The Early Years of Radio Astronomy: Reflections 50 Years After Jansky's Discovery

Edited by W. T. Sullivan III
421 pp. Cambridge U.P., New York, 1984. $39.50

Serendipitous Discoveries in Radio Astronomy

Edited by K. Kellermann and B. Sheets
321 pp. National Radio Astronomy Observatory, Charlottesville, Va., 1984. $7.00

Who, in 1930, could have foretold that the rickety contraption rotating leisurely on the open expanse of a New Jersey potato field was destined to open new vistas on the universe? Karl Guthe Jansky, its designer, had started to use it to track down the direction of arrival of the crackling thunderstorm static that plagued the trans-Atlantic short-wave links of the Bell system. He found what he was looking for—the static from occasional local and more frequent distant storms. There was also a very weak but persistent source of static that moved almost completely around the horizon once each day. Jansky could have ignored it, but like a true Prince of Serendip, he was intrigued with his discovery and after extended observations determined that this radio noise was coming from the center of our galaxy. Thus was opened a new window on the cosmos, revealing a sky very different from the optical one we had known before.

When a score of radioastronomers recount their involvement in pioneering a branch of science that changed the course of astronomy, you should, and do, get a fascinating story. Radioastronomy, one half-century after Karl Jansky's discovery, is ripe for the introspective reflections of the pioneers, who give us an inside picture of the complex interplay of instrumentation, research methods and discovery. Covering events prior to 1960, *The Early Years of Radio Astronomy* is a noteworthy contribution

Woodruff Sullivan, the editor, relates interesting details of Jansky's discovery and events leading up to it. He also discusses the question of why Jansky was unable to follow up on his discovery and why the scientific establishment did not do so. Next Grote Reber, who followed Jansky and was for a decade the world's only active radioastronomer, tells his story. Then Bernard Lovell (Jodrell Bank) and others from England and Frank Kerr and other Australians tell their stories of the following decade or two. Other countries represented are Canada, France, Japan and the Soviet Union, but radioastronomy developments in the Netherlands and the US in the 1950s are not included. The book ends with four contributions in a more philosophical vein by David Edge, William McCrea, Hendrick van de Hulst and Owen Gingerich, who analyze cycles of discovery, research styles and the extent of radio's impact on astronomy and cosmology.

There are not many books on the history of radioastronomy. Perhaps the best known is John Pfeiffer's popularly written *The Changing Universe* (Random House, New York, 1956), which covers essentially the same period. Lovell chronicles the remarkable history of one of the world's most active radioastronomy centers in *The Story of Jodrell Bank* (Harper and Row, New York, 1968). A compilation of early articles in scientific journals are reprinted in *Classics in Radio Astronomy* (Reidel, Boston, 1982), edited by Sullivan, and my own *Big Ear* (Cygnus–Quasar, Powell, Ohio, 1976) tells the story of the Ohio telescope.

Early Years is well documented with references and well illustrated with photographs of the pioneers and their radio equipment along with many graphs and drawings. It is not a text, yet it teaches a lot of basic radioastronomy, doing so in an interesting narrative manner, without mathematics.

Serendipitous Discoveries in Radio Astronomy is the result of a workshop organized by Kenneth Kellermann of the National Radio Astronomy Observatory and held at Green Bank, West Virginia, in May 1983, 50 years after Jansky's discovery of cosmic radio waves. Several dozen pioneers met with 27 members of the Jansky family to do homage to Karl and to recount their role in the early development of the new science of radioastronomy. Not only the presentations but also the discussions that accompanied them are recorded in the book, and here we sense keenly how differently science is done from the way it is usually perceived.

There were talks by a science analyst, Martin Harwit; a science reporter, Walter Sullivan; and a historian of astronomy, Woodruff Sullivan III. The discovery of Jupiter's radio signals was related by Kenneth Franklin, and the first detection of the hydroxyl-radical line, which resulted in the discovery of giant molecular clouds, by Alan Barrett. The discovery of quasars was recounted by Maarten Schmidt; the discovery of the 3-K background of the primordial fireball by Robert Wilson of Bell Laboratories, and Princeton University's role, by David Wilkinson; the determination of Mercury's rotation period, by Gordon Pettengill; and the delightful story of the first pulsar, by Jocelyn Bell Burnell. The last tale alone is worth the price of the book. Papers by Reber and John Bolton were presented *in absentia*.

Jesse Greenstein, Geoffrey Burbidge,

Frank Drake, Harry van der Laan, John Findlay and many, many others told fascinating stories, but John Broderick's talk on the "buffalo syndrome" is a classic and deserving of special mention. It pictures the plight of the scientist who can't get support to do an unpopular experiment because the buffalo herd is going the other way. But when someone demonstrates that his idea has merit, the herd turns and tramples him in its stampede.

Controversial issues were freely discussed. The charges that "no major discoveries have been made at a national center" and that "by building big instruments, by determining the total means of doing research . . . [everyone goes] down the same road in lockstep" elicited spirited discussion. The talks brought out that essentially all of radioastronomy was pioneered by persons who came in from the outside—many trained as physicists—and were not regarded by optical people as real astronomers. Not only was Jansky trained as a physicist—he obtained a BS and MS in physics from the University of Wisconsin—but he was even named after a famous University of Michigan physicist, Karl Guthe.

Of serendipity and discovery, R. Hanbury Brown commented that you need the right man in the right place at the right time, but he must be a man who doesn't know too much. This explains how physicists and engineers came into radioastronomy and made discoveries. "Many of them didn't know the Sun from the Moon or a planet from the stars. But that was all right; they were self-reliant people who got on with their job."

Profusely illustrated with photographs and drawings, *Serendipitous Discoveries in Radio Astronomy* is a unique contribution to the literature of science and discovery, focusing on how pioneers succeed in spite of the odds. It can be read with benefit by students, amateurs and professionals of all disciplines.

As one of the participants, I found the workshop to be a thrilling and unforgettable experience. The editors are to be commended for making the full proceedings available in book form.

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Vibrational Spectroscopy at High External Pressures: The Diamond Anvil Cell

John R. Ferraro
264 pp. Academic, New York, 1984. $59.00

The diamond-anvil cell has evolved since its creation in the late 1950s to one of the most powerful research tools in high-pressure science. This text deals with the cell and its application to infrared and Raman spectroscopy. The eight chapters may be divided roughly into two parts: The introductory sections discuss designs and pressure calibration, and the remainder of the book is concerned with spectroscopic studies of a wide variety of materials. It does provide a concise review of the diamond-anvil cell and of the effects of pressure on various vibrational modes in a number of classes of solids.

Unfortunately, at times Ferraro's references to historical or scientific detail are inaccurate. For example, in the preface he tells us that "the diamond anvil cell (DAC) was discovered by workers at the National Bureau of Standards. . . ." To be sure, Alvin Van Valkenberg and Charles Weir (to whom the book is dedicated) were instrumental in the development of the cell at NBS and most of the design improvements occurred there over the following 15 years, but the idea of using opposed diamonds for the generation of pressure was also employed indepen-