WILLIAM GEORGE FASTIE

similar to a design proposed by Hermann Ebert at the beginning of the 20th century that was rejected and subsequently forgotten because of concerns with fabrication feasibility. Without prior knowledge, Fastie rediscovered and significantly improved the design. With characteristic humility, when he learned of Ebert's prior work, he insisted that the design be named solely for Ebert. Fastie's recollections about the reinvention of the Ebert spectrometer were published in PHYSICS TODAY (January 1991, page 37).

During the mid-1960s, Fastie also shifted his interest to astronomy. He designed several precision-pointing telescopes whose designs are still used by the sounding rocket community. He designed the prototype for the Hopkins Ultraviolet Telescope that flew on the space shuttle in December 1990 and March 1995 and tested it on a sounding rocket.

Fastie's skills as a scientist were recognized with his 1977 appointment by NASA as a member of the Hubble Space Telescope (HST) science working group. In 1979, the Association of Universities for Research in Astronomy Inc requested that Hopkins serve as the proposed site for the Space Telescope Science Institute. Fastie played a significant role in preparing the proposal, particularly in the detailed formation of the concept of the institute.

Fastie also worked on diverse topics such as the bioluminescence of the Chesapeake Bay and the development of new kinds of spectroscopic instrumentation. He had a gift of encouraging enthusiastic coworkers and young scientists.

Fastie retired from Hopkins in 1982. However, he continued to work on campus through 1997 as a telescope scientist and a member of the HST science working group. Until 1996, he also continued to lead a program to search for extrasolar planets using HST.

In recognition of his scientific achievements, Fastie received the David Richardson Medal for 1972 from the Optical Society of America and the Exceptional Scientific Achievement Medal for Outstanding Contributions to the Space Program from NASA in 1973.

Fastie, who had a sharp wit and an infectious sense of humor, will be missed.

PAUL D. FELDMAN
RICHARD C. HENRY
H. WARREN MOOS
Johns Hopkins University
Baltimore, Maryland

ROBERT MICHAEL HJELLMING

Robert Michael Hjellming

Robert Michael Hjellming, an astronomer at the National Radio Astronomy Observatory (NRAO) in Socorro, New Mexico, and an adjunct professor of physics at New Mexico Tech (New Mexico Institute of Mining and Technology) for more than 30 years, died of natural causes on 29 July 2000 while he and his wife Carol were making scuba certification dives in Santa Rosa, New Mexico.

The concept of scuba diving in New Mexico seems surreal to me. But Bob had a proven history of making his high-risk "adventures" pay off handsomely throughout his professional career. As one of Bob's students, I saw a mentor who moved on, always with intensity, intelligence, agility, and unflappable civility, leaving us with the illusion that his students could do so too.

Born in Gary, Indiana, on 12 December 1938, Bob earned his degrees from the University of Chicago: BS in physics in 1960, and MS and PhD in astronomy and physics in 1961 and 1965, respectively. His doctoral thesis was on physical processes in regions of ionized hydrogen. He began his post-PhD career at Case Western Reserve University in 1965.

In 1968, Bob joined NRAO, working in Charlottesville, Virginia. From 1969 to 1971, his interests shifted from numerical models of radiation transfer in ionized nebulae to analytical models of clouds in the cold interstellar medium. He also was interested in analyzing statistical populations of upper energy levels of hydrogenic atoms to successfully explain the stimulated amplification of radio recombination lines propagating through the interstellar medium.

That was just the start of a careening career. In 1970, Bob teamed up with Campbell Wade, an NRAO colleague, to try to detect radio emission from stars, an idea so conjectural at the time that they started the program during engineering time at the Green Bank Interferometer (GBI) in West Virginia. During the two years that followed, there was a veritable blizzard of new discoveries of radio stars, novae, and x-ray sources.

In 1973, Bob and his family moved to Socorro, where he headed the team that developed the initial data calibration and analysis software for the Very Large Array (VLA)—at that time an interferometer without any antennas—an irony well suited to a theoretician! His successful conversion from theorist to astute but wary observer seemed effortless, and he wound up writing the comprehensive VLA user manual, commonly referred to as the "VLA Greenbook."

By the late 1970s, Bob jumped off the management treadmill to reinvigorate his scientific career. He moved with agility between theory and observations, concentrating first on one type of star, then another. He published 71 papers on about 20 objects in the 1980s alone, including many reviews. Simultaneously, he mentored students, having supervised a dozen more PhD students and postdocs by the time of his death.

Bob had many long-term associates and collaborators who worked in teams to observe the evolution in shape and spectrum of various types of transient galactic radio sources. The most famous of these was the

campaign to monitor SS433 shortly after its discovery. This campaign led to the discovery of precessing relativistic jets that make rotating corkscrew patterns on the sky. In the 1990s, he actively pursued the x-ray transients discovered and monitored by new satellites such as Rossi X-ray Timing Explorer (RXTE) and Compton Gamma-Ray Observatory (CGRO), emphasizing the connections between the x rays from the accretion disk and the synchrotron jets seen at radio wavelengths. He also was one of the first scientific users of the new Astronomical Imaging Processing System (AIPS++) imaging package. The last article Bob published, on the x-ray transient V4641 Sgr, appeared in the *Astrophysical Journal* in December 2000. That article, in which he combined GBI and VLA data with a new imaging algorithm and a substantial extension to the model he developed for SS433, showcased Bob's unique abilities as an observer, software pundit, and theoretician.

It is highly appropriate that a number of conferences held in the fall of 2000 were dedicated to Bob. His death was tragic, but he died as he likely would have wished—extending the limits of his reach and always looking ahead.

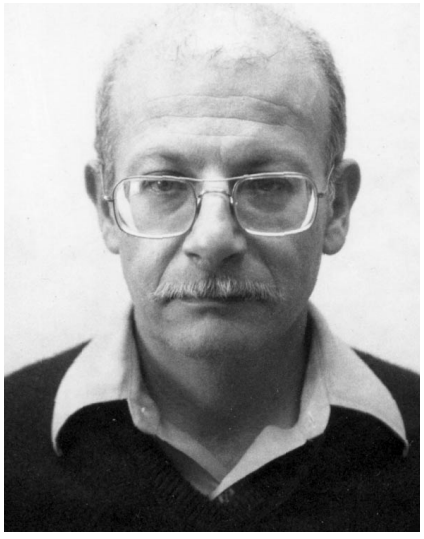
BRUCE BALICK
University of Washington
Seattle

Thomas Emanuel Feuchtwang

Thomas Emanuel Feuchtwang, an emeritus professor of physics at Pennsylvania State University, died 10 August 2000 in Boynton Beach, Florida, following a lengthy battle with Parkinson's disease.

Emanuel's life was exciting, both scientifically speaking and otherwise. Born in Budapest on 21 May 1930, he moved to Palestine and what would subsequently become the State of Israel, whose independence he fought for in 1948. Five years later, he came to the US as a student. He earned all of his degrees in electrical engineering: a BEE from the Georgia Institute of Technology in 1953, an MS from Caltech in 1954, and a PhD in microwave theory from Stanford University in 1959.

The following year, Emanuel joined the University of Illinois at Urbana-Champaign as a postdoctoral fellow in the physics department. His



THOMAS EMANUEL FEUCHTWANG

research involved theoretical collaborations with the experimental group on color centers, headed by Charles P. Slichter, and the group on the Mössbauer effect, headed by Hans Frauenfelder. In 1962, he moved to the University of Minnesota, Twin Cities, where he worked with Bill Peria on surface-lattice-dynamical effects in low-energy electron diffraction.

Emanuel came to Penn State as a tenured associate professor in 1965; he remained at the university for the rest of his career. His initial research interests were in electron emission and tunneling phenomena. He developed, in his inimitable style, a rigorous tunneling theory that avoided the transfer Hamiltonian formalism. He also worked extensively on electron spin polarization in field emission and photoemission. While at Penn State, Emanuel held numerous visiting academic and industrial appointments, both nationally and internationally, including the following: Cornell University; Westinghouse Laboratories in Pittsburgh; Tel Aviv University; the Technion–Israel Institute of Technology in Haifa; the University of Hawaii at Honolulu; and Cambridge University.

The major emphasis of Emanuel's research during the latter part of his career was on electronic and atomic properties of surfaces and, in particular, the scanning probe microscopy and spectroscopy that were made possible by the development of the scanning tunneling microscope and its derivatives. Much of this research was related to the issues of what exactly could be learned from these initial experiments with an STM and what potential information might be gleaned from future experiments.

Emanuel was also an accomplished scholar outside of science. He read Western and Near Eastern literature extensively, and was versed in the classical and contemporary histories of the same regions. He spoke English, French, German, and Hebrew and studied Aramaic. He also was a serious biblical scholar.

Emanuel approached many nonscientific problems with the same intensity and persistence that he brought to his research. One of his greatest passions was his unswerving support of the State of Israel. Yet he retained a deep understanding and respect for Arab culture and history.

Emanuel was a remarkable scientist, who stimulated and was admired by physicists worldwide. He leaves behind, among colleagues and friends, memories of his broad scientific, intellectual, and cultural interests.

MILTON W. COLE
PAUL H. CUTLER
HEINZ K. HENISCH
Pennsylvania State University
University Park

Chanchal Kumar Majumdar

Chanchal Kumar Majumdar, a leading condensed matter theorist in India, died on 20 June 2000 in Calcutta following a heart attack.

Majumdar was born on 11 August 1938 in Calcutta. He grew up during the last years of British rule in the highly nationalistic environment of Calcutta, where science was viewed as the great equalizing pursuit. Inspired by physicists Jagdeesh Chandra Bose, C. Venkata Raman, Satyendra Nath Bose, and Megh Nath Saha, all of whom worked in Calcutta at some point during the first half of the 20th century, many people were attracted to physics. In this environment, Majumdar was an extraordinary student; his record scores in state- and university-level examinations are an academic legend.

Majumdar completed his PhD in theoretical condensed matter physics with Walter Kohn in 1965 at the University of California, San Diego. His thesis was on the effect of interactions on positron annihilation in solids. That same year, he made a significant contribution: the Kohn–Majumdar theorem he formulated in collaboration with Kohn. The theorem proposes the continuity between bound and unbound states of a potential in a many-body continuum, a crucial clue to the orthogonality catastrophe that underlies the physics of the Kondo