"Leopold [second from left] and students prepare a restored prairie for burning at the University of Wisconsin Arboretum, about 1945." [Bradley Center Archives; from *Aldo Leopold: His Life and Work*]

science, western lands, and environmentalism, this definitive biography should be read as well by those interested in our nation's past in general, for it portrays the transformation of the United States from a frontier culture into an increasingly scientific society—a transformation which, as Leopold's life shows, has not been entirely detrimental to our environment.

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## Research in Neuroscience

**Fidia Research Foundation Neuroscience Award Lectures.** Vol. 2, 1986–1987. ALFRED G. GILMAN, ERWIN NEHER, TOMAS HÖKFELT, JOSEPH B. MARTIN, and VIKTOR HAMBURGER. Raven, New York, 1988. x, 164 pp., illus. $39.

Recent advances in biophysical and molecular approaches to neuroscience have affected areas as distinct as signal transduction and inherited neurological disorders. This collection contains the lectures of the 1986 Fidia Foundation Award recipients, who represent a broad range of disciplines in neuroscience. The lectures honor Rita Levi-Montalcini, Luigi Galvani, Camillo Golgi, and Vittorio Erspamer. Dedicated as a whole to Levi-Montalcini, the volume commemorates her contributions to neuroscience by reprinting the report on the partial purification of nerve growth factor that she published with Stanley Cohen in the *Proceedings* of the National Academy of Sciences.

In addition to the diversity of subject matter, the lectures vary in approach, ranging from general reviews to outlines of the author's own work. Although some of them suffer from attempts to combine these approaches in too little space, their accessibility outweighs any deficiencies; the volume is well worth the reading, especially for nonspecialists.

In the first lecture, A. Gilman discusses the role of G proteins in transmembrane signaling. Then E. Neher describes his innovative patch clamp approach to solving the mechanisms of secretion. Hökfelt and colleagues analyze the ups and downs of various immunohistochemical approaches to determining peptide and transmitter phenotypes of central and peripheral neurons. This discussion is supplemented by summary tables that help the novice understand where particular transmitters and peptides are located. It includes a brief foray into the physiological implications of peptide and transmitter coexistence and speculation on their potential relevance to disease. J. Martin's lecture provides an excellent introduction to molecular genetic approaches to clinical neurology. The use of linkage analysis to locate the genes responsible for several inherited neurological disorders is described in a manner that conveys both the technical essentials and the excitement of this endeavor.

Each lecture is preceded by a biographical sketch of the neuroscientist for whom it is named. Pietro Corsi deftly condenses the lifelong contributions of Levi-Montalcini, Galvani, Golgi, and Erspamer into one-and-a-half-page essays. These summaries add a valuable dimension to the lectures that follow, since the work of each award recipient is somewhat related to that of the neuroscientist whom the lecture honors.

The final complement is a special lecture given by Viktor Hamburger on the occasion of his receiving the Fidia-Georgetown Award in Neuroscience, given every three years. Hamburger, the acknowledged father of neuroembryology, is the first recipient of this award in his field. His brief discourse—also preceded by a biographical sketch by Corsi—covers some of the first experiments of Mangold, Spemann, Harrison, and Detwiler on neural induction. Hamburger then traces the path of his investigations and collaborations that led to the discovery of the role of target tissue in neuronal survival, of naturally occurring neuronal cell death, and ultimately of nerve growth factor—an appropriate ending for this volume dedicated to Levi-Montalcini.

In sum, this collection is highly readable, bringing several key areas in neuroscience within easy reach of the newcomer. The volume also contains sufficient new perspective to be reasonably informative to the seasoned neurobiologist. One cannot, however, help being frustrated by the brevity of some of the contributions, given their high quality.

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## Nucleosynthesis in Stars

**Cauldrons in the Cosmos.** Nuclear Astrophysics. CLAUS E. ROLFS and WILLIAM S. RODNEY. University of Chicago Press, Chicago, 1988. xviii, 561 pp., illus. $74.95; paper, $34.95.

In this book the authors effectively communicate their fascination with a subject that has motivated the large volume of experimental work produced in their respective careers. As is stated by William A. Fowler in the foreword, "*Cauldrons in the Cosmos* is a potent witches' brew distilled from the ferment in the authors' hearts and minds, stimulated by their joy and delight in the nature of the universe which they, and we, inhabit." The authors describe how nuclear astrophysics has developed as a merger of astronomy, astrophysics, and low-energy nuclear physics sustained by "two of the most fundamental traits of human character: the need to explore and the need to understand." The book is written in an informal style that those uninitiated in the jargon of nuclear astrophysics and astronomy will find readable and illuminating. It covers essentially every topic of relevance to nuclear astrophysics, with emphasis on those that are most readily studied by modern laboratory techniques.

Since the book is written from the viewpoint of experimentalists, it includes many intuitive discussions of astrophysical concepts in place of rigorous theoretical treatments. It is an excellent supplement to D. D. Clayton's *Stellar Evolution and Nucleosynthesis*, both because of its pragmatic viewpoint and because it updates a number of developments in nuclear astrophysics during the 20 years since that book was first published. The preface also includes an interesting historical overview of the development of modern astronomy.

A major fraction of the book is devoted to stellar reaction rates, with an in-depth discussion of the accelerator and detection techniques for measuring them. Indeed, I have not found such a thorough discussion of modern low-energy nuclear laboratory techniques even in textbooks on nuclear

physics. Prospective graduate students in experimental nuclear astrophysics will find this material essential.

The discussions of the burning stages of stellar evolution are interspersed with discussions of the state-of-the-art measurements of the relevant quantities. Students will find these discussions useful as a means for understanding the uncertainties in the field. Theoreticians will also find the book helpful, both for its explanations of experimental techniques and its overviews of a number of outstanding problems.

In summary, *Cauldrons in the Cosmos* is a useful and long-awaited introduction to nuclear astrophysics from the viewpoint of those who have labored to provide the insight that could only be obtained from laboratory-based low-energy nuclear physics. I strongly recommend it to anyone who wishes to understand the way in which this field has progressed toward a systematic scientific explanation of much of the observed universe.

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## Some Other Books of Interest

**Tributes to Paul Dirac**. J. G. TAYLOR, Ed. Hilger, Bristol, U.K., 1987 (U.S. distributor, Taylor and Francis, Philadelphia). x, 123 pp., illus. $22. Based on a meeting, Cambridge, U.K., April 1985.

**Reminiscences About a Great Physicist**. Paul Adrien Maurice Dirac. BEHRAM N. KURSUNOGLU and EUGENE P. WIGNER, Eds. Cambridge University Press, New York, 1987. xviii, 297 pp., illus. $49.50. Based on a meeting, Jan. 1983.

P. A. M. Dirac, in the words of Abdus Salam "undoubtedly one of the greatest physicists of this or any century," died in Florida in October 1984 at the age of 82, and the following April a meeting honoring his memory was held at Cambridge University, where he had spent most of his career. *Tributes to Paul Dirac* consists largely of talks given at that meeting. After an introduction by P. T. Matthews the book opens with a "biographical sketch" of Dirac by R. H. Dalitz, to which is appended a list of his major papers and his books, most notably *The Principles of Quantum Mechanics*, first published in 1930 and still (in a fourth edition) in use. There follows a section of brief personal reminiscences by former students and colleagues of Dirac's: R. J. M. Phillips, J. C. Polkinghorne, Rudolf Peierls, Bertha Jeffreys (Swirles), Eugene Wigner (Dirac's brother-in-law), J. E. Lannutti, S. Shanmugadhasan, and C. J. Eliezer. The remainder of the volume is devoted to appreciations of Dirac's contributions in various areas of physics: Jagdish Mehra and Polkinghorne on the early development and the interpretation of quantum mechanics, Salam on finite field theories, James Lighthill on Fourier analysis and generalized functions, Peter Goddard on magnetic monopoles, and Taylor on constrained dynamics.

*Reminiscences About a Great Physicist*, now also presented as a memorial, was originally intended as a festschrift for Dirac's 80th birthday. It consists, in addition to various prefatory matter (including a drawing of Dirac by Richard Feynmann), of 23 papers by 25 authors, including a number also represented in *Tributes* and others who knew Dirac during his later years in the United States. The first group of papers, headed Human Side, includes reminiscences by Dirac's widow, Margit, and by Lannutti, Peierls, Wigner, and five others. Under the heading More Scientific Ideas Dalitz discusses Dirac's more practically oriented work, particularly during World War II, and A. Pais provides a discussion drawn partly from his book *Inward Bound*. More technical contributions are provided by four other authors or pairs of authors, and the section also contains a paper by Dirac ("The inadequacies of quantum field theory") presented at the meeting from which the volume stems. Among the final group of papers, Influenced and Inspired by Association, are the paper by Salam also included in *Tributes* and papers by Nevill Mott and Willis E. Lamb, Jr. There is redundancy among the contributions—there are, for instance, at least two versions of Dirac's meeting with E. M. Forster, a number of contributors proffer Dirac's own explanation of his much-noted taciturnity, and there are several outlines of his family background and education—but, as the title of the book indicates, the contributors also offer many anecdotes and impressions from their own direct experience of Dirac.—**K.L.**

**Instruments and Experiences**. Papers on Measurement and Instrument Design. R. V. JONES. Wiley, New York, 1988. xii, 485 pp., illus. $79.95. Wiley Series in Measurement Science and Technology.

R. V. Jones, perhaps most broadly known for his work in scientific intelligence in World War II, has since the 1930s been concerned with the design and performance of scientific instruments. Here he brings together a selection of his papers in the field, dating from 1951 to 1979. Because of teaching and other duties, Jones writes in the introduction, "I had to concentrate on problems that escaped the attention of large teams, and which could be taken up and laid aside, rather like knitting. . . . With basic interests in optics and in sensitivity of detection and in precision of measurement, I was naturally led to appreciate the importance of mechanical design, and the frequency with which optical and electronic design of the highest quality could be let down because too little attention had been paid to mechanical detail." The 31 papers chosen to represent this work are grouped into 10 "chapters." The opening chapter is a retrospective account of the author's early work on the detection of infrared radiation (work that could not be published because of its relevance to air defense). After the war Jones was elected to Clerk Maxwell's former chair at the University of Aberdeen, Scotland, where he took up work on optical levers, the subject of chapter 2. Subsequent chapters represent work on spring movements, microbarographs, capacitance micrometers, and measurement of optical radiation pressure and "aether drag." Each group of papers is preceded by an informal "commentary" giving some of the scientific rationale and "less lofty considerations" underlying the work covered. Part 2 of the volume is less technical in character, containing an essay on "some factors in the design of instruments that experience has taught [the author] to value," an "idiosyncratic review" of trends in instrumentation, and the texts of five lectures on broader themes—education, the advancement of learning—as related to instrumentation.—**K.L.**

**Kelvin's Baltimore Lectures and Modern Theoretical Physics**. ROBERT KARGON and PETER ACHINSTEIN, Eds. MIT Press, Cambridge, MA, 1987. xii, 547 pp., illus. $40. Studies from the Johns Hopkins Center for the History and Philosophy of Science.

In 1884 Sir William Thomson, later Lord Kelvin, delivered a series of lectures on wave theory and molecular dynamics at Johns Hopkins University. "Despite the fact that in these lectures Kelvin argued against the electromagnetic theory of light and proposed a model for the ether that few Americans were willing to take up," writes Robert Kargon in the introduction to this volume, "his enthusiasm for the discipline, his personal magnetism, and his performance gave a tremendous boost to the morale of the fledgling physics profession in the United States, and provided a focus for interest in mathematical physics, a subject not at the time noticeably strong in the western hemisphere." A revised version of the lectures was published in 1904 under the title *The*