

The Academy of Science of South Africa bestowed its highest honor, the Gold Medal for Science-for-Society, on **Brian Warner** at a ceremony last fall. Warner was cited for providing “science of benefit to the public.” He is a distinguished professor of natural philosophy in the faculty of science at the University of Cape Town and heads the university’s astronomy department.

John Loughhead was appointed executive director of the UK En-

ergy Research Centre, located on the campus of Imperial College London. A former vice president of technology for Alstom in its Paris head office, he started at UKERC last November.

On 6 December, **Susan Hockfield** became the 16th president of MIT. She was previously provost and a professor of neurobiology at Yale University.

Roger Raab received the De Beers Gold Medal, the highest honor

given by the South African Institute of Physics, at the institute’s annual conference held last July in Bloemfontein, South Africa. Raab, professor emeritus of physics at the University of KwaZulu-Natal in Pietermaritzburg, has “made a truly impressive contribution to his research field of theoretical and experimental molecular physics,” according to the citation. “One of his crowning achievements,” the citation says, “has been to complete the development of multiple theory.”

Obituaries

Thomas Gold

Thomas Gold, professor emeritus of astronomy at Cornell University, died on 22 June 2004, in Ithaca, New York, of complications from a heart attack. One of the great cosmic thinkers in the past six decades, he questioned with confidence and without hesitation many fundamental physics assumptions. He was an “ideas” man of enormous breadth who many times succeeded in finding the right solutions to prominent problems, such as the nature of pulsars and the mechanism of hearing.

Tommy was born in Vienna, Austria, on 22 May 1920. When he was 13, he moved with his family to Berlin, Germany. His family subsequently fled Hitler’s Germany for London because Tommy’s father was of Jewish heritage. Tommy attended a boarding school in Zuoz, Switzerland, and, in 1938, went to Cambridge University as a mechanical engineering student. But when Britain declared war on Germany in 1939, his Austrian citizenship landed him in an enemy alien camp in Canada. He was soon returned to England and was appointed to the British Admiralty Signals Establishment, where, for the rest of the war, he designed radar detection systems, partly in collaboration with Hermann Bondi and Fred Hoyle. He received his BA in mechanical engineering in 1942.

Shortly after the war, while a graduate student at Cambridge, Tommy created a model of a positive feedback mechanism in the inner ear to explain the theory of hearing. Other scientists disregarded that work for many decades, but modern theories of hearing incorporate much of it. Gold, Bondi, and Hoyle developed the controversial cosmological theory called the steady state theory, in which the universe maintains a constant appearance, despite its expansion, by



Thomas Gold

creating new matter. The theory had no adjustable constants and was beautiful, even though observations have since disproved it.

Tommy accepted a professorship at Harvard University in 1957. He then moved to Cornell in 1959 to build a modern department of astronomy from an almost nonexistent one. He fostered interdisciplinary research as the founder and first director of Cornell’s Center for Radiophysics and Space Research. During his 20 years in that post, the Arecibo Observatory was built in Puerto Rico and is operated by Cornell. Although the observatory was initially designed by Bill Gordon, a Cornell engineering professor, for ionospheric backscatter, Tommy guided its use for radio astronomy.

His fertile mind led him into many fascinating areas of research, such as the alignment of galactic dust, the instability of Earth’s axis of rotation, the dusty lunar surface, the Sun’s cosmic rays, and plasmas and magnetic fields in the solar system. Other areas that caught his interest were the origin of

solar flares, the nature of time, molecules and masers in the interstellar medium, rotating neutron stars and the nature of pulsars, terrestrial sources of hydrocarbons, and the deep Earth biosphere. Starting in 1961, he discussed the formation and abundance of interstellar molecular hydrogen and pointed out its dynamical importance very close to the Galactic Plane. He was a central figure with NASA during the Apollo Moon missions but disagreed with the agency on several topics and voiced his opposition to the excessive use of humans in space. As early as 1955, he had pointed out that the lunar surface could not be pristine rock. He estimated the thickness of Moon dust; it was a slight overestimate but a good antidote to those who had ignored a loose surface entirely.

In 1969, Cambridge awarded Tommy a DSc in recognition of his record of research and publication. He was appointed the John L. Wetherill Professor of Astronomy at Cornell in 1971 and spent the rest of his career at the university until his retirement in 1986.

Perhaps Tommy’s greatest contribution came when pulsars were discovered and he explained them as rotating neutron stars, an explanation that has proven correct. However, some of his ideas that have not yet been accepted are still stimulating and thought provoking. One example is his work on the Arrow of Time in terrestrial phenomena, which he claimed is controlled by the direction of the expansion of the universe. Another is his conjecture of very slow accretion onto some cold protostars, which might produce cold white dwarf stars without any hydrogen burning. A more recent idea was that fuel in the form of methane and other hydrocarbons originates deep within Earth as remnants of material included in the planet’s formation. He wrote two books on this subject: *Power from the Earth* (Orion, 1987) and *The Deep Hot Biosphere* (Copernicus, 1999).

The second discusses microbiology in deep cracks in Earth. Many geologists disagree with the ideas presented in these works, but the concept of “life in cracks” seems to be fairly well accepted.

Among many honors, Tommy was a fellow of the Royal Society. He received the Gold Medal of the Royal Astronomical Society in 1985.

In his leisure time, Tommy was a competitive skier, both on snow and water. He was also a master carpenter. Whatever project he undertook, he did with enthusiasm and confidence. Many of his ideas were of fundamental importance to physics and astronomy, and those that have survived have been outstanding contributions.

Yervant Terzian
Edwin E. Salpeter
Cornell University
Ithaca, New York

Robert Aloysius Hein

Robert Aloysius Hein, known worldwide for the low-temperature-physics and superconductivity work he carried out during his long career at the Naval Research Laboratory (NRL) in Washington, DC, died of cancer on 3 August 2004 at his home in Catonsville, Maryland.

Bob was born on 26 September 1925 in Reading, Pennsylvania. At the age of 17, he enlisted in the US Army and, during the winter of 1944, fought with the 75th Field Artillery Battery B at the Battle of the Bulge. Bob maintained a lifelong connection with his comrades from the Field Artillery.

He returned from the war to finish high school and then enrolled at the Catholic University of America in Washington, DC. In 1950, when he was a junior in college, he was hired to work in NRL's cryogenics branch as a research physicist.

The late 1940s and early 1950s were exciting times in low-temperature physics, especially at NRL. The laboratory had recently purchased from the Arthur D. Little Corp the second commercially available Collins-type liquid helium cryostat. Francis Bitter of MIT had developed high-field magnets that could provide steady magnetic fields in excess of 3 tesla, and NRL had installed such a Bitter magnet. And one of Bob's colleagues, Warren Henry, had just invented an all-metal cryostat that was far more robust than the glass Dewar systems previously used to hold liquid helium at low temperatures for experiments.

Bob recognized that by merging those new tools he could systematically study the properties of superconducting materials at high mag-

netic fields and low temperatures. He developed adiabatic demagnetization techniques to reach temperatures well below 1 K and established one of the first research groups in the US to routinely perform superconducting materials research at these very low temperatures. From the mid-1950s through the mid-1960s, he collaborated with many leading superconducting materials scientists such as Henry, Bernd Matthias of Bell Labs, and John Hulm of the Westinghouse Research Laboratories.

Bob and his group are credited with discovering superconductivity in tungsten ($T_c = 0.016$ K) and in iridium ($T_c = 0.10$ K). In 1964, his team was the first to find superconductivity in doped germanium telluride compounds—the first superconducting semiconductors ever reported. Low transition temperatures in these low-electrical-carrier (doping-dependent) materials had just been predicted by Marvin Cohen. That discovery also has great historical significance because it demonstrated that low-electrical-carrier materials could be superconductors. Twenty-two years later, superconductivity was discovered in another low-electrical-carrier material, lanthanum copper oxide, the first member of the new class of high-temperature superconductors.

Under an NRL fellowship program, Bob continued his education at Catholic University and in 1967 received his PhD under Paul Meijer. His thesis was entitled “Critical Magnetic Field of the Superconducting Semiconducting Tellurium–Tin Compounds.”

Bob subsequently expanded his research group at NRL and began working on applied and fundamental aspects of superconductivity. He headed

the newly formed cryogenics and superconductivity branch from 1972 to 1979. During that time, his group developed multi-filamentary wire for magnet applications, such as motors for naval ship propulsion, and superconducting quantum interference devices for magnetic sensor applications, such as anomaly detection and extremely low-frequency (less than 1 Hz) communication systems. He also served for one year as the scientific liaison officer to the Office of Naval Research in London. In that capacity, he disseminated information to American scientists about European research that was of possible interest. Beginning in 1975, Bob was a visiting scientist first at the Research Institute for Precious Metals and Metal Chemistry in Schwabisch Gmünd, Germany; then at the University of Giessen; and later at the University of California, San Diego.

In 1979, Bob left NRL for NSF to direct its low-temperature physics program. He remained in that post until his retirement from federal service in 1981. He then became a research professor at Catholic University and later a visiting scientist at the University of Washington in Seattle.

Bob was not from Missouri, but he could have been. An experimentalist at heart, Bob only really believed a measurement when he could reproduce it himself. Scientists who worked with Bob learned to be careful with their experiments and analyses and to be very precise in the published reports of their work. Bob was excited about his research and frequently would spend all night working in the laboratory. His enthusiasm for science rubbed off on those who worked with him, and many lively scientific discussions could be heard coming from Bob's lab, his office, or in nearby hallways.

As a manager, Bob did not shrink from difficult or unpopular decisions. Rather, he approached them thoughtfully and seriously, particularly those decisions that would affect his colleagues' careers or personal lives. He was compassionate and supported and encouraged his younger colleagues.

An avid bowler, Bob also was active in German language clubs and enjoyed gardening and keeping in contact with his friends. Those who knew or worked with Bob quickly recognized him as a man of character and integrity.

Don Gubser
Tom Francavilla
Marty Nisenoff
Joe Feldman
Stu Wolf

Naval Research Laboratory
Washington, DC



Robert Aloysius Hein