BOOKS: HISTORY OF SCIENCE

The Ascetic and the Vixen

Stephen Kotkin

Sakharov
A Biography
by Richard Lourie

Brandeis University Press (University Press of New England), Hanover, NH, 2002. 495 pp. $30, £21. ISBN 1-58465-207-1.

Andrei Sakharov gave Stalin the hydrogen bomb, and two decades later he won the Nobel Peace Prize. Novelist and translator Richard Lourie skillfully suggests, without explicit argumentation, how these apparently disparate events befit the same man and accord with a consistent set of beliefs and practices involving science, social justice, and pride. His elegant biography of Sakharov offers an intimate tableau of man and milieu.

Grandfather Ivan Sakharov, from a dynasty of priests, became a gadfly lawyer and a founding member of the Russian Empire's tiny party of constitutional democrats. His wife Maria, of noble heritage and with a family record of service to the tsars dating to 1655, took up the defense of political prisoners. Their son Dmitri studied physics and music at Moscow University and married into the Sofianovs, a family of military men, staunch patriots. Such was the distinctly Russian lineage—privilege, political resistance, patriotism—into which Andrei Dmitrievich Sakharov was born. The year was 1921, a time of Red victory in civil war and of an emerging partnership (satirized to perfection in Bulgakov's *Heart of a Dog*) between Soviet dictatorship and science.

Sakharov, a product of that partnership, was an exceptional yet also a Soviet man. A childhood immersed in European refinements, extended family, musical sociability, and partial home schooling had rendered Andrei a cultured if hypersensitive soul. Under the sway of his father, he enrolled in physics at Moscow University in 1938, during the crescendo of a terror that mostly bypassed youth, even those not absorbed in the magic of elementary particles or of building a new, supposedly more just society. After the 1941 Nazi invasion, Sakharov failed a physical and served the meatgrinder war effort in a munitions factory. Challenged to test the hardness of armor-piercing shells without destroying them, he hit upon the solution of magnetizing and demagnetizing the core (a core that was too soft would require less coercive force to demagnetize). In the factory laboratory, the theorist pressed into applications also met a woman, Klava, and soon proposed to her in writing, as characters did in 19th-century novels.

The inside story of the Soviet nuclear weapons program has been captured by David Holloway's *Stalin and the Bomb* (Yale University Press, New Haven, CT, 1994). Lourie's distillation is light on the science and robust on the personalities and paradoxes: the enterprising and Stalinist bosses, the oppressive atmosphere and productive science at the "Installation" (the atomic weapons lab), the freewheeling political discussions and sincere laments at Stalin's death in 1953, and Sakharov's breakthrough idea of a "layer cake" design to achieve thermonuclear fusion. At age 32, Sakharov unanimously became the youngest member ever voted into the country's Academy of Sciences. Almost unique in elite surroundings, he declined to join the Communist party. But like nearly everyone else in nuclear science, the patriotic and suddenly indispensable Sakharov was, in Evgeny Feinberg's words, "completely loyal in regard to the official ideology."

Wartime worker. After passing his final examinations in July 1942, Sakharov opted to accept an assignment to a munitions factory rather than continue his studies in theoretical physics.

What opened a rift between state and servant, Lourie ably shows, was not remorse over inventing such a destructive weapon—the hostile United States already had the bomb—but the physicist's guilt over the health fallout from testing and shock that the disposition of his awesome creation would lie beyond his control. Sakharov (code-named "Ascetic" by the KGB) used his access to lobby Nikita Khrushchev not for personal perks but to maintain the Soviet Union's temporary unilateral ban on nuclear tests, which neither the United States nor Britain had reciprocated. His efforts elicited a furious rebuke for meddling and a demand to recant. "My opinion hasn't changed," Sakharov calmly told his overseers in 1961, "but I do my work and carry out orders." At Khrushchev's command, a new device designed by Sakharov was set and detonated. "Khrushchev kissed Sakharov," writes Lourie, "all the rancor and ire had been incinerated by the Big Bomb…a single explosion exceeding all the bombs dropped in World War II, atomic included." Not long thereafter, the Soviet leader signed an historic treaty with the Americans that banned nuclear tests in space, on land, and at sea. Sakharov—stubborn, principled, vain, and naïve—rejoiced.

Khrushchev, and then Brezhnev, had a problem. Stalin had built the Soviet system as a riposte to capitalism during the Great Depression and to fascist militarism. But after World War II, radical changes had taken place outside the USSR: unprecedented prosperity and a mass-consumption revolution, repudiation of authoritarianism for democracy in Europe and Japan, and a uniting of the formerly fractious West under American tutelage. The competition shifted from mobilization and tanks to living standards and computers. The KGB expanded geometrically and so did the Soviet Union's scientific ranks, as a result of massive state investment. Conformity was the rule among the intelligentsia, and the few score bravehearts, whom the KGB and foreign press dubbed "dissidents," did not view themselves as anti-Soviet when they doggedly began petitioning Soviet rulers to act in accordance with the Constitution. Sakharov joined the law campaign moved by a sense of injustice and compassion for the persecuted individuals. But the authoritative "father of the Soviet H-bomb" went further, prophetically warning the Soviet leadership of the dire consequences for science and the state of a failure to permit the free flow of information. That would have necessitated revealing the depth of the transformation in the capitalist world, thereby threatening Soviet legitimacy. Yet politically clinging to censorship undermined the intellectual labors of the conformists too.

Lourie gestures meekly against a predictable Sakharov-centered, Moscow-centered portrayal of dissent in the multinational, multiconfessional Soviet Union. His diaphonous literary sensibility avoids scholarly analysis or even explanation. Instead, he crafts an engaging narrative by evoking context artfully, as he goes on to trace the familiar ground of Klava's death, Sakharov's crucial second marriage to the human-rights activist Elena Bonner (code-named "Vixen"

The author is in the Department of History, Princeton University, Princeton, NJ 08544, USA. E-mail: kotkin@princeton.edu

by the KGB), the tensions within dissident circles, Sakharov's seven-year internal exile, the demoralizing KGB thefts of four successive drafts of his memoirs (which Lourie would eventually translate and on which he draws on copiously here), and the summons from Gorbachev 21 months into *perestroika* to return to Moscow. "He was a move in Gorbachev's game," Lourie writes, "a bishop brought in at a sudden diagonal." Though intrigued by string theory, Sakharov had long since ceased doing science systematically. He emerged, hesitantly, as the leader of a democratic opposition. He died in 1989, while executing a government commission to write a new Soviet constitution. The Soviet Union died two years later, and so did the impressive edifice of Soviet science, which collapsed along with the state that had engendered, nurtured, and harassed it.

BOOKS: PLANETARY SCIENCE

Travelers in Space and Time

Monica Grady

Stable shield. This 47.4-kg iron meteorite from Cabin Creek, Arkansas, was shaped by ablation after drag forces oriented it with respect to its direction of motion.

Meteorites
A Journey Through Space and Time
by Alex Bevan and John de Laeter
Smithsonian Institution Press, Washington, DC, and University of New South Wales Press, Sydney, Australia, 2002. $35.95, £27.50, A$59.95. ISBN 1-58834-021-X.

The Cambridge Encyclopedia of Meteorites
by O. Richard Norton
Cambridge University Press, New York, 2002. 374 pp. $50. ISBN 0-521-62143-7.

It has been argued that meteoritics, the science of meteorites, was born at the turn of the 19th century: Ernst F. F. Chladni published the first textbook on meteorites in 1794. In 1801, Giuseppe Piazzi discovered the first asteroid, Ceres, and the next year Edward C. Howard published the first chemical analysis of stony meteorites. Two hundred years later, we are in the middle of a golden age of meteorite study. Once considered rare curiosities and regarded with veneration or superstitious dread, meteorites are now recognized as natural objects lingering from the earliest period of solar system formation. Meteorites are true time travelers, carrying within themselves evidence of over 4.56 billion years of evolution.

Meteorites span a range in composition and texture from unmelted, primitive stony objects to highly differentiated irons. They provide probes for tracing the origin and evolution of the dust from which the solar system aggregated and for studying processes of planetary formation. Most meteorites are fragments from asteroids, but rare lunar and martian meteorites yield information on their parent bodies that complements data obtained from space missions. With sophisticated instrumentation, we can investigate submicrometer-sized presolar grains, which emanated from stars whose life cycles were completed before that of the sun had commenced. The material needed to carry out these various studies falls randomly and unpredictably all over Earth's surface. Until approximately 30 years ago, the recovery of new meteorites was a matter of chance and only about 2000 meteorites had been recognized. (Fewer than 12 per year if one takes the date of Howard's analysis as a starting point.) Today, however, over 30,000 meteorites are known; the annual acquisition of specimens has increased by nearly three orders of magnitude through the efforts of teams of collectors who have returned meteorites preserved in hot and cold deserts. Almost every collecting trip turns up unusual meteorites and increases the diversity of material available for study.

Along with the rapid increase in the number of recovered meteorites, there has been a concomitant increase in the number of meteorite collectors and dealers. This has led to an enhanced interest in planetary sciences in general and meteorites in particular. There is, more than ever before, an extensive market for nonspecialist texts describing the nature and significance of meteorites. The two most recent entrants in this field are very different in style, although their contents necessarily overlap a great deal.

Alex Bevan, a mineralogy curator at the Western Australian Museum in Perth, and John de Laeter, an emeritus professor of physics at Curtin University in Perth, offer *Meteorites: A Journey Through Space and Time*. Billed as "written for people who are not scientists," the book is structured as a series of 14 self-contained essays that covers all aspects of meteoritics. The text is straightforward and well illustrated, and the book more than fulfills its promise to explain the nature and significance of meteorites. The authors avoid the traditional approach to meteoritics, in which specimens are described in terms of their classification and properties; instead, the chapters are more process-orientated. Through detailed but clear treatments of planetary formation and differentiation, meteorites are placed firmly within the context of the solar system's evolution. Bevan and de Laeter also provide a fascinating historical overview of pre–19th century beliefs about meteorites. My principal disappointment in this otherwise excellent book is that enlargement of a few of the digital images has left them pixelated, reducing the sharpness and clarity of the textures shown. Notwithstanding this shortcoming, the authors have chosen a rich variety of illustrations with which to enhance their text. I would recommend their book to nonspecialists fascinated by meteorites and interested in what can be learned from them.

In contrast to Bevan and de Laeter's book, the grandly titled *Cambridge Encyclopedia of Meteorites* by O. Richard Norton, an astronomer and former director of the University of Arizona's Flandrau Planetarium, is something of a disappointment. Few specialists would claim to have the breadth and depth of knowledge required to write a complete encyclopedia on a subject, especially a work that aims to "act as a reference source for students, teachers and scientists." And this is where Norton's

The author is in the Department of Mineralogy, The Natural History Museum, Cromwell Road, London SW7 5BD, UK. E-mail: m.grady@nhm.ac.uk