masterful chapter, and it is a 'must' for anyone seeking a thumbnail sketch of early developments in U.S. radio astronomy. It covers considerable territory, and is enriched throughout by anecdotes and quotes that reveal Burke's personal knowledge of—and, in many cases, his direct involvement in—the various topics that he discusses.

In addition to the three foregoing contributions, some of the astrophysics chapters include valuable historical perspectives. For instance, Bignall, de Bruyn and Jauncey reach back to the 1960s in their discussion of variable extragalactic radio sources; Wielebinski reminds us that the concept of magnetic fields can be traced back more than 3,000 years to the Chinese; Taylor summarizes early Galactic H-line studies; Konovalenko & Stepkin, and Booth, respectively, provide valuable overviews of early work on recombination lines and Galactic masers; Wilson and Batrla discuss the pioneering days of 'radio astrochemistry'; and in his chapter on "Next generation space VLBI" Hirobayashi takes us back to early terrestrial VLBI experiments, and introduces the Radioastron and VSOP projects.

Radio Astronomy from Karl Jansky to Microjanksy is an attractive book and a credit to the editors. It is well laid out and very readable (notwithstanding the technical nature of some of the content). Another notable feature of the volume is the large number of illustrations, many of them in colour. The only obvious limitation I noticed was the absence of an index, yet this is a minor quibble and in no way diminishes the overall value of this volume. It is an excellent reference work for astrophysicists and for historians of radio astronomy who wish to measure their own studies against more recent developments, and at €72 will be an affordable and valuable addition to many libraries.

References

Kellermann, K.I., 2005. Grote Reber (1911-2002): a radio astronomy pioneer. In Orchiston, W. (ed.). *The New Astronomy: Opening the Electromagnetic Window and Expanding our View of Planet Earth*. Dordrecht, Springer. Pp. 43-70.

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In Synchrony with the Heavens. Studies in Astronomical Timekeeping and Instrumentation in Medieval Islamic Civilization. Volume 1: The Call of the Muezzin (Studies I-IX). Volume 2: Instruments of Mass Calculation (Studies

***X-XVIII)*, by David A. King (Leiden, Brill, 2004 & 2005), pp. 930 & 1,068, ISBN 9004122338 (Volume 1) & 900414188X (Volume 2) (Hardback), €380(2 volumes).**

The five prayer times in Islam are based on the astronomical position of the Sun in the sky. They are calculated based on the length of the shadow and the start and the end of the twilight during the day. No Western scholar knows more about the history of regulating the time schedules for these prayers, or the determination of the direction of Mecca, than David A. King, the Professor of History of Science at Goethe University in Frankfurt.

His book *In Synchrony with the Heavens*, which is in two volumes, contains a series of studies that was written by the author over a period of thirty years. Many of the papers in this book have been published before in various journals. However, several chapters of this work are published here for the very first time. They are based on more than five hundred Arabic manuscripts unearthed by the author in libraries around the world that had never been studied before. Dr King confirms that most of the material in this book will be new to many western readers. Surprisingly, he also mentions that some of this material will also by new to many Muslim readers who are unfamiliar with Western writings on the history of Islamic science.

The first volume of this book is titled *The Call of the Muezzin*, and it is divided into several parts. The first and second parts of this volume are surveys of tables for time-keeping by the Sun and stars and the regulation of astronomically-defined times of Muslim prayer for the period between ninth to the nineteenth centuries. The third and fourth sections describe the arithmetical shadow-schemes for time-reckoning, as well as the definition by legal scholars of the times of prayer in Islam. The role of the *Muezzin* and the *Muwaqqit* in medieval Islamic societies is described in part five of this volume. In part six, Dr King writes about the universal solutions to problems of spherical astronomy in Islamic astronomy, and provides examples of universal solutions from *Mamluk* Syria and Egypt. Another aspect of Dr King's work has been in explaining the orientation of medieval Islamic architecture and cities. This combination of architecture and astronomy is revealed in the orientation of the ventilators of medieval Cairo and in the *Safavid* world-maps which were centered on Mecca. These topics are discussed in detail in part seven of this book, where, as in part eight, the author highlights aspects of practical astronomy in mosques and monasteries. inally the last part of this volume, which is titled "When the night sky over Qandahar was lit only by stars ...", is a study of several tables that were found in an astronomical handbook (*Zij*) dating from around AD 1000 written by the astronomer ibn Labban.

The second volume of this book is tilted *Instruments of Mass Calculation*. It opens in part ten with a survey of the astronomical instruments used by Muslim astronomers for over a millennium. The next section of this volume, part eleven, explains the approximate formula for timekeeping which was used for many instruments from the eighth century until the nineteenth century. The author goes on to describe in the next part of this book the use of the universal horary quadrant for timekeeping by the Sun and stars. In the following parts of this volume Dr King conducts several studies on early selected Islamic astrolabes. He gives detailed descriptions of many instruments dating between the eighth and tenth centuries which were found in Baghdad as well as many others which are still preserved in museums and private collections around the world. This second volume then concludes with a detailed checklist of medieval Islamic and European astronomical instruments pre-dating AD 1500 ordered chronologically by region.

Several years ago Dr King coined the term "Astronomy in the Service of Islam", although it is a philosophical debate as to whether it is more accurate to consider Islam's service to astronomers which might better describe the significance of this religion in opening up new branches of astronomical activity in the Islamic civilization. The message that the author always tries to convey throughout his work is summarized in his words: "... the material presented here makes nonsense of the popular modern notion that religion inevitably impedes scientific progress, for in this case, the requirements of the former actually inspired the progress of the latter for centuries."

Finally, I would like to recommend this book to those who are really involved in the study of the history of religious Islamic astronomy. This book is a purely scholarly endeavour, and is by no means a light read. As the nature of this work is a collection of studies, the information is sometimes repeated in a number of different papers. However, Dr King's works are always a delight to read. His knowledge in his field is unequaled today.

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***The Cosmic Century: A History of Astrophysics and Cosmology*, by Malcolm Longair (Cambridge, Cambridge University Press, 2006), pp. xvi + 545, ISBN 978-0-521-47436-8 (Hardback), AU$90.**

The Cosmic Century is unusual in that it is really two books in one. The first book, while focussing on the development of astrophysics and cosmology in the twentieth century, starts by discussing key nineteenth century developments in photography and spectroscopy. The photographs of thousands of stellar spectra led to a classification scheme that, when connected with stellar colour, directly led to the HR Diagram and subsequently to a basic understanding of stellar physics by the time of the Second World War.

This book divides the historical developments broadly into those that occurred before the Second World War, and those that occurred afterwards. Longair makes clear that while the discoveries made before the War depended on nineteenth century technology, those afterwards often depended on new technologies operating at wavelengths other than in the visible region of the electromagnetic spectrum. Radio astronomy is probably the best example. While Jansky and Reber did pioneering work in the 1930s, it was mostly ignored by the astronomical community, and radio astronomy did not 'take off' until the War created both the trained people and equipment that could be used in this new science.

The 'second book', so to speak, is the detailed and clear explanation of the technical developments which, by themselves, could almost make an upper-level undergraduate astrophysics textbook. Longair also includes about fifty pages of explanatory notes where derivations or further details are given to concepts discussed in the text. Fifty-six pages are given to references, so if needs be the interested reader can go to the literature for more information.

This book is more than the sum of the two above-mentioned parts: it is an opportunity to learn astrophysics and cosmology from the point-of-view of what astrophysicists and cosmologists were thinking about as the science developed. The writing is always clear, and this book would make an excellent supplement for an upper-level astrophysics course. Even a less-prepared reader would get a lot out of it if they skipped the more mathematical sections.

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***Journal of the Antique Telescope Society*, #27-#28, 2006 [Special Alvan Clark Issue], pp. 44, US$20:00. Copies of this issue of the *Journal* can be obtained from the Executive Secretary of the Society, Dr Walter Breyer (for details e-mail him at: whbreyer@alltel.net).**

The Antique Telescope Society was founded in 1990 to "... unite colleagues interested in antique telescopes, binoculars,

books, and related items; and to promote the membership's interests in astronomical history and discovery, the history of optics, and the preservation and use of these instruments through stewardship and education."

One of the most valued benefits of Society membership is the *Journal*, and the latest issue deserves special mention. This is a 44-page double number devoted solely to that distinguished American telescope-maker, Alvan Clark.

While Alvan Clark's principal telescopes are well-known and have been brilliantly documented by Warner and Ariail (1995), remarkably little has been written about his early years. In a bid to remedy this, the special 2006 Alvan Clark issue of the *Journal of the Antique Society* contains an introductory paper (by *Journal* Editor, Trudy E. Bell), and the following seven contributions:

- Early Clark I: Alvan Clark's Letters to Boston Newspaper Editors, 1847– 1851 (by Craig B. Waff)
- Table of Alvan Clark's Known Pre-Factory Refracting Telescopes (by Craig B. Waff and Robert B. Ariail)
- Early Clark II: *Scientific American* Coverage of Clark's Pre-Factory Career, 1849–1860 (by Trudy E. Bell)
- Alvan Clark Bicentennial at Mount Auburn Cemetery (by Richard Koolish and Kenneth J. Launie)
- Early Clark III: The Loomis and Clark Connection, 1850–1855 (by Ian R. Bartky and Robert B. Ariail)
- Early Clark IV: William Leitch's 1861 Visit to Alvan Clark's Workshop (by Robert A. Garfinkle)
- Early Clark V: Maria Mitchell's 1872 Notes on Alvan Clark and Telescope Making (by Trudy E. Bell and Robert B. Ariail)

Between them, these well-illustrated papers provide a wealth of new information about Alvan Clark, and throw new light on the early-Clark era. They are essential reading for anyone interested in the history of telescope-making in the U.S.A.

References

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