

ICTP honors four with Dirac Medals

The International Centre for Theoretical Physics (Trieste, Italy) presented Dirac Medals last year to three individuals for their work in mathematical physics: In February Edward Witten (Princeton University) received a 1985 medal, and in November Yakov Borisovich Zel'dovich (Space Research Institute, Moscow, USSR) received a 1985 medal and Alexander Polyakov (Landau Institute of Theoretical Physics, Moscow, USSR) received a 1986 medal. Yoichiro Nambu (Enrico Fermi Institute for Nuclear Studies, University of Chicago) will receive a 1986 medal in July.

Nambu will be honored for "being one of the first physicists to formulate the idea of spontaneous symmetry breaking and in particular, chiral symmetry breaking in relativistic particle physics. His contributions to the quark model in the 1960s and, later, his geometrical formulation of the dual resonance models as the dynamics of a relativistic string theory are of fundamental importance." Nambu received his BS (1942) and his ScD (1952) from

the University of Tokyo. He began teaching at Osaka City University as an assistant professor in 1949; he was made a full professor there in 1950. Concurrently he was a member of the Institute for Advanced Study (Princeton, New Jersey) from 1952 to 1954. In 1954 he came to the University of Chicago as a research associate; he became an associate professor in 1956 and a full professor in 1958. In 1971 he was named Distinguished Service Professor of Physics, and in 1977 he was named Harry Pratt Judson Distinguished Professor. Nambu originated the concepts of spontaneous breaking of chiral symmetry, spontaneous mass generation and the interpretation of pions as Goldstone bosons. He introduced color as a quantum number in the quark model and proposed a gauge theory of color. He also proposed string theory as a dynamical basis of the dual resonance model.

Polyakov was honored for "being among the first to emphasize the importance of scale invariance in quantum field theory, particularly in con-

nection with the theory of critical phenomena. He was also one of the first to recognize the relevance of the topological ideas in field theory, through the discovery of the monopole and instanton solutions in non-Abelian Yang-Mills theories. Polyakov's reformulation of the string theories in terms of covariant path integral and his classification of the two-dimensional conformal field theories (in collaboration with his colleagues at the Landau Institute) are among the important contributions to theoretical physics of the decade." Polyakov received his undergraduate degree at the Moscow Institute for Physics and Technology in 1967, and his PhD from the Landau Institute in 1969. He is now senior scientific investigator and head of the department of quantum field theory at the Landau Institute.

Zel'dovich was honored "for far-ranging contributions to relativistic astrophysics, particularly in theories of compact objects and cosmic evolution." After completing his undergraduate education at Leningrad University,

SALAM AND POLYAKOV



LUNDQUIST AND ZEL'DOVICH





ZICHICHI, WITTEN AND SALAM

Zel'dovich began working at the Ioffe Physicochemical Institute of Leningrad in 1931 (later the Institute of Chemical Physics). His initial research was in the crystals section on catalysis, and absorption on inhomogeneous surfaces. Zel'dovich outlined the mechanism for the formation of nitrogen oxide (NO) at high temperatures (an important ecological effect), the theory of combustion, and the theory of detonation (1940). From 1939 to 1949 he and Y. B. Khariton did the first theoretical analysis of the nuclear chain reaction in uranium fission. During World War II Zel'dovich worked on solid propellant combustion in short range missiles. Since 1984 he has worked in astronomy—on the relativistic physics of singular objects such as neutron stars and (nonrotating) black holes. He has studied the interaction of the 3-K background radiation with matter; he and his former student Sunyaev predicted a Compton interaction with hot gas in galaxy clusters, which has been confirmed. Zel'dovich has written, with I. D. Novikov, *Relativistic Astrophysics*.

Witten received the first Dirac Medal for his "path-opening contributions to the physics of elementary particles and gravity, to the search for unification, and to the imaginative pursuit of the implications for cosmology." Witten received his PhD from Princeton University in 1976. From 1976 to 1980 he was a postdoctoral and, later, a junior fellow at Harvard University. In 1980 he became a professor of physics at Princeton. One of Witten's initial research projects was in quantum chromodynamics in a world with many colors. (See *PHYSICS TODAY*, July 1980, page 38.) He then studied applications of topology in quantum field theory. He has worked extensively on many aspects of unification theory: dynamical symmetry breaking of supersym-

metry, the Skyrme model, Kaluza-Klein theory, Morse theory and superstring theory (see *PHYSICS TODAY*, July 1985, page 17). In addition he showed the applicability of anomalies to the Skyrme model of mesons and baryons, and with Luis Alvarez-Gaume (Boston University) he introduced the idea of gravitational anomalies, which



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impose constraints on higher-dimensional theories.

ICTP instituted the medals in 1985; they are awarded annually on Dirac's birthday, 8 August, to both a senior and a junior physicist for work in theoretical physics. Nobel laureates and recipients of the Wolf Foundation prizes are not eligible for the award.

Pegram and Beams awards presented

At its annual meeting last November, the Southeastern Section of The American Physical Society presented the George Pegram Award for outstanding physics teaching in the southeast jointly to Delma Rae Carpenter Jr and Richard Bryant Minnix (both of the Virginia Military Institute, Lexington) and the Beams Award for distinguished research in physics to Paul Hugh Stelson (Oak Ridge National Laboratory).

Carpenter received his BS in 1949 from Roanoke College, his MS from Cornell University in 1951, and his

PhD in physics from the University of Virginia in 1957. He has taught physics at the Virginia Military Institute since 1951, and was named professor of physics in 1963. He has served as head of the department (1969-74) and as Director of Research for the institute's research laboratories (1965-85). Minnix received his BS from Roanoke in 1954, his MS from the University of Virginia in 1957, and his PhD from the University of North Carolina at Chapel Hill in 1965. He began teaching at the institute in 1956, was named full pro-

CARPENTER AND MINNIX

