

Feigenbaum and Libchaber share Wolf physics prize

The Wolf Foundation has presented its 1986 prize in physics to Mitchell J. Feigenbaum (Cornell University) for his "pioneering theoretical studies demonstrating the universal character of nonlinear systems, which has made possible the study of chaos" and to Albert J. Libchaber (University of Chicago) for his "brilliant experimental demonstration of the transition to turbulence and chaos in dynamical systems." The two will share the \$100 000 award, which will be presented in Jerusalem, Israel, in May.

Feigenbaum received his BEE from the City College of New York (1964) and his PhD in theoretical high-energy physics from the Massachusetts Institute of Technology (1970). He was a research associate at Virginia Polytechnic Institute from 1972 until 1974, when he joined Los Alamos National Laboratory. In the late 1970s, with the help of a computer, Feigenbaum discovered that the bifurcations that double the periods of orbits in phase space cascade geometrically toward a limit and that the rescaling and the rate of convergence can be described by a universal constant. He then developed a theoretical explanation that determines not only the constant but the entire dynamics as well. His discoveries have shown that this route to chaos, period doubling, is common to a wide class of systems (see page 17). Feigenbaum was named a fellow in the Los Alamos theoretical-physics division in 1981. In 1982 he became a professor in the Cornell physics department and atomic and solid-state physics laboratory.

Libchaber received his PhD in 1965 from the École normale supérieure in Paris. He was a member of the technical staff at Bell Laboratories from 1965 to 1966, but returned to the École normale in 1967 as Maître de Recherche of CNRS. Libchaber was appointed director of research at CNRS in 1974. In 1979 he made the first experimental observation, in convective Rayleigh-Bénard systems, of the bifurcation cascade that Feigenbaum had predicted. In his original experiment Libchaber used microbolometers engraved in a convective cell containing



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helium to measure temperature fluctuations in the liquid. He was thereby able to observe period doubling (possibly accompanied by mode-locking) that leads to chaos, and to confirm the values of Feigenbaum's constant (see PHYSICS TODAY, March 1981, page 17). This work was done in collaboration with Jean Maurer (CNRS). More recently Libchaber has worked with mercury, applying a magnetic field to provide an additional degree of freedom. In 1983 he became a professor of physics at the University of Chicago.

In the citation for the physics prize, the foundation noted that "besides their unique experimental achievement, these results are conceptually very important. They provide the first



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evidence of the route to chaos, a long-standing problem. They clearly open a new field of physics, namely the study of instability bifurcations in nonlinear systems. Moreover, they are the first neat study of the onset of turbulence in a perfectly controlled geometry (the problem is very rich, depending on the Prandtl number, on the aspect ratio, etc.).

"Libchaber's work is characterized by the extreme elegance of the experimental technique, by the purity of the effects he is studying. He has retained the 'esthetics' of research, which is nowadays very rare. He has the talent of a 19th-century physicist with the facilities of 1980; the blending is unique."

Tanaka receives Nishina prize

The Nishina Memorial Foundation of Japan last December presented its Nishina Memorial Prize, one of the highest awards presented by the Japanese physics community, to Toyochi Tanaka (MIT). Tanaka was cited for his discovery of a phase transition and critical phenomena in polymer gels and his elucidation of their physical and chemical basis.

Tanaka received his BS (1968) and

his DSc (1972) from the University of Tokyo; he then came to MIT as a research associate. In 1975 he became an assistant professor of physics there. In the late 1970s Tanaka was scattering laser light in polyacrylamide gels to study the temperature dependence of their thermal density fluctuations when he discovered that as he lowered the temperature of the gel the fluctuations slowed down critically and the