David E. Aspnes received the 1987 Wood Prize for "his pioneering role in the development of the technique of spectroscopic ellipsometry as a probe for materials characterization." Aspnes received his BS and MS in electrical engineering from the University of Wisconsin, Madison, in 1960 and 1961, respectively, and earned a PhD in physics from the University of Illinois, Urbana, in 1965. He became a member of the technical staff at Bell Labs in 1967; since 1983, he has been a district manager at Bell Communications Research.

The 1987 C. E. K. Mees Medal was presented to Adolf W. Lohmann in acknowledgment of "his stimulation of optical research activities in academic and industrial centers in several countries as well as his interdisciplinary contributions to physical optics and optical signal processing." The biennial Mees Medal honors achievements in optics that transcend national and disciplinary boundaries. Lohmann attended the University of Hamburg, where he received an MSc in physics in 1951 and a PhD in physics two year later. After graduating, he served on the faculty of the Technical University of Braunschweig and worked as a researcher at the Royal Institute of Technology, Stockholm. He moved to IBM in 1963, and in 1967 he became a professor of applied physics and information science at the University of California, San Diego. In 1973 he began his current position as a professor of physics at the University of Erlangen–Nuremberg.

IN BRIEF

Steven L. Richardson, formerly a program director for the condensed matter theory program at NSF and a senior research scientist at the Kodak Company's Corporate Research Laboratories in Rochester, New York, has been appointed associate director of the newly formed Materials Science Research Center of Excellence and associate professor of electrical engineering at Howard University in Washington, DC.

OBITUARIES

A. N. Kolmogorov

Andrei Nikolaevich Kolmogorov, who died on 20 October 1987 at the age of 84, was one of the greatest scientists in Russian history. His work in probability theory, turbulence (the "law of $\frac{2}{3}$") and dynamical systems ("chaos") was fundamental and is now regarded as classic. The range of his contributions was enormous—from poetics to stratigraphy, from genetics to celestial mechanics, from topology to mathematical logic and algorithmic complexity theory.

Kolmogorov's first work was in the history of the medieval Novgorod Republic. But when he found that history professors required at least five different proofs of every result, Kolmogorov chose mathematics, where one proof suffices. At the age of 19 he constructed an integrable function with a Fourier series divergent almost everywhere, and this unexpected result made him an internationally recognized mathematician.

At that time a mathematics graduate student at Moscow University was obliged to pass 14 examinations in various mathematical subjects, but it was possible to substitute an original article on a relevant topic in place of an examination. Kolmogorov never took any of the examinations, but instead wrote many articles contain-

A. N. Kolmogorov

ing new results in function theory, set theory, topology, mathematical logic, probability theory and other topics.

In May 1934, a little before James Alexander, Kolmogorov introduced the cohomology ring, one of the most important topological invariants of a space. The idea had come to him from physics: He generalized such notions as the distributions of charges and currents in space, on surfaces and on lines, considering the similar "functions of sets" for a more abstract mathematical situation. (In modern mathematics this derivation of the

ANDREW GEMANT AWARD

Call for Nominations

The Andrew Gemant Award of the American Institute of Physics recognizes the accomplishments of a person who has made significant contributions to the understanding of the relationship of physics to its surrounding culture and to the communication of that understanding. The Selection Committee invites nominees for the 1990 award.

Criteria

The awardee is chosen based on contributions in one or more of the following areas:

a. Creative work in the arts and humanities that derives from a deep knowledge of and love for physics.
b. The interpretation of physics to the public through such means as mass media presentations or public lectures.
c. The enlightenment of physicists and the public regarding the history of physics or other cultural aspects of physics.
d. The clear communication of physics to students who are learning physics as part of their general education.

Nature of the Award

The awardee will be invited to deliver a public lecture in a suitable forum, will be asked to designate an academic institution to receive a grant of $3,000 from AIP to further the public communication of physics, and will receive a cash award of $5,000 at the annual fall meeting of the AIP Corporate Associates.

The Award is made possible by a bequest of Andrew Gemant to the American Institute of Physics. The 1990 Award will be the fourth. Previous awardees are Philip Morrison of MIT (1987), Freeman Dyson of the Institute for Advanced Study (1988) and Gerald Holton, Harvard University (1989).

Procedures

The awardee will be named by the AIP Governing Board in March 1990, based on the recommendation of an outside Selection Committee appointed by Board Chairman Hans Frauenfelder.

Send nominations with supporting material to:

John S. Rigden
Director of Physics Programs
American Institute of Physics
335 East 45th Street
New York, NY 10017

Deadline for receipt of nominations is *31 December 1989.*

cohomology theory from physics is formalized by the theory of distributions and by the De Rahm theorem.)

Though educated in abstract, set-theoretical mathematics, Kolmogorov was still always interested in the natural sciences and other applications, in which he would put aside the shackles of mathematical rigor to obtain a concrete result. But after having guessed a result he always tried to formulate it rigorously as a mathematical theorem or conjecture whose proof might be deduced from the very first postulates of the theory.

It is impossible to list here even Kolmogorov's main mathematical discoveries. His work on the foundations of probability theory, the theory of stochastic processes (including stationary processes), Markov chains and processes, the Fokker–Planck equation and Brownian trajectories forms the base of modern probability theory. He was also one of the founders of the theory of the reaction–diffusion equations (with Ivan Georgievich Petrovski and Nickolai Sergeevich Piscounov) in 1937.

Kolmogorov's work in 1941 on turbulent motions changed the shape of the theory of turbulence. Here he introduced the ideas of self-similarity and scaling, leading to the famous "Kolmogorov's law of $\frac{2}{3}$." These ideas and the modern developments that have arisen from them are now crucial in statistical physics and field theory.

In the theory of dynamical systems, Kolmogorov constructed in 1954 a perturbation theory of the quasiperiodic motions of Hamiltonian systems. His results imply the stability of magnetic surfaces in fields with tokamak geometry and the stability of the fast rotation of an asymmetrical heavy rigid body. They also imply the stability of the motion of a planetoid in an elliptical orbit, perturbed by a "Jupiter" (that is, a planet in a circular orbit in the same plane). This was the first rigorous result regarding typical motions in the three-body problem, whose formulation goes back to Newton.

In 1958 Kolmogorov began working on a unification of the concepts of the ergodic theory of classical dynamical systems and the theory of hydrodynamical instability. His program included ergodic analysis of the idealized models of hydrodynamical instability. His conjectures differ from the modern "strange attractors" program only in terminology. (Like Newton, Kolmogorov disliked publishing conjectures, and the most well-known published result emanating from his research in ergodic theory is the "Kolmogorov–Sinai entropy.")

Kolmogorov considered his most difficult achievements to be his work from 1955 to 1957 on the 13th Hilbert problem, which involved the representation of continuous functions of many variables as the superpositions of continuous single-variable functions and on the summation operation. This work was followed by a study of the quantity of information needed to approximate a multivariable function to a given accuracy. He found in 1958 that the answer depends on the ratio of dimensionality to smoothness.

Kolmogorov's last work before retiring from active research (he believed it impossible to do good mathematics after the age of 60) was dedicated to applying the ideas of information theory to the theory of algorithmic complexity and to the foundations of probability theory. (In this work, he defined the *stochasticity* of a sequence as an asymptotically high complexity of any algorithm predicting the consecutive members of the sequence.)

For instance, Kolmogorov proved that any "computer" containing N elements of fixed diameter related to no more than k other elements by "wires" of fixed thickness may be packed in a cube of edge $\sim N^{1/2}$. He had guessed this result by starting from the observation that the gray substance of the brain (the neurons) forms its surface, while the white substance (the junctions) is inside.

A primitive brain with N neurons may be packed in a cube of edge $\sim N^{1/3}$, but almost every "computer" (graph with N vertices), and certainly every one that is sufficiently complicated, requires that the edge scale as $N^{1/2}$. Kolmogorov, of course, defined rigorously what it meant for a graph to be "sufficiently complicated." His definition made use of the universality property of complicated graphs with N vertices, namely that they contain as their subgraphs all the graphs with $O(N)$ vertices.

After his 60th birthday Kolmogorov became a high school teacher, and this was his main occupation for the last 20 years of his life. In his very last years he prepared three volumes of his collected works (to be published in English by North Holland in 1989 or 1990).

Unlike most of the great mathematicians of the 20th century, A. N. Kolmogorov revolutionized both mathematics and physics, following in the line of Newton and Poincaré.

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