obituaries

To notify the community about a colleague's death, subscribers can visit http://www.physicstoday.org/obits, where they can submit obituaries (up to 750 words), comments, and reminiscences. Each month recently posted material will be summarized here, in print. Select online obituaries will later appear in print.

Boris Valerianovich Chirikov

Boris Valerianovich Chirikov, a pioneering contributor to the foundations of dynamical chaos, died from cancer in Novosibirsk, Russia, on 12 February 2008. His name and ideas are known to everyone working in nonlinear dynamics and chaotic behavior of deterministic classical and quantum systems.

Boris was born in the Russian town of Oryol on 6 June 1928. He did his undergraduate and master's studies in Moscow State University's department of physics and technology (now the Moscow Institute of Physics and Technology). Before graduating from MIPT in 1952, Boris began working in the Thermotechnical Laboratory, now the Institute of Theoretical and Experimental Physics; for a few years, he continued to work there, studying meson physics. In 1954 he accepted an offer from Gersh Budker, then head of the Laboratory of Novel Acceleration Methods (now the Kurchatov Institute), to join his group, and Boris began working on problems of accelerator and plasma physics.

In 1958 Budker founded the Institute of Nuclear Physics, which now bears his name, in Akademgorodok, a new scientific center south of Novosibirsk, in western Siberia. Boris joined him there in September 1959. Until his last days, Boris worked at Budker's institute, first as an experimentalist, then as a theoretician. He became a corresponding member of the Russian Academy of Sciences in 1983 and a full member in 1992.

Boris's early research at the institute was the experimental study of a few problems formulated by Budker. The first one was related to ionic compensation and stability of a high-density relativistic electron beam. After five years of intensive work on that problem, Boris and his coworkers built the B-3 betatron with parameters that even now are considered extraordinary.

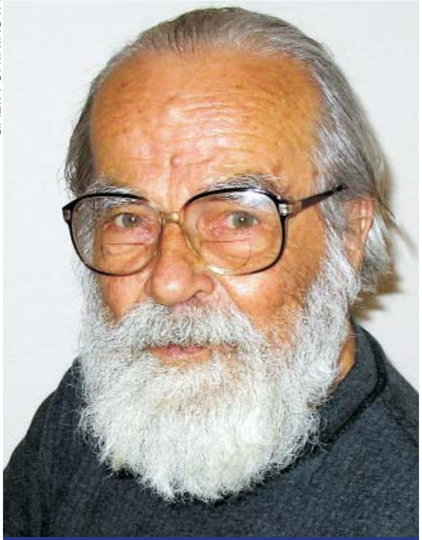
In Boris's evolution from experimentalist to theorist, the critical problem that he studied, suggested by Budker, was the mysterious loss of electrons in magnetic traps for confinement of hot plasma. In a seminal 1959 paper, Boris developed a new method for analyzing nonlinear resonances; that work led him to understand the physics responsible for the loss of electrons: the overlap of nonlinear resonances resulting in the deterministic diffusion of electrons. That study gave rise to the Chirikov "resonance overlap" criterion of chaotic motion in dynamical systems.

In 1965 Boris applied his approach to the Fermi-Pasta-Ulam paradox and explained it analytically. He showed that the parameters used in the numerical study of the FPU problem were taken well below the border of strong chaos. Later, those results were confirmed numerically. Among other important results from Boris and his group during that period are the derivation of the chaos border in the Fermi acceleration model (1964); the discovery of weak Arnold diffusion in four-dimensional nonlinear maps (1969–75); the analysis of statistical properties of chaos in 2D nonlinear maps, including the discovery of the power-law decay of Poincaré recurrences in Hamiltonian systems with divided phase space (1969–81); and the demonstration that the dynamics of Halley's comet is chaotic (1989). Those and other results are summarized in Boris's 1969 professorship thesis and his famous 1979 review paper in *Physics Reports*.

Boris's work usually included both analytical methods and numerical experiments, now considered the most effective method of analyzing complex systems. His innovative use of numerical simulations often indicated new directions for both theory and experiment.

Researchers and students in dynamical theory closely associate Boris's name with the "standard map" that serves as a cornerstone of that field. Many physical systems have mapping approximations whose stability and transition from regular to chaotic motion can be conveniently investigated by expanding around a fixed point to obtain the Chirikov standard map. In 1977 Boris initiated the investigation of the quantum version of the map, also known as the kicked rotator. His early studies of that model with his coworkers resulted in the discovery of dynamical localization of quantum chaos. The effect of such localization later was observed in experiments with hydrogen and Rydberg atoms in a monochromatic microwave field and with cold atoms and Bose–Einstein condensates in optical lattices. In applications to quantum systems with complex behavior, the kicked rotator is considered the basic model demonstrating all essential properties of quantum chaos.

From the founding of the Novosibirsk State University in 1959, Boris participated in the development of physics courses. He helped initiate a modern approach to physics education that was introduced at the university. His original lectures on classical mechanics and electrodynamics are used by hundreds of students around the world. His ideas on classical and quantum chaos theory have been essential both to his students



GALYA CHIRIKOVA

Boris Valerianovich Chirikov

Recently posted death notices at http://www.physicstoday.org/obits:

Carroll W. Zabel
5 October 1920 – 18 April 2008
Edward N. Lorenz
23 May 1917 – 16 April 2008
John A. Wheeler
9 July 1911 – 13 April 2008
Yoginder Joshi
1938 – 2 April 2008
George Switzer
11 June 1915 – 23 March 2008
William L. Kraushaar
1 April 1920 – 21 March 2008
Walter E. Spear
20 January 1921 – 21 February 2008
Robert Lee Mieher
10 October 1932 – 4 December 2007
Bruce Sellwood
1947 – 2 November 2007

and to readers of his published works.

Boris had a remarkable ability to go deeply into the problems of both theoretical and experimental physics and mathematics. His kindness and goodwill will be remembered by all his friends and colleagues. Borrowing a phrase from his friend Andy Sessler, we say we "feel touched to have had [our lives] touched" by Boris.

Felix Izrailev
Universidad Autónoma de Puebla
Puebla, Mexico
Allan Lichtenberg
University of California, Berkeley
Dima Shepelyansky
CNRS
Toulouse, France

John Morgan Greene

John Morgan Greene

John Morgan Greene, an unusually creative, world-renowned physicist and applied mathematician, died on 22 October 2007 in San Diego, California, due to complications from Parkinson's disease. His work on magnetohydrodynamics set the gold standard in fusion plasma physics, and his codiscovery of the soliton inverse scattering transform is among the greatest developments in applied mathematics.

Born on 22 September 1928 in Pittsburgh, Pennsylvania, John spent the bulk of his formative years in Manhattan, Kansas. He consistently placed first in the Kansas state mathematics competition and earned a scholarship from the Pepsi Cola Co to attend Caltech. He graduated from Manhattan High School in 1946, Caltech in 1950, and the University of Rochester in 1956 with a PhD in physics. His thesis, "Higher-Order Corrections to the Nucleon–Nucleon Potential in Charge-Symmetric Pseudoscalar Theory," was written under the advice of David Feldman and Robert Marshak. As a graduate student he also published work in astrophysics with Malcolm Savedoff. While researching nuclear theory at Rochester, he learned about inverse scattering in quantum mechanics, a fortuitous event of subsequent importance.

In 1955 John joined Princeton University's Project Matterhorn, the predecessor to the Plasma Physics Laboratory, where Lyman Spitzer was using his stellarator to confine plasma magnetically for controlled fusion. Simplified magnetohydrodynamic equations were used in early theory to calculate stellarator equilibrium and stability properties. Over several decades John and his collaborators tackled ever more realistic magnetohydrodynamic calculations for toroidal devices. With one of us (Johnson) and Katherine Weimer he coauthored classic papers on toroidal stellarator and tokamak equilibrium and on ideal kink and interchange instabilities. In collaboration with others, including Bruno Coppi and Alan Glasser, they developed a major treatment of dissipative instabilities. John had a lifelong interest in computation and early on explored the limits of computer simulation. He, Ray Grimm, and Johnson developed the Princeton Equilibrium and Stability in Tokamaks, or PEST, code, an important tool used worldwide to design and interpret fusion experiments.

With Ira Bernstein and Martin Kruskal, John investigated both nonlinearity and inhomogeneity in the Vlasov equation. In a famous 1957 paper, they constructed exact nonlinear periodic and pulse-like traveling-wave solutions—later called Bernstein-Greene-Kruskal modes—by means of an inverse problem for obtaining trapped particles. That work was a harbinger of the soliton solutions later obtained by inverse scattering.

The history of the Korteweg–de Vries soliton has been widely recounted because of its broad importance in physics and mathematics. John's unique contribution was to the inverse scattering transform, for which he, Clifford Gardner, Kruskal, and Robert Miura received the 2006 Leroy P. Steele Prize from the American Mathematical Society. One day, as Kruskal and Miura were working on the blackboard, John walked by on his way to get coffee. He quipped, "You are trying to solve the inverse scattering problem," which he recalled from his days at Rochester. John was most pleased with his inverse scattering work; his wife, Alice, recalls his triumphal announcement, "It unfolded like a lily!"

John's interest in Hamiltonian dynamics arose from the area-preserving maps that describe magnetic field lines in stellarators. After many years of work, in 1968 he published numerical techniques for obtaining and describing periodic orbits, precursors to his famous 1979 paper that described "Greene's residue criterion." That criterion, which provides a method for calculating to very high accuracy the parameter value for the destruction of the last action surface (torus) with golden mean frequency (rotation number), is deeply significant. That work was placed in a renormalization group setting in the 1980s with his student Robert MacKay and generalized to nontwist maps with Diego del-Castillo-Negrete and one of us (Morrison) in 1996. In 1979 Morrison interested John in viewing magnetohydrodynamics as an infinite-dimensional Hamiltonian system, and that interest resulted in an influential 1980 paper on noncanonical Poisson brackets.

In 1982 John joined the theory group at General Atomics in San Diego, California, and became an adjunct professor of physics at the University of California, San Diego, in 1983. In 1992 he published important results on the significance of magnetic field nulls for reconnection. He continued to work with and inspire many colleagues even after his retirement in 1995. In 1992, for his many discoveries, he received the James Clerk Maxwell Prize from the American Physical Society.

John, an Eagle Scout and an avid hiker, camper, and bird watcher, was active in conservation projects and in the Sierra Club. Markedly accomplished, yet gentle and generous, John had a kind and humble spirit that drew the best from his fortunate collaborators. His unique mannerisms shaded a stunning combination of deep physical insight and exceptional mathematical ability. John's human qualities together with his devotion to science serve as models to his many colleagues and friends who miss him.

Philip J. Morrison
University of Texas at Austin
John L. Johnson
Plasma Physics Laboratory
Princeton, New Jersey
Vincent Chan
General Atomics
San Diego, California ■