BOOK REVIEWS

Visionary and Mobilizer

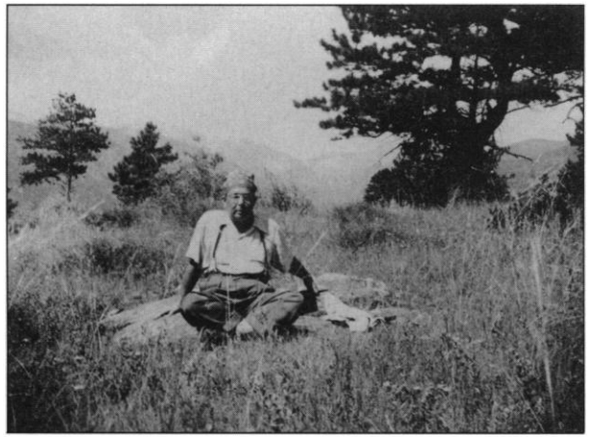
Genius in the Shadows. A Biography of Leo Szilard. WILLIAM LANOUETTE with Bela Silard. Scribner, New York, 1993. xx, 588 pp. + plates. $35.

In the elite circle surrounding Bohr, Einstein, and the other revolutionaries who created quantum mechanics only the most talented of students gained acceptance. Among these was Leo Szilard, one of a group of brilliant young Hungarians including John von Neumann and Eugene Wigner who went to Berlin to study in the early 1920s. Szilard was not quite as proficient in mathematics as his two dazzling friends, but for his doctoral dissertation he submitted a pathbreaking analysis of the relation between information, measurement, and entropy whose importance was generally recognized only much later. Szilard went on to make seminal contributions to nuclear physics during the '30s and played an influential role in the development of molecular biology after World War II—often with contributions that are not reflected in the corpus of his scientific publications.

Perhaps Szilard's most consequential impact was in alerting the scientific community and the military establishment of Great Britain and the United States to the potentialities of nuclear chain reactions. Szilard had been sensitized by H. G. Wells's *The World Set Free: A Story of Mankind*, which he had read not long after its publication in 1914. Very soon after the discovery of the neutron in 1932 he became obsessed with the fact that a nuclear chain reaction was now a possibility. He correctly foresaw both the nightmarish consequences of such a reaction and its potential as a source of plentiful energy. In fact he patented the idea in 1933.

After the discovery of fission in 1939 by Hahn and Strassman no one did more than Szilard to warn the American government of the peril that an atomic bomb would pose if first developed and constructed by Nazi Germany. As is well known, Szilard enlisted the help of Einstein (who had been his teacher in Berlin and with whom he had in 1930 patented a design for a pump with no moving parts) to alert President Roosevelt to this potential. Once the Manhattan Project was launched, Szilard, Anderson, and Fermi were the first to measure the average number of neutrons released during fission, and Szilard and Fermi conceived the design for the first nuclear pile. It was Szilard's engineering knowhow that was responsible for the use of pure (boron-free) graphite as a moderator—a decisive component in the successful construction of the critical assembly.

Looking beyond the war, no one foresaw more clearly than Szilard the dangers of triggering an arms race with the Soviet Union if atomic bombs were used against Japan, and no one worked harder to avert that possibility. Szilard was the leader of the postwar campaign to defeat the May-



"Leo Szilard sits 'botching'—his term for creative daydreaming—in the Rocky Mountain National Park, Colorado, in the 1950s." [From *Genius in the Shadows*; photograph by Trude Szilard/Egon Weiss Collection]

Johnson bill, which would have given supervision of the atomic enterprise to the military. He mobilized the American scientific community, testified at length before Congress, and gave innumerable public lectures, marshaling more than enough support to ensure the defeat of the bill. During the first two decades of the Cold War Szilard labored tirelessly to find means to reduce the threat of nuclear war. He initiated and helped create public forums such as the Council for a Livable World and the Pugwash conferences, and in one-to-one encounters he brought to the attention of world leaders mechanisms for lessening the dangers.

It is often the case with such precocious, unusually able people as Szilard that they never become adequately socialized. Totally committed to rationality and never losing his curiosity and sense of wonder, Szilard remained childlike in his science, his politics, and his personal life. At times warm and charming and at others brusque and aloof, he was always on the move. During most of his adult life he had no permanent base of operation and lived out of suitcases, appearing where critical discussions and experiments were being carried out, making his contributions, and then moving on.

Understanding the nature of Szilard's contributions and what made it possible for him to be so influential would shed much light on both the community he moved in and the world he lived in. William Lanouette has written a biography of Szilard that attempts to offer such an understanding. In this task he had the assistance of Bela Silard, Leo's younger brother. Bela contributed family memoirs and recollections especially to the first five chapters of the book, which deal with Leo's family, his growing up in Budapest, and his studies in the Gymnasium there and in Berlin. They are rich in detail—almost too much so—and convey a sense of milieu and Leo's closeness to his mother. But I suspect that the collaboration also prevented Lanouette from achieving the distance necessary for a balanced account. His presentation of Szilard's accomplishments is unduly polarized and slights the role of other participants in the events. For example, regarding the collaboration on the nuclear pile, one gets the impression from Lanouette's account that the success in getting the pile operational was primarily due to Szilard's "genius," that Szilard had most of the ideas, including that of a "breeder" reactor. It is well known that Szilard and his collaborator Fermi had very different personal and professional styles and did not get along with one another, and for an appreciation of Fermi's contributions the reader will have to look elsewhere, for example to Herbert Anderson's account in *The Nuclear Chain Reaction: Forty Years Later*.

The lack of balance is also manifested in Lanouette's assessment of Szilard's role in getting the United States started in building an atomic bomb. It has long been known (as set forth in the first volume of the official history of the Atomic Energy

Vignette: Leo Szilard

Enmity to [Szilard] is partly based on formalities, such as curt behavior, which does not serve the purpose when official personalities are to be faced. . . . Nobody understands his motives, his interests, his attitude. His lack of self-interest evokes mistrust. . . .

As far as I myself am concerned, I consider S. one of the rarest phenomena, to be judged in a positive way, a person whose qualities can be utilized only with difficulty in the present economic system. He is what he seems to be: an idealist devoted to the task. As his consciousness, however, is materialistic, leaning to experimenting, and agnostic, he fails to understand himself, same as the world fails to understand him. I am holding him in honor, and I value him.

—*Karl Polanyi*, around 1938, in a letter to his brother Michael, as quoted in *Genius in the Shadows*

Commission, published in 1962) that Rudolf Peierls and Otto Frisch's work in wartime Britain, embodied in the reports of the MAUD Committee and conveyed to Vannevar Bush and James Conant by Kenneth Bainbridge and Charles Lauritsen in the fall of 1941, was decisive in committing them and the National Defense Research Committee to the project and in initiating the massive effort that led to Stagg Field, Argonne, Oak Ridge, Hanford, and Los Alamos. Moreover, as has been emphasized by McGeorge Bundy in *Danger and Survival: Choices About the Bomb in the First Fifty Years*, it was because Conant and Bush committed themselves to the effort before Pearl Harbor that it was feasible to give it the support and momentum that made the commitment irreversible. This would have been impossible if the decision had had to be made after Pearl Harbor in competition with more immediate and pressing demands. The larger picture in no way detracts from Szilard's crucial contributions to the project, but it places the events in their correct perspective. It was the British effort that played the all-important role in getting the American effort going at a level that would guarantee success, not Szilard and Einstein's initial démarche. Unfortunately, the book makes no reference to MAUD, to Peierls and Frisch, or to Bundy's account.

The biography suffers from other defects. To comprehend why so perplexing and peculiar a personality as Szilard was taken so seriously in scientific circles it is important to appreciate his powers in scientific matters, and the book is weak in its presentation of that aspect of his activities. The reader cannot appreciate the significance of Szilard's work in thermodynamics in 1922 or his role in shaping molecular biology after the war from the descriptions given in the book, which are at best superficial and at times wrong, nor are Szilard's general acuity and brilliance in dealing with scientific issues adequately conveyed. In almost any area of science Szilard had the ability to go to the heart of the matter, extract the essential element, and find marvelous but credible ways to account for the phenomena that had been observed. The scientific community accepts behavior from its most brilliant members that would never be condoned in the society at large, and as long as he thought what they were doing was worthwhile and interesting, people got enormous pleasure as well as valuable insights from discussing things with Szilard—though his associates did indeed find it difficult to reconcile his deep commitment to critical inquiry with his mania for patenting all the devices his scientific ideas suggested to him.

Despite its shortcomings, the biography is a valuable piece of work. Lanouette corroborates and gives further evidence—based on FBI files and on documents from the Groves papers—that it was the war, and in particular the Manhattan Project, that transformed the political framework in which scientists operated. The national security state was born with the war, and with the Manhattan Project. Groves testified at the Oppenheimer hearings in 1954 that by 1942 he had no illusion "but that Russia was our enemy." From its very inception he directed the atomic bomb project and instituted its security system on the basis of that assumption. Szilard was always suspect and was constantly watched by the FBI. Initially this was due to the antipathy of Groves. Later on, Szilard's forthright stand against the use of the bomb on Japanese cities, his commitment to the international control of atomic energy, his unconventional views on how to stabilize the arms race by abolishing secrecy, and his proclivity for carrying on personal diplomacy at the highest levels all reinforced the presumed need for surveillance. The FBI files Lanouette studied are voluminous. The biography vividly describes Szilard's postwar political involvements to try to make the world a safer place to live in and sensitively delineates the role he played in shaping the character of the Salk Institute.

The physicists who created quantum mechanics had been brought up with the belief that rigid boundaries existed between the moral and the physical domains. They helped destroy that fiction. Szilard's life can be read as the attempt by a highly gifted and thoughtful person to find a means to build a stable world in which it is realized that the moral, the political, and the scientific spheres are inextricably related and constantly interact. For all his personal shortcomings Szilard's life and accomplishments merit close study. Lanouette has helped us in that task.

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An Intricate Ecosystem

The Patterned Peatlands of Minnesota. H. E. WRIGHT, JR., BARBARA A. COFFIN, and NORMAN E. AASENG, Eds. University of Minnesota Press, Minneapolis, 1992. xx, 327 pp., illus. $44.95.

Cancers across the landscape to some, potential profit to others, wild beauty to still others—peatlands inspire a variety of reactions. With their complex patterns, strange plants and animals, mysterious soggy surfaces, and buried history of all of these features, how can they fail to intrigue? Yet the intricacies of peatlands and how this complicated ecosystem has developed have been relatively little studied. Take, for example, the carbon cycle. We know much about this cycle in oceans, lakes, and forests, but where are the data on peatlands, which have the largest carbon store of all northern terrestrial ecosystems? Out of this sea of ignorance comes a rich deposit of knowledge in the form of this book—a comprehensive treatment of the largest peatland area in the 48 contiguous United States.

The editors of *The Patterned Peatlands of Minnesota* have organized its 19 chapters around five major themes: vegetation (including development and landscape ecology), fauna, hydrology, historical development, and human influences. The contributions vary in quality, readability, and useful-