

dard map" is nonintegrable. Using results of Chirikov, they predicted that chaos sets in for arbitrarily weak perturbations and found how the width in phase space of the chaotic—or stochastic—layer scales with the strength of the perturbation. Such results, discussed at length in part 2 of the book, are of considerable physical interest because many systems are mathematically isomorphic to the nonlinear pendulum or variants thereof. In part 3 the authors take great care to present a wide spectrum of applications: in plasmas, mechanics, optics, atomic physics, solid-state physics and astrophysics.

Part 4, which concludes the book, is devoted to a lively presentation of numerical experiments due to Usikov that concern various Poincaré maps with one pair of action-angle variables. This clever presentation is very well documented and will be interesting to students as well as research workers in other fields. It starts with a set of color pictures, follows these with a set of demonstrations on floppy discs (for any IBM-compatible PC) and finally gives the original program (in BASIC). Particularly fascinating are the presentations of maps displaying structures with quasicrystal-type symmetries. (See the article by Alexander Chernikov, Sagdeev and Zaslavsky in *PHYSICS TODAY*, November 1988, page 27.) Clever computer studies have become important in recent times for the study of dynamical systems. No doubt this welcome part of the book will trigger new insights and ideas among readers. It is a pity that these numerical experiments seem split off from the rest of the book. For instance, there are no specific references to them in the text to motivate the analytic reasoning.

The book is informal: Most developments of topics are self-contained, with no claims made as to mathematical rigor; and order of magnitude estimates more than once replace detailed analytical derivations. This style is in the modern Russian tradition of Lev Landau and Evgenii Lifshitz. Although as physicists we prefer this style, this *parti pris* of informality sometimes leads the authors to skip important points. Except for one special case, frequency locking is not covered. Similar remarks could be made regarding the presentation of Serge Aubry's theory of the ground state of one-dimensional classical chains of atoms. In a later chapter on "strong" turbulence, the Kolmogorov-Obukhov $-5/3$ power law is never mentioned and ordinary neutral fluids are mentioned only to

motivate various scenarios for the onset of turbulence.

The authors are at their best when discussing areas in which they have actually worked. Dissipative problems such as those encountered in fluid turbulence are treated in a haphazard or sketchy manner. (These include much of what is called "dynamical systems" in the West.) For instance, the universality of the period-doubling route to chaos as developed by Mitchell Feigenbaum is only briefly touched upon. No hint of an explanation is given and the word "renormalization" is not to be found. By contrast the treatment of the nonlinear Korteweg-de Vries equation by inverse-scattering techniques is well presented.

The physical appearance of the book leaves much to be desired. New chapters are signaled in characters no larger than those of the text. Chapter numbers are not designated on every page. The numbering of equations is itself chaotic and there are many misprints, particularly in equations and mathematical symbols, which are sometimes barely decipherable. It would be most desirable to have a new edition with fewer typos and a better reference system.

This book deserves wide reading and will be a rich source of inspiration to the growing community of scientists interested in nonlinear science. It also can be read profitably by graduate students in plasma physics, applied mathematics and theoretical physics. It is not organized as a textbook, however, and contains no exercises.

Vospominania ob Igore Vasilieviche Kurchatove [Recollections about Igor Vasilievich Kurchatov]

Edited by
Anatolii Aleksandrov
Nauka, Moscow, 1988.
322 pp. 2.10 rubles hc
ISBN 5-02-000047-7

A man came for the first time to the horse races. Approaching the track, he stopped to tie a loose shoelace. Suddenly, a saddle was tightened on his back, irons were forced into his mouth, and he was pushed out onto the track. So he raced. He did not win first prize, but he did come in second.

That is how Vasilii Emelianov, a specialist in metallurgy and one of the managers of the Soviet Atomic project, described his and his colleagues' situation in the fall of 1945 to Igor Kurchatov, father of the Soviet A- and

H-bombs. This account appears in a book of memoirs about Kurchatov, edited by Anatolii Aleksandrov, former president of the Soviet Academy of Sciences and a close friend and collaborator of Kurchatov's. The book contains approximately 60 essays in Russian, 40 of which appear here for the first time; the remaining 20 are reprinted from Soviet literary and scientific magazines as well as from a previous, smaller collection of memoirs on Kurchatov published in the USSR in 1983.

Kurchatov (1903-60) was a first-rate physicist who combined qualities of J. Robert Oppenheimer and Edward Teller. This blend enabled him to find the right language for dealing with such disparate personalities as his Soviet colleagues, captive German nuclear physicists, marshals of the Soviet Army and such "tough cookies" as Stalin and his henchman Lavrenti Beria, overlord of the Soviet Atomic project.

Memoirs collected in this volume, particularly those under the subtitle "The Problem of Uranium," examine significant phases of the Soviet A- and H-bomb projects. The memoirs of Georgi Flerov describe the events that led to the Soviet decision on 10 March 1943 to restart nuclear research in the USSR, under Kurchatov's leadership. Three crucial tests are described in considerable detail in other essays. In the first Soviet A-bomb test, on 29 August 1949 the bomb was lifted to the top of a steel tower by means of a specially constructed elevator. The second A-bomb test, was conducted at the same site in August 1951; the bomb was dropped from a plane. The first H-bomb test, which took place on 12 August 1953, also occurred at this test site. The "product" was the same size as the first Soviet A-bomb. There were no separate special storage places for cryogenic technology or liquid deuterium. The bomb was put on a 30-meter-high metal tower. At a distance of over 30 kilometers, the shock wave almost knocked the observers to the ground. Within a 5-km radius of the epicenter of the explosion, the surface was baked into a ceramic-like, dark mirror.

Just these few examples should show that the book is extremely interesting and merits translation into English. Still, one would expect under the conditions of *glasnost* a more frank and complete account of one of the major achievements of Soviet science and technology. Nowhere does the book recall the participation in the Soviet nuclear project of such German physicists as Gustav Hertz and Nikolaus Riehl, nor does it

mention the Soviet-German geneticist Nikolai Timofeev-Resovsky; all these men worked in the USSR after their deportation from Germany following the end of the Second World War. The subject of the nuclear disaster of 1957-58 in the Urals is still off limits. Beria is never mentioned. And although Andrei Sakharov was rehabilitated by Gorbachev more than two years ago, Sakharov is also conspicuously absent from the book.

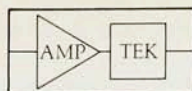
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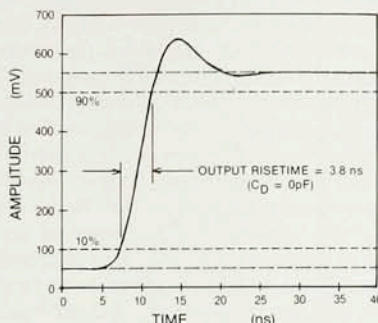
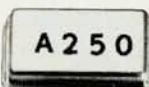
Loren R. Graham
Columbia U. P.,
New York, 1987. 565 pp.
\$45.00 hc ISBN 0-231-06442-X

There has been a resurgence of discussions concerning the relationship between science and philosophy. Experimental confirmations of quantum mechanics have in recent years forced philosophers to rethink their positions on realism and instrumentalism. More specifically, John S. Bell's famous theorem and subsequent experiments have seriously undermined David Bohm's hidden-variable models in quantum mechanics, which provided some hope for the realist view of our world. The influence of scientific theories and experiments on philosophy is unquestionable. The influence of philosophical, ethical, religious and even political theories or beliefs on the creation—and justification—of theories is more controversial. That such influences have occurred has been documented by historians and sociologists of science.

Science, Philosophy, and Human Behavior in the Soviet Union is Loren Graham's unique and impressive study of how the philosophy of dialectical materialism influenced the development of Soviet science in the cases of both theory creation and theory justification, as well of science's influence on dialectical materialism. The strength, and paradoxically also the weakness, of Graham's study is that he tries to show for every major scientific discipline how dialectical materialism usually pushed science into interesting new directions. The weakness lies in the fact that Graham's examples are, by the very nature of his project, usually sketchy. It is difficult to provide a comprehensive account when one tries to cover in 12 chapters practical-



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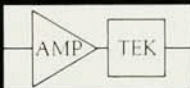
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