state & society

Radioastronomers Ryle and Hewish win Nobel Physics Prize

Two Cambridge University radioastronomers, Sir Martin Ryle and Antony Hewish, share this year's Nobel Prize for Physics. Ryle is cited for his "pioneering work" in radioastronomy, especially the development of antenna synthesis, and Hewish for the discovery of pulsars in 1967.

This is not only the first Nobel Prize to be presented for contributions to radioastronomy—it also marks the first time the committee has awarded the prize to fulltime astronomers of any description. The other examples that come to mind—Albert Michelson for optical interferometry, especially his stellar interferometer (1907) and Hans Bethe for his work on nucleosynthesis in the interiors of stars (1967)—are of physicists cited for astronomical applications of their research. Ryle and Hewish will share the prize valued this year at $124 000; the ceremony is to take place in Stockholm on 10 December.


HEWISH AND RYLE

Ryle, now 56, worked on radar during World War II and began his career as a radioastronomer with a German "Wurzburg" radar dish at Cambridge in 1946. Wartime radar work had given radioastronomy a flying start in several European centers at that time with discoveries such as the solar radio emissions investigated by J. S. Hey in 1942.

Ryle's major contribution to observational technique since then has been in the development and improvement of "aperture-synthesis" telescopes, and the closely related radio interferometers, for continually higher angular resolution. "Aperture synthesis" refers to the use of two or more relatively small antennas that can be moved to occupy successively the positions of individual components in a much larger array, so boosting the effective aperture of the instrument to something approaching the maximum separation of individual elements.

Starting with relatively simple combinations of linear fixed reflectors and single movable elements, Ryle added his one-mile interferometer (consisting of three 60-foot diameter paraboloids, one of them movable) in 1968. The rotation of the east–west baseline of this instrument over a 12-hour period allows for the synthesis of an aperture equivalent to that of a one-mile diameter paraboloid; the steerable elements can follow any point in the northern skies visible from Cambridge's latitude.

The eight-element, five-kilometer interferometer completed in 1972 represents the latest improvement in observational power. Its angular resolution, at wavelengths from 3 to 21 cm, is about

continued on page 80

Future of US medium-energy facilities is uncertain

Low budgetary levels through the 1970's might force the shutdown of at least one of four new US medium-energy physics facilities, according to a report issued by the Atomic Energy Commission and the National Science Foundation. This survey of US medium-energy science, prepared at the request of the two agencies, details the consequences of low, intermediate and high-funding levels on program priorities and on the new installations, which are currently in transition from construction to operation. A 15-member *ad hoc* committee, headed by Roger H. Hildebrand (University of Chicago), prepared the report, which also includes recommendations for the orderly transition from older to newer machines (having greater intensity, energy range and resolution), an outline of opportunities for different nuclear-structure studies at higher energy machines and recommendations for international cooperation in medium-energy research.

The report is the first to examine the field (covering roughly 100 to 1000 MeV) in a number of years and because it was completed shortly before the FY 1976 budget is to be finalized, the report will be an important source of advice for NSF and AEC (which provide principal support for the medium-energy field) in coordinating and planning medium-energy programs.

The older facilities in the report are the 184-inch synchrocyclotron at the Lawrence Berkeley Laboratory and the synchrocyclotron at the Space Radiation Effects Laboratory (SREL) in Newport News, Virginia. The newer facilities include the newly rebuilt Nevis synchrocyclotron at Columbia University, expected to be operational next year; the linear accelerator at the Clinton P. Anderson Meson Physics Facility in Los Alamos, New Mexico (LAMPF), recently operational at low

Nobel Chemistry Prize

continued from page 78

tion-dependent properties (such as chain dimensions, dipole moments and optical polarizability tensors) over all configurations of virtually any macromolecular chain of specified chemical structure.

His career has carried him through a number of industrial and academic positions including stays at Dupont (1934–38), the University of Cincinnati (1938–40), Esso Laboratory (1940–43), Goodyear (1943–48), Cornell University (1948–56), Mellon Institute (1956–61) and Stanford University (1961 to the present). He has written two books: the enduring *Principles of Polymer Chemistry* (1953) and *Statistical Mechanics of Chain Molecules* (1969).

In looking over the significance of Flory's career, polymer chemist Eugene Helfand (Bell Laboratories) commented to us, "Beyond the breadth of his research, Flory's impact is attributable to the fact that he challenged the central problems, provided practical solutions and verified them with the right experiments." —RAS

Nobel Physics Prize

continued from page 77

one sec of arc—a figure comparable to that of larger optical telescopes on good mountain sites.

In all these multiple-element telescopes Ryle has made perhaps his strongest contributions to the art with his elegant improvements in the electronics of receiver technique. One example is "phase-switching," a trick of interferometer circuitry that considerably improves sensitivity and stability.

Ryle's observing program has included studies of the structures of radio sources and the establishment of accurate positions for comparison with visible objects. His "Third Cambridge Catalogue" of some four hundred sources, published in 1959, has given us the familiar "3C" numbering system by which most of these objects are still known. A fourth and a fifth catalogue have followed since.

The program of detailed counting made possible by this cataloging activity enabled Ryle to pursue his cosmological interests; from the distribution of these objects in space he believes he has evidence to support the "big-bang" theory of the creation of the Universe over the rival "steady-state" theory. Although this question is still not resolved to everyone's satisfaction, there is no doubt that Ryle's statistical work on radio sources has stimulated the progress of the argument.

A Fellow of the Royal Society since 1952, Ryle was appointed the first professor of radioastronomy at Cambridge in 1959. He received his knighthood in 1966 and became Astronomer Royal in 1972. In his spare time he is a keen sailor and boatbuilder.

Hewish, now aged 50 and like Ryle a Fellow of the Royal Society, is a Fellow of Churchill College and has been a professor of radioastronomy since 1971. He first joined Ryle in the early days of the Cambridge radio observatory, (renamed the Mullard Radio Astronomy Observatory in 1957) where he assisted in the development of antenna arrays and made some observations of radio emission from the solar corona. Then he became interested in interplanetary scintillation of radio sources—a "twinkling" effect due to spatial and temporal irregularities in the interplanetary medium. This work had two aims: one, the study of the interplanetary medium itself, and the other, the detection of small angular-diameter radio sources. Only objects smaller than 1 sec of arc can scintillate in this way, and some information on their angular structure can be inferred.

In August 1967 Hewish started a thorough survey of the sky with a new fast-response antenna, specially designed for detecting scintillating sources. With this fixed horizontal array, built very cheaply with student labor and covering four and a half acres, Hewish planned to survey the entire sky once each week. But at the end of that month he and his student, Jocelyn Bell, noticed unexpected scintillations in a region (away from the Sun) where a strong effect was not anticipated. The extreme regularity of these "scintillations" became apparent for the first time on 28 November when an improved recording system showed pulses above the noise level; after ruling out all likely sources of interference the Cambridge group realized they had something very unusual on their hands. A search of the records revealed three more of these "pulsars," as they quickly became known, and by late 1968 the world of radioastronomers was in a ferment as yet more were discovered at other laboratories.

Theories of what pulsars might be abounded, of course, in those early days. Even the possibility of communication from distant civilizations was admitted—Hewish's designation of the first four pulsars, on the original data sheets, as "LGM 1," "LGM 2" and so on (for "Little Green Men") was intended as a wry reference to this remote possibility.

But soon the theoretical speculations settled down to two kinds of models—pulsating white dwarfs and rotating neutron stars. Now, six years later, neutron-star models appear to have everyone's support. In May of 1968 Hewish foresaw this possibility in a conversation with PHYSICS TODAY. "We are keeping an open mind," he said, "but we don't discount neutron stars." Noting that theoreticians "have a fair amount to play with," he added that "this is a good time to be a theoretician." Certainly pulsars have turned out to be not only very exciting for astronomers but also, as neutron stars, a very fundamental discovery for all physicists. —JTS

Election results

There were three winners among the five scientist-candidates whom we reported on in October (page 77). Incumbents George Brown Jr (D-Cal.), James Martin (R-N.C.) and Mike McCormack (D-Wash.) retained their seats. The two first-time scientist-candidates, Democrats George Seielstad (Cal.) and Lloyd Wood (Ohio) were not able to unseat Republican incumbents W. M. Ketchum and W. H. Harsha respectively.

in brief

The application deadline for National Science Foundation energy-related graduate traineeships is 6 January, with awards scheduled to be made in late April. Information is available from Fellowship and Traineeship Section, Division of Higher Education in Science, NSF, Washington, D.C. 20550.

Postdoctoral research associateships and visiting fellowships to the Joint Institute for Laboratory Astrophysics for 1975–76 are available. Applications for research associateships may be submitted at any time, although mid-February is most advantageous; visiting fellowship applications are due before 16 January. Contact G. Dunn, Visiting Scientists Program, JILA, University of Colorado, Boulder, Colo. 80302 for information and applications.

The AAAS is sponsoring a Mass Media Intern Program for advanced graduate students in the social and natural sciences for Summer, 1975. The deadline for applications is 1 February. For further information, contact W. Weisman-Dermer, Communications Office, AAAS, 1776 Mass. Av, NW, Washington, D.C. 20036.

Approximately 250 National Research Council postdoctoral research associateships of $15 000 or more in federal labs and research centers will be available in the physical, earth and biological sciences for 1975. Applications are due 15 January. Details are available from Associateship Office, JH 606-P, National Research Council, 2101 Constitution Ave, NW, Washington, D.C. 20418. □