ELLIOTT H. LIEB
AWARDED
1988 BIRKHOFF PRIZE

The George David Birkhoff Prize is awarded every five years to a recipient selected, by a joint committee of the American Mathematical Society and the Society for Industrial and Applied Mathematics, for outstanding contributions to "applied mathematics in the highest and broadest sense." The 1988 recipient is ELLIOTT H. LIEB of Princeton University.

The Birkhoff Prize Fund was originally created by the Birkhoff family in 1967. The awards are currently augmented by monies from the AMS Leroy P. Steele Fund (presented to the Society for prizes in honor of George David Birkhoff, William Fogg Osgood, and William Caspar Graustein). In 1988 the award is $4000.

Previous recipients of Birkhoff prizes are Jürgen K. Moser (1968), Fritz John (1973), James B. Serrin (1973), Garrett Birkhoff (1978), Mark Kac (1978), Clifford A. Truesdell III (1978), and Paul R. Garabedian (1983).

The Birkhoff Prize is awarded by action of the Councils of the AMS and SIAM on the recommendation of the joint AMS–SIAM Committee to Select the Winner of the Birkhoff Prize for 1988, whose members are Wendell H. Fleming, W. Gilbert Strang, and Hans F. Weinberger (chairman).

The material which follows consists of the selection committee's citation, the remarks of Professor Lieb at the Prize Session in Atlanta on the presentation of the award, and a brief biographical sketch of Lieb.

Citation

The Birkhoff prize is awarded to Elliott Lieb of Princeton University for his profound analysis of problems arising in mathematical physics. In nonlinear differential equations and in the classical inequalities of analysis, Lieb has resolved the cases of greatest importance to physics—exactly the cases in which simplified hypotheses and general compactness arguments did not apply, and the analysis was most delicate. In the Schrödinger equation his work went beyond short range interactions, to allow the slow decay of Coulomb potentials. The Lieb-Thirring inequality connects the stability of matter to a new estimate, independent of N, for the norm of an antisymmetric N-fold tensor product. His sharp bounds in the Hardy-Littlewood-Sobolev inequalities have opened new approaches to nonlinear equations. Lieb's influence on mathematical physics—the Thomas-Fermi problem, the theory of liquid crystals, harmonic maps, the Ising model, and much more—has reached so far because it has remained so deep.

Elliott H. Lieb

Response

Naturally, I am very happy to receive the Birkhoff prize of the American Mathematical Society and the Society for Industrial and Applied Mathematics. My pleasure stems not only from the generous citation of my own work but also from the fact that a certain tradition in mathematical physics is being honored. The tradition I have in mind is that mathematical physics

does not simply borrow from mathematics but that there is also some feedback. From time to time problems in physics can generate mathematical questions whose answers have some intrinsic mathematical value. In other words, good mathematical physics can aspire to be both good mathematics and good physics, and both fields can benefit from the interaction. This is the view shared by most of my coworkers in mathematical physics. In the nineteenth century this attitude was not uncommon but, unfortunately, in about the first half of the twentieth century there was a tendency on both sides to disparage it. Happily, the interdependence of the two fields is now being increasingly appreciated by both mathematicians and physicists.

Biographical Sketch

Elliott H. Lieb was born July 31, 1932, in Boston, Massachusetts. He received his B.Sc. degree from the Massachusetts Institute of Technology in 1953 and his Ph.D. degree in mathematical physics from the University of Birmingham, England, in 1956. He also received an honorary D.Sc. degree from the University of Copenhagen in 1979.

Professor Lieb was a Fulbright Fellow at Kyoto University (1956–1957). He was a research associate at the University of Illinois (1957–1958) and at the Laboratory for Nuclear Studies at Cornell University (1958–1960). Between 1960–1963, he worked as a staff physicist at the T. J. Watson Research Center of the IBM Corporation. He was associate professor of physics at Belfer Graduate School of Science, Yeshiva University (1963–1966); professor of physics at Northeastern University (1966–1968); and professor of mathematics at Massachusetts Institute of Technology (1968–1975). Since 1975, he has been a professor of mathematics and physics at Princeton University.

Professor Lieb has held numerous concurrent positions. For a year (1961–1962) he was a visiting Senior Lecturer in mathematics at Fourah Bay College, The University of Sierra Leone. He was a visiting professor at the Institut des Hautes Etudes Scientifiques, France (1972–1973 and 1986); at the Research Institute of Mathematical Sciences of Kyoto University (1978–1979); and at the Institute of Advanced Study, Princeton (1982). In both 1972 and 1978 he was awarded a Guggenheim Fellowship. For five years he was an editor for *Communications in Mathematical Physics* and is currently an editor for *Advances in Applied Mathematics, Studies in Applied Mathematics, Letters in Mathematical Physics* and *Reviews of Modern Physics*. He was a member of the board of governors of the Institute for Mathematics and its Applications (1983–1986) and has been a member of the board of trustees of the Mathematical Sciences Research Institute since 1985.

Professor Lieb received the Boris Pregel Award for Research in Chemical Physics from the New York Academy of Sciences in 1970; the Dannie Heineman Prize for Mathematical Physics from the American Physical Society and the American Institute of Physics in 1978; and the Science Prize from UAP in France 1985. He is a member of the American Mathematical Society, the Mathematical Association of America, and is a fellow of the American Physical Society. He is a member of the U.S. National Academy of Sciences and the Austrian Academy of Sciences.

Professor Lieb is a member of the International Association of Mathematical Physics and served on its executive committee from 1979 to 1981 and as its president from 1982 to 1984.

Professor Lieb's primary areas of research interest are harmonic analysis, combinatorics, statistical mechanics, solid state physics and atomic physics.