scientists; power was happily and successfully shared by the president and the council. Minor flurries occasionally arose but were soon resolved. Growing insistence on scientific qualifications for new fellows had, by the end of the century, elevated election to an internationally recognized mark of scientific approbation.

Hall deals also with the useful encouragement of science provided by the Society. She considers the relations of the Society with government, which frequently solicited its advice about scientific matters, and its cordial and cooperative dealings with other learned bodies. Her chapter on its encouragement of scientific exploration is particularly interesting.

By the end of the century the Royal Society stood as a model for superior societies everywhere, its fellowship now scientists all and its activities profoundly useful. Twenty-seven excellent illustrations add to the enjoyment of this authoritative book.

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Letters from Russia

Kapitza, Rutherford, and the Kremlin. LAWRENCE BADASH. Yale University Press, New Haven, Conn., 1985. xii, 129 pp., illus. $20.

Valuable, scholarly books on the history of Soviet science are not many. A principal reason for this is that scholars who have access to archival sources are not free to write the whole truth and those who have freedom have no such access. Soviet historical literature, although abundant, has somewhat limited informational value, since one of its implied functions is to improve the image of the system. The Soviet past is still crowded with Orwellian un-persons and un-events. Western students of Soviet history are, on the other hand, in the situation of the proverbial drunkard who looks for his lost watch under a street lamp because that is the only illuminated spot around. They have to content themselves with scraps scattered among archival collections in the West, only rarely being given very restricted access to the Soviet archives. In this situation, Lawrence Badash's book on Peter Kapitza comes as a welcome surprise. Making use of previously unpublished documents found in the Rutherford collection in the University Library at Cambridge, England, Badash proves that under some lamps one can still find something of value.

The role played by Kapitza in the development of Soviet physics was both practical and symbolic. As the director of Moscow's Institute of Basic Physical Problems Kapitza was the founder of one of the world's best centers of low-temperature physics; his personal scientific contributions were recognized internationally and won him the Nobel Prize in physics in 1978. His own government bestowed highest official honors upon him—he was awarded the Order of the Red Banner of Labor and four times the Order of Lenin. His life, however, was not just a simple success story. The vicissitudes to which he was subjected made his fate symbolic in two respects: first, the Soviet authorities, who valued his services highly, granted him everything except personal freedom. For a very large part of his active life Kapitza was, for all practical purposes, a prisoner in his own country. Second, his case was also characteristic of the tangled relationship between Soviet scientists and the foreign intellectual community. This relationship was marked by a mixture of dependence and official mistrust. The Soviets borrowed from the West, at the same time rejecting its values; most of the leading Soviet physicists of the 1930's were educated abroad and then denied the possibility of continuing working contact with their Western colleagues.

Kapitza belonged to this select group. In 1921, as a young scientist with an engineering background, he went to Cambridge to work in the famous Cavendish Laboratory under the direction of Ernest Rutherford. Kapitza did so well that he was soon appointed professor of the Royal Society and director of his own magnetic laboratory. These accomplishments did not go unnoticed in his native country, but the recognition took a peculiar form. In the summer of 1934, during a visit to his homeland, Kapitza was detained and denied the right to return to England. With the exception of short visits abroad some 30 years later, he stayed in the Soviet Union until his death in 1984.

Badash's *Kapitza, Rutherford, and the Kremlin* focuses on the 1934–35 episode of Kapitza's life. It is based on a collection of Kapitza's letters to his wife, Anna, who remained in Cambridge for about a year after his detention in the Soviet Union before going to Moscow to join him. Parts of these letters, mostly those dealing with less personal matters, were translated by Anna Kapitza for Rutherford, who was leading an effort to bring the Soviet physicist back to England. These fragments were preserved in the Rutherford collection, and they form the core of the book. They provide us with unique insight into Kapitza's feelings and the everyday problems, some grand and some rather trivial, that he experienced during the first year of his detention.

There were many scientists, among them leading physicists, who fared much worse than Kapitza and perished together with millions of other victims of Stalinist terror. Kapitza survived and was given ample opportunity to develop his scientific talents. The Soviet government even bought the equipment of his Cambridge laboratory in order to recreate favorable working conditions for him. Did he find consolation in his research and in the apparent success that crowned it? This we do not know, because he was never allowed to tell his own story, and some questions concerning his life in the Soviet Union will quite possibly remain unanswered forever. We may never know for sure, for instance, whether Kapitza fell into disgrace and was a victim of persecutions in the late '40's, when he temporarily disappeared from public view. Perhaps he was just entrusted with an important role in the Soviet atomic project. As far as the circumstances of his 1934 detention are concerned, Kapitza's letters to Cambridge, brought to light by Badash, may in fact be the most complete and reliable source of information available. This is exactly the type of episode that Soviet historians might find difficult to reconstruct in all details.

Kapitza's letters make for enlightening reading. They are matter-of-fact and free of grandiloquence, although the circumstances they refer to sometimes border on farce. Kapitza had, for instance, to instruct his colleagues in Cambridge not to wrap laboratory equipment in old newspapers before sending it to the Soviet Union because every piece of printed matter had to pass censorship. Badash is a historian of science who has not specialized in Soviet studies. (He might have avoided a formal deficiency of inconsistent spelling of Russian names by consulting a specialist in the field.) He did not attempt to write a definitive biography of Kapitza. He does, however, provide the reader with sufficient background knowledge concerning the broader historical and political context in which Kapitza's case should be considered. Badash cannot be blamed for the fact that of the three main actors listed in the title of his book—Kapitza, Ruther-

ford, and the Kremlin—we learn the least about the last one. As George Orwell once said, it takes more imagination than intellect to understand the Soviets.

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A Radiochemist and His Times

Radiant Science, Dark Politics. A Memoir of the Nuclear Age. MARTIN D. KAMEN. University of California Press, Berkeley, 1985. xii, 348 pp. + plates. $19.95.

Martin Kamen, extrovert, scientist, musician, and discoverer of ^{14}C, has written an autobiography covering the years 1913 to 1954. During that period, and especially between 1937 and 1954, he lived life intensely and interacted with many leading figures of the time in nuclear physics, biochemistry, and music. He had enriching experiences when, as a member of Ernest Lawrence's Radiation Laboratory during its best years, he was one of the pioneers in the use of radioactive isotopes. Later, he endured persecution by the House Un-American Activities Committee and others.

Kamen, the only son of Russian immigrants, early demonstrated unusual talent as a musician. At age nine he played the violin in a concert. Later he switched to the viola, and one of his lifelong favorite pastimes has been playing chamber music. His talent was such that it led to association with some of the musical greats, including Isaac Stern.

"Don Cooksey took this snapshot of Franz N. D. Kurie outside Le Conte Hall, on the Berkeley campus of the University of California, early in 1937. Kurie is preparing to haul away a week's supply of cyclotron needs, easily contained in a child's wagon. Big Science had not yet come to the Rad Lab." [From *Radiant Science, Dark Politics*]

Kamen received his B.S. and Ph.D. degrees at the University of Chicago, where he majored in physical chemistry. He completed his doctorate in the depression year of 1936, and he used part of a small accumulation of savings to travel to Berkeley to visit Lawrence's laboratory. Since he was a cheerful extrovert and a needed chemist in a physics laboratory, he was permitted to work without compensation for some months. He was then made a paid member of the staff at the princely salary of $1200 a year (no nonsense about a nine-month basis). In addition to serving as part of the crew of the cyclotron, his duties included preparing samples of ^{32}P and other radioisotopes for use on campus and elsewhere. He established a close relationship with Samuel Ruben of the chemistry department, and they conducted a large series of studies on photosynthesis using the 21-minute radioactivity of ^{11}C.

Among the many scientific activities in which Kamen participated, the most significant was the discovery in 1940 of ^{14}C. This radioisotope has been of enormous importance in advances in modern biology. Kamen and others had seen evidence of the probable existence of ^{14}C as early as 1936. For example, cloud-chamber observations of the irradiation of nitrogen with neutrons revealed tracks interpretable as $^{14}N + n \rightarrow {}^{14}C + p$. Moreover, experience from the bombardment of many elements with deuterons made it seem very likely that the reaction of $^{13}C + d \rightarrow {}^{14}C + p$ would occur. However, the abundance of ^{13}C in natural carbon is only about 1 percent, and when a bombardment of moderate duration was conducted no carbon radioactivity was detected.

One day in October 1939, Ernest Lawrence summoned Kamen to his office. Lawrence was in an unusual state of irritation because of statements by Harold Urey concerning the limited value of radioactive tracers. Urey pointed out that only short-lived radioactive isotopes of carbon, nitrogen, and oxygen had been discovered. None had been found in hydrogen. In contrast, Urey had developed means of separating the stable isotopes of those elements and this already had led to important biomedical discoveries. Lawrence was dependent on foundation support for his existing and future cyclotrons. He very much needed the discovery of ^{14}C. When Kamen told him that long, intense bombardments might be required, Lawrence quickly told him that the search for long-lived radioisotopes of biological significance had an extremely high priority. Kamen proceeded to carry on a tremendous program of bombardments culminating in an exhausting 72-hour effort. This produced enough ^{14}C for quick, unequivocal identification by Ruben and Kamen. Later, Kamen found that neutron irradiation of NH_4NO_3 was a much better approach to obtaining good yields of ^{14}C.

A chapter of the book is devoted to an assessment of Ernest Lawrence and Robert Oppenheimer and the relationship between them. Kamen had innumerable contacts with both. He was drawn into Oppenheimer's orbit soon after his arrival in Berkeley. Kamen states, "I had much in common with Oppenheimer. We came from very similar cultural backgrounds, and we were both firstborn sons of Jewish families, with all the pressure for achievement that implied. We both had received an intensive education in classics and humanist literature. I was thus drawn to Oppie from the moment I met him, and I could appreciate his strengths, as well as his failings." In another passage he states, "Oppie—highly cerebral and introspective, by turns arrogant and charming—was continually plagued by a sense of insecurity. He possessed extraordinary analytic powers but little manual ability. E.O.L. [Lawrence]—less cerebral and highly intuitive—showed practically no self-doubt and remarkable mechanical skills. They shared a common drive to be center stage." In this chapter and scattered throughout the book is additional information bearing on the eventual estrangement of the two great scientists.

Oppenheimer and Kamen shared a

Martin Kamen "with Sol Spiegelman (right) at Cold Spring Harbor in 1947, attending a conference on cytoplasmic inheritance. Photographer unknown. Much interest was excited by our work on phosphate turnover in yeast. This provided some evidence for the existence of genetic copies of nuclear genes, which we called plasmagenes." [From *Radiant Science, Dark Politics*]