In Memoriam

William H. Beatty III, a member of the AGU Ocean Sciences Section since 1973, died at 41 in June 1987.

Noye Johnson, a Dartmouth geology professor and pioneer in the study of acid rain, died on December 27, 1987, in Hanover, N.H. He had been a member of AGU since 1963.

John Roehl, an AGU member from Myrtle Beach, S.C., died on August 29, 1987.

Newton Stone of Cathedral City, Calif., a member of the AGU Atmospheric Sciences Section since 1950, died on November 21, 1987.

Steven Zarbin, 46, a member of the Tectonophysics Section since 1969, died recently.

Books

History of British Space Science

PAGE 33

Harrie Massey and M. O. Robins, Cambridge University Press, New York, xxi + 514 pp., 1986.

Reviewed by Allan A. Needell

On May 13, 1953, as H. S. W. Massey (born Harrie Stewart Wilson Massey) was leaving his office to take part in the annual cricket match between the staff and students of the University College London physics department, he received a fateful telephone call from an official at the Ministry of Supply. According to Massey, the official asked whether he would be interested in using ministry supplied rockets for scientific research. "Without hesitation he said 'yes' and this really marked the beginning of the British scientific rocket programme," (p. 17).

Sir Harrie Massey died on November 27, 1983. In addition to an extraordinary scientific career, and a career as a senior statesman of British science, Massey also left behind an essentially completed manuscript devoted to chronicling the major events and accomplishments of British space science. The book project, according to M. O. Robins (Massey's coauthor and a pioneer in British rocketry and space science in his own right) was conceived in 1978. In 1981 the authors received a commission from the British Science and Engineering Research Council (SERC). The present volume is the result.

Leaving aside for the moment considerable difficulties that arise for historians because of the authors' failure to adequately cite or describe their extensive unpublished source material, the volume provides a review of the scientific and technical issues and the organizational and political debates surrounding the exploitation by Massey and his colleagues (primarily at British universities) of rocket, satellite, and space probe technology. It provides a fascinating and important perspective, one different enough from the American view to help provide insight into the rapidly changing post–World War II relationships between science, economics, and politics — both national and international.

During the 1950s in Britain, as in the United States, there were already a number of scientists, primarily those interested in the ionosphere, whose research work could be significantly aided by rocket and space research techniques. In Britain, which in the 19th century had been a leader in the development of military rockets, the technology was made available only when scientists recognized the potential of using the guided missile systems developed after the end of World War II for scientific purposes. Again as in the United States, the development of guided missile systems in Britain involved many military organizations, in the latter case including the Royal Aircraft Establishment (RAE) at Farnborough, the Admiralty, the Ministry of Supply, Woolwich Arsenal, and the Armament Research and Development establishment. British industry was also deeply involved, as were other Commonwealth countries. Most notably, a test range was established near Woomera, Australia.

Gradually the RAE assumed a leadership and coordinating role in the development of rocketry in Britain. Its Controlled Weapons Department (later the Guided Weapons Department), led by D. G. King-Hele, began development in 1953–1955 of what would become the British Skylark scientific sounding rocket. At the same time, spurred on by contact with the American Rocket Research panel and an international conference on rocket research held at Oxford in 1954, British scientists — most notably Massey and his colleagues at University College London and elsewhere — began to explore ways in which they might use rockets to further their research on atmospheric chemistry, optical phenomena in the atmosphere, radio propagation, and winds at high altitude.

Of course, it immediately became apparent that the funds required for rocket research were far greater than those available to existing departments and research groups and that a mechanism for coordinating the scientific use of rockets and for obtaining government support had to be created. The mechanism used was the committee structure of the Royal Society, specifically the Gassiot Committee, the long-standing advisory committee of the Royal Society devoted to meteorological and geomagnetic researches. Early in 1955 a new subcommittee of the Gassiot committee was established to advise the full committee on upper atmosphere research using rockets.

While the Skylark program developed, leading to successful flights from the Woomera test range beginning in late 1957, U.K. scientists actively participated in several aspects of the International Geophysical Year. A special National Committee for the IGY was set up by the Royal Society in 1953. In addition to participating in meteorological and rocket programs, British scientists were interested in the research potential of Earth-orbiting satellites whose launch was predicted by both the United States and the Soviet Union. However, because British scientists had no access to the actual satellites, they concentrated on the potential of tracking the satellites in orbit, using both active and passive methods. Such tracking provided important data on Earth's gravitational field and on radio propagation through the ionosphere.

Once satellites became a reality, British scientists faced the problem of arranging for a more permanent post-IGY organization and for defining what was to be done on a national basis and how to take advantage of international opportunities that might arise. Especially important was the prospect of pursuing bilateral cooperative agreements with the new U.S. National Aeronautics and Space Administration (NASA) and eventually joining with other European countries in their efforts to pool their resources to provide European scientists with independent capabilities for research using advanced technology.

The earliest of the bilateral programs was the agreement that NASA would launch the Ariel satellites, whose instrumentation was British. The European efforts gave rise first to the European Launch Vehicle Development Organization (ELDO) and the European Space Research Organization (ESRO), which were organizational forerunners of the current European Space Agency (ESA). Massey recounts these efforts in detail from his unique perspective.

For the U.S. reader, viewing the evolution of space science from the vantage of the leading British participant aids in sorting out certain ways in which seemingly inevitable organizational and institutional arrangements in fact reflect specific national contexts. For the historian, understanding how special contexts determined special arrangements is a central issue. It is only to be lamented that this contribution does not provide more critical and explicit evaluation of its sources or the results of careful, creative digging for additional evidence and documentation. This book is, after all, a memoir dedicated to putting on the record the facts as they were experienced by its authors. It does succeed. The historical research that is yet to be done will certainly build upon what is presented here.

Allan A. Needell is with the National Air and Space Museum, Smithsonian Institution, Washington, D.C.

Tectonostratigraphic Terranes of the Circum-Pacific Region

PAGES 33, 37

David G. Howell (Ed.), *Earth-Science Ser.*, vol. 1, Circum-Pacific Council for Energy and Mineral Resources, Houston, Tex., ix + 581 pp. (+ color map), 1985, $32.00.

Reviewed by Rob Van der Voo

Have you always wondered where the Tujunga, Baldy, and Cortez terranes might be located today, let alone during the Cretaceous or early Tertiary? This book may provide the answer, because in a little less than 600 pages for $32, which includes a marvelously pro-

duced color map of the entire Circum-Pacific region, one can read almost everything one wants to know about Earth's "ring of fire" and its displaced or suspect terranes. The printing, proofreading, illustrations, and references are all of the highest caliber, and the book is handsomely produced indeed. In page-by-page reading, I found maybe five typographical errors, but I will spare you the details.

The contents of the book are divided into five parts, comprising principles or applications of terrane analysis and four unequally long parts on the four quadrants of the Pacific coasts. The northeast quadrant includes Alaska, the Canadian Cordillera, the U.S. coastal and Rocky Mountain belts, and Mexico; the northwest includes Kamchatka, northeast Asia, China, Japan, Taiwan, and the Phillipines; the southwest section has articles on Australia, Malaya, Indonesia, New Zealand, and Antarctica; and the southeast comprises the Andes from Colombia to southern Chile. The book offers introductory text for beginning students of terrane analysis, as well as plenty of useful details and data for the expert who needs a handy reference volume. Subject matter or emphasis ranges from hydrocarbon generation in marginal basins, biogeography, paleomagnetism, geochronology, and structural and metamorphic aspects to stratigraphy and shows how the entire discipline of geological sciences is contributing to terrane analysis. There is literally something here for everyone in solid Earth science.

Of necessity, the number of contributions to each of the four quadrant sections is variable, ranging from 19 for the northeast quadrant to three for the southeast. Nevertheless, every tectonic element around the Pacific is covered one way or another, accompanied by index maps and useful cross sections. When I read through the individual articles, I was impressed by the uniformly high level of readability and the accessibility of the information presented. Moreover, I could not find examples of overinterpretation or wild speculation, although I am certain that there are ambiguities and controversial aspects to each area discussed. Although this book is an up-to-date account of our current knowledge, it is not a complete encyclopedia of where a given terrane originated or how it arrived at its present location. If anything, this collection of articles forms a set of pointers for future research. If this book has a drawback, it is that the index does not contain enough entries. Thus it is not very easy to look up locations or geographic names if one does not remember in which part of the globe these were to begin with.

Every practicing tectonicist with interests in displaced terranes will want to purchase this volume, and I recommend liberal placement of owner identification in this book to avoid unwanted "long-term borrowing." The 1:17,000,000 map can be ordered separately and is "worth the detour," to borrow a phrase from the *Guide Michelin*.

By the way, those three mystery terranes (Tujunga, Baldy, and Cortez) are in southern California, just east of Los Angeles.

Rob Van der Voo is with the Department of Geological Sciences, University of Michigan, Ann Arbor.

Fabry-Perot Interferometers

PAGE 37

G. Hernandez, *Cambridge Studies in Modern Optics*,1 vol. 3, Cambridge University Press, New York, xvi + 343 pp., 1986, $69.50.

Reviewed by R. J. Sica

This third volume of the *Cambridge Studies in Modern Optics* is a comprehensive and authoritative treatise on the design, construction, and analysis of measurements from these multiple-beam instruments. Its treatment of the Fabry-Perot interferometer is highly mathematical and unified, weaving together in a coherent and consistent format the work of over 400 different authors. The author is well qualified to discuss these topics, having used these devices to study the dynamics of the upper atmosphere for the past 25 years. During this time he has made several fundamental contributions to interferometry, in addition to aeronomy.

Chapter 1 is an excellent, and for many of us, long-overdue historical perspective on the Fabry-Perot interferometer, with an interesting account of the early work of R. Bouloch. The backbone of the book, the mathematical treatment of the Fabry-Perot interferometer, is contained in Chapter 2. The mathematical formalism of the ideal interferometer is extended to imperfect devices, off-axis systems, and continuous spectra.

One of Hernandez's important contributions to the field of interferometry is the extension of Chabbal's and Jacquinot's work on the luminosity × resolution product to yield unambiguous values of the optimum reflectivity and scanning aperture for a given spectral line of a given width to be measured. Chapter 3 contains a detailed discussion of this topic, starting with Chabbal's initial work. Specific optimization results for high-resolution investigations of single-line spectra are presented, and these are of particular interest for aeronomical and astronomical applications. Although the results are discussed in the context of a scanning instrument, modifications and trade-offs of the results when modern imaging devices are employed are discussed. This chapter also covers the optimization of instrumental operation from the perspective of equal time or equal noise methods of sampling.

Multiple-etalon devices are discussed in Chapter 4. Two-etalon systems are discussed in considerable detail, and a complete description of polyetalon devices is included. A detailed treatment of the author's high-luminosity Twin-Etalon Scanning Spectrometer as a member of a family of devices that allow an increase of flux to reach the detector without a significant loss in resolving power is given. Other classic configurations of the Fabry-Perot interferometer, such as Connes' spherical Fabry-Perot, are discussed in Chapter 5. Of particular interest in this chapter is the treatment of etalons of finite size and their effect on the retrieval of line shapes and positions.

Chapter 6 covers the topics of emission and absorption inside the etalon cavity. The topics naturally follow into a section on the most popular use of the Fabry-Perot interferometer in both the laboratory and everyday life, as the resonance cavity for a laser. Selection of individual laser modes by using various optical devices inside the laser cavity is discussed.

The treatment of practical Fabry-Perot interferometers in Chapter 7 is in the form of an extended review paper. Practical etalons, their spacers and support, scanning techniques, alignment and spacer control, choice of mirrors, and selection of a Fabry-Perot are covered. Unfortunately, the many illustrations of various instruments in the first section of this chapter are often difficult to understand because of the terse figure captions. A full understanding of any of the devices would require the original papers, to which there are numerous references. The rest of the chapter, particularly the excellent section on selection of a Fabry-Perot interferometer, is sufficiently detailed.

The book ends with a chapter on nonclassical Fabry-Perot devices, including insect eye lenses, parallel Fabry-Perot interferometers, and multiplexing techniques. A comprehensive bibliography, glossary, and author and subject indices follow.

Hernandez has successfully blended his own numerous contributions to Fabry-Perot interferometry with a through review and synthesis of the many different variations of this instrument since the initial studies of Bouloch, Perot, Buisson, and Fabry. For spectroscopists contemplating use of a Fabry-Perot interferometer, this work should be a required introduction to the advantages and limitations of the Fabry-Perot technique. The detailed discussion of the analysis of line width and position in the presence of noise should be of particular interest to aeronomers who are using high-resolution spectrometers for atmospheric dynamics and thermodynamics measurements. Graduate students will find this book a blessing that will save many hours in the library reviewing the literature. While this book would be an excellent choice for a graduate-level special topics course on Fabry-Perot interferometers, no problems are included. This book is extremely well written and exhaustive in its treatment of one of the most important experimental devices employed in the study of Earth's upper atmosphere.

R. J. Sica is with the Center for Atmospheric and Space Sciences, Utah State University, Logan.