Institute of Physics presents awards for 1983

At a ceremony in London last month the Institute of Physics presented its 1983 awards: Alastair Bruce of the University of Edinburgh won the Maxwell Medal; Ian Young of the GEC Hirst Research Centre in Wembley was honored with the Duddell Medal; John M. Shannon of Philips Research Laboratories in Redhill was awarded the Paterson Medal; Sir Granville Beynon of University College, Aberystwyth was given the Charles Chree Medal; Jeffrey Goldstone of MIT won the Guthrie Medal; Charles A. Taylor of University College, Cardiff, was presented with the Bragg Medal; Roger Cashmore of the University of Oxford was honored with the Charles Vernon Boys Prize; James M. Burch of the National Physical Laboratory in Teddington won the Thomas Young Medal, and Alan F. Gibson of the Science and Engineering Research Council's Rutherford Appleton Laboratory was awarded the Glazebrook Medal.

The Maxwell Medal was given to Alastair Bruce "for his contributions to the study of structural phase transitions."

Bruce pioneered the application of such statistical techniques as the renormalization group and nonlinear soliton theories to the theory of structural phase transitions. He has also studied the multicritical behavior of perovskites, the properties of incommensurate systems, and the interpretation of Raman, x-ray and neutron scattering experiments. Bruce has been concerned with how universality arises in different systems and with understanding universality in displacive and order–disorder transitions. Recently he has been involved in the development of a configuration-based theory of low-dimensional Ising systems, in which the critical exponents are controlled by the dimensionality of the droplets that form the coarse-grained configuration.

After obtaining his PhD in theoretical solid-state physics from the University of Edinburgh in 1973, Bruce did postdoctoral work at Cornell University from 1973 to 1974. He then returned to the University of Edinburgh, where he has been a reader in the physics department since 1981.

The Duddell Medal was awarded to Ian Young "for his contributions to research on and the design of nuclear magnetic resonance imaging systems for use in medical diagnostics."

Young began his career working on precision optical transducers, and in the 1960s led a team developing a ring-format bidirectional data-transmission system for process plants. He subsequently worked with a group developing television automation equipment; these interests led to his work on magnetic scanning systems and nmr imaging. His contributions to the development of nmr imaging systems useful for medical diagnostics culminated in the design of the NEPTUNE system recently installed at Hammersmith Hospital. NEPTUNE is able to produce images in orthogonal directions from slices of objects by using several reconstruction methods to maximize its selectivity to tissue differences. For example, because NEPTUNE can distinguish between grey and white matter in the brain, it can be used to detect such diseases as multiple sclerosis. In addition to his work on nmr, Young is currently investigating other biomagnetic effects that may be clinically useful.

Young received his PhD from the University of Aberdeen, and then did precision optics at Hilger and Watts. He became technical manager responsible for defense systems and process control while on the staff of Evershed and Vignoles, and when the George Kent Group acquired Evershed and Vignoles, he stayed on to work on television automation equipment. He then worked on nmr imaging at Thorn–EMI until coming to the GEC Hirst Research Centre, where he is now responsible for medical systems research.

The Paterson Medal is being awarded for the first time this year. It is given to recognize "outstanding contributions to the development, invention or discovery of new systems, processes or devices which show the commercial exploitation of physics." John M. Shannon was honored "for his applica-

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tion of the technique of ion implantation to semiconductor devices and particularly his invention of the bulk unipolar diode and the monolithic hot electron transistor."

His invention of these devices is believed to have made a significant contribution to the electronics industry. Their design and operation depends on the creation and control of potential barriers in semiconductors by precise doping techniques in very thin layers, on the thermionic emission of hot electrons and on the transport of hot electrons in highly doped layers. Shannon's work on understanding, analysing and precisely measuring these physical phenomena provided the basis for the inventions. He is now concentrating on research in semiconductor power devices and microwave devices, with a particular interest in the properties, application and realization of semiconductor devices with dimensions comparable with the carrier mean free path.

After obtaining a degree in applied physics from Brunel University in 1966, Shannon joined Mullard Research Laboratories (now Philips Research Laboratories). In 1970 he worked on solid-state imaging devices at North American Philips Laboratories. In 1973 he became leader for semiconductor physics and devices at Mullard; he is now group leader of the Philips Discrete Devices Group. In 1974, Shannon obtained his PhD from the University of Surrey, where he has been a reader in the department of electronic and electrical engineering since 1978.

Sir Granville Beynon received the Charles Chree Medal "for his major contributions to solar-terrestrial physics."

Beynon has played a leadership role in radio and solar-terrestrial physics research for several decades. He is identified with the early application of ionospheric data to radio communications, the first observations of traveling ionospheric disturbances, studies of ionospheric radio-wave absorption, and pioneering work on the use of rockets for studies of the lower ionosphere. In addition to his research contributions, Beynon has served the community on numerous scientific panels and committees, including as a member of the SERC Astronomy, Space and Radio Board. He also played an active role in setting up the ionospheric program as part of the International Geophysical Year, was a former president of the International Committee for Geophysics, and is currently editor of the Journal of Atmospheric and Terrestrial Physics.

After graduating from the University College, Swansea, Beynon joined the staff of the Radio Research Station in Slough in 1938; while there he collaborated with the late Sir Edward Appleton on a series of radio studies of the ionosphere. He taught at University College, Swansea, from 1946 until 1958 when he came to the University College of Wales at Aberystwyth as head of the physics department; he is now professor emeritus of physics.

The Guthrie Medal was given to Jeffrey Goldstone "for his contributions to theoretical physics and particularly for his work on the theory of nuclear matter, symmetry breaking and string theory."

Goldstone is perhaps best known for the "Goldstone theorem," which, because of its importance to the understanding of symmetry breaking, has applications across many fields of physics. The theorem says that spontaneous symmetry breaking necessitates that massless scalar particles exist—what are now called "Goldstone bosons." The most important implications of this theorem have been for the construction of unified theories of weak and electromagnetic interactions.

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Goldstone has contributed to many areas of theoretical physics including nuclear theory, statistical mechanics, particle physics, solid-state physics, and field theory. He is now investigating fractionally-charged solitons.

After graduating from Trinity College, Cambridge, Goldstone remained there, working as a research fellow from 1956 to 1960, as a staff fellow from 1962 to 1977, as university lecturer in applied mathematics and theoretical physics from 1961 to 1976 and as a reader in mathematical physics from 1976 until 1977, when he was appointed to the chair in physics at MIT, he now holds.

The Bragg Medal was awarded to Charles Taylor "for his many contributions to physics education, particularly through lectures given at the Royal Institution, on television and at many venues throughout the world."

In the citation Taylor was recognized for being "a brilliant expositor" in the tradition of Bragg himself, and for writing textbooks described as "models of clarity and originality." Through his work with the International Commission on Physics Education, he has actively contributed to the advancement of physics education, including serving as chairman of two international conferences. The Royal Institution lectures he gave in 1971 to 1972, were subsequently televised and published under the title *Sounds of Music*. He has also written four books in the field of optical and x-ray diffraction, and is the author of *Physics of Musical Sounds*. Recently he has been concerned with improving the public image of science, and to this end has helped to develop a program of lectures for primary schools in South Wales.

After graduating from Queen Mary College in London, Taylor joined the Admiralty in 1942, working on radio countermeasures at Haselmere, in the US Naval Research Lab and in the

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Radio Research Lab at Harvard. In 1946 he did high-vacuum research at Metropolitan-Vickers Electrical Company and joined the staff at what is now the Institute of Science and Technology at Manchester University. Since 1965 he has been professor of physics at University College, Cardiff. He has also served as vice-president for education at the Institute of Physics from 1970 to 1975, as chairman of the Committee on Teaching Science of the International Council of Scientific Unions from 1978 to 1982, and since 1977 he has been professor of experimental physics at the Royal Institution.

Roger Cashmore was honored with the Charles Vernon Boys Prize "for his many and original outstanding contributions in the field of experimental high energy physics."

Early in his career, Cashmore was interested in experimental baryon and meson spectroscopy, particularly in observing new states and measuring their decay properties. Results from this work contributed to our understanding of quarks. He later investigated the interactions of leptons, quarks and gluons using the PETRA storage ring at DESY. Out of this work come the discovery of the gluon bremsstrahlung, predicted by quantum chromodynamics, and the observation of weak-interaction effects in both lepton and quark production. Cashmore is now interested in developing future e^+e^- and ep colliding-beam machines.

After obtaining his PhD from Oxford University in 1969, Cashmore became a research associate at the Stanford Linear Accelerator until 1974, when he returned to Oxford as Research Officer in the department of nuclear physics. From 1977 to 1979 he was senior research fellow at Merton College; he has also been a lecturer at Oxford and a tutorial fellow at Balliol. From 1982 to 1987 he will be a SERC senior research fellow.

The Thomas Young Medal was given to James Burch "for his many contributions to the application of optical principles to practical engineering problems, including the use of holographic and speckle interferometry and white light moiré photography in the measurement of deformation, vibration and strain."

Burch invented the scatter-plate interferometer used for testing optical systems, and developed new methods for making accurate linear and radial metrological gratings, now used for precise length and angle measurements in modern machine tools. He also played a significant role in the development and application of lasers: he was one of the (independent) inventors of holographic interferometry and was a pioneer in the use of holographic and speckle interferometry as noncontact methods for measuring displacement, vibration and strain. He orginated the use of white-light moiré photography, to extend optical methods of measuring deformation in large structures. He wrote, with Anthony Gerrard, *Introduction to Matrix Methods in Optics*. He is now primarily interested in developing a new form of monocentric axicon lens for close-range photogrammetry.

After serving in the RAF, Burch received his PhD from Bristol University in 1954. Since then he has been at the National Physical Laboratory in Teddington, except for short periods spent as a visiting professor at various universities in the US and the UK.

The Glazebrook Medal was presented to Alan Gibson "for his work in establishing and subsequently operating the laser facility" at the SERC Rutherford Appleton Laboratory.

Gibson had assumed his present position as head of the Laser Division of the Rutherford Appleton Lab in 1977. As the first director of the SERC Laser Facility at the Lab, he has succeeded in

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establishing it as a noted scientific center in a few short years.

In addition to his contributions as director of the facility, Gibson is the author with R. J. Elliott of *Solid State Physics and Its Applications* and has served as the editor for nine volumes of *Progress in Semiconductors*. His research interests have included the use of infrared lasers to study the properties and applications of semiconductors at high light intensities, and he has made contributions to the physics of semiconductors and to the development of laser detectors, especially by making possible the detection of infrared laser pulses and through the stabilization of CO^2 lasers.

After graduating from Birmingham University, Gibson joined the Telecommunications Research Establishment (now RSRE, Malvern) in 1944. In 1963 he became the first professor of physics at the newly established University of Essex, later serving there as head of the physics department, as dean of the School of Physical Sciences and as provice-chancellor.

Fermi Award to Anderson, Neddermeyer

At a ceremony on 25 April in the crowded basement auditorium of the US Department of Energy's Forrestal Building in Washington, D.C., President Reagan named Herbert L. Anderson and Seth H. Neddermeyer to share the 1982 Enrico Fermi Award. The last time a president presented the Fermi prize was in 1968 when Lyndon Johnson honored John Wheeler. Named after its first recipient, who was cited just before his death in 1954, the award is given "for any especially meritorious contribution to the development, use, or control of atomic energy." In the past it has gone to such eminent physicists as E. O. Lawrence, Eugene Wigner, Glenn Seaborg, Hans Bethe, and, sharing it in 1966, to Otto Hahn, Lise Meitner and Fritz Strassmann. For high drama, none of the Fermi awards equalled President Johnson's presentation in 1963 to J. Robert Oppenheimer—the government's first official recognition of Oppenheimer since his security hearings a decade earlier and the occasion on which Edward Teller, who had won the prize a year earlier, asked Oppenheimer's forgiveness for any wrongs he may have committed at those hearings.

Before reading the citations for the latest award winners, Reagan hailed them as "nuclear explorers who repre-