LOOKING BACK WITH WIGNER ON A LIFE IN PHYSICS

The Recollections of Eugene P. Wigner

Andrew Szanton
Plenum Press, New York,
334 pp. $24.50 hc
ISBN 0-306-44326-0

Reviewed by Victor F. Weisskopf

This book is an autobiography. Sure enough, it is written by Andrew Szanton, a freelance writer, but it reproduces the outcome of 30 interviews such that Eugene Wigner speaks in the first person. Szanton succeeds in presenting the real Wigner—you hear him talk. Anybody who knows him would recognize his way of speaking, including a few awkward phrases that he sometimes uses.

Wigner belongs to that small group of theoretical physicists who shaped quantum mechanics. He recognized the importance of the concept of symmetry in quantum mechanics, where it plays an infinitely more decisive role than it ever did in classical physics. It appears as a conventional spatial symmetry in the angular dependence of wavefunctions belonging to states with definite angular momentum. Wigner generalized these space and time symmetries in the representations of the Lorentz and Poincaré groups. Even more important are the unconventional symmetries in abstract spaces, such as the permutation symmetry and the isospin symmetry. Intimately connected with symmetry considerations are the concepts of invariance and group theory. Gauge invariance is an important property of almost all field theories. The group concept has become more and more dominant in theoretical physics. Not all of this goes back to Wigner's work, but he was able to formulate it in an elegant and transparent way that inspired many others to use group theory in most fields of physics.

Numerous are his contributions to nuclear physics, to the theory of nuclear reactions and to the regularities and irregularities of nuclear spectra: There is the Wigner–Eckart theorem about matrix elements between states of different angular momenta and the famous Breit–Wigner resonance formula. Wigner pioneered much of solid state physics and inspired Frederick Seitz and many others to follow up on his ideas. He also contributed fundamentally to the formulation of quantum field theory. All this is only a selection of his great achievements in physics. There is hardly a paper in contemporary theoretical physics that is not based on some of his ideas, whether he is quoted or not.

Interestingly, Wigner mentions very little of all this in the book. The word symmetry appears only a few times, with no attempt to explain its significance. Most of his other contributions are not mentioned at all, except when he gives credit to his collaborators. He is much more explicit when describing John von Neumann's contributions. This is typical of Wigner's proverbial modesty. At one point he says, "I am not a great man." Getting the Nobel Prize, he says, was a completely unexpected honor, and he expresses doubt that he has achieved enough to deserve it, quoting a German proverb: "The stupid one has luck." Is this another expression of his excessive modesty? A witty colleague once remarked, "Wigner is tops in humility." We others were disappointed that he had to share the Nobel with two others.

Wigner is less modest when he talks about his contributions to the Manhattan Project, in particular his leading role in constructing the Hanford reactors devoted to the production of plutonium. Wigner's college education started with chemical engineering, before he switched to physics. Perhaps he was glad to apply his first training to the defense of his adopted country. Unfortunately, he does not explain in the book what his specific contributions were. He mentions some conflicts with the DuPont Company, which carried out the construction, but he does not describe them.

The most revealing and fascinating parts of the book are the descriptions of Wigner's youth, his family's home in Hungary and his warm and devoted relation to his father, who was the manager and owner of a tannery. His father wanted him to take over this enterprise; this was the reason he studied chemical engineering. He had to disappoint his father when he switched to physics. Most fascinating is Wigner's account of a group of four friends who met in Hungary and came to the US later on. The group consisted of Wigner, Von Neumann, Leo Szilard and Edward Teller. They were bound together by their common origin and an education based on the high cultural level of the Jewish upper-middle class of those days. I had thought these famous Hungarians went to the same high school but I learned from the book that this was not so.

The deep personal friendship and mutual admiration between those four men started early and survived the terrible years of communism, fascism and anti-Semitism in Hungary and Germany, where all four went for higher education. They renewed their intimate contacts when they arrived in the United States. Here they represented a nucleus of Hungarian culture and lifestyle. Wigner says on one occasion in the book: "After 60 years in the United States, I am still more Hungarian than American. I speak English with a thick accent. Much of the US culture escapes me." Perhaps this is true also for other immigrants who are not so honest to admit it.

There were sharp differences in political outlook among this group of Hungarians. Von Neumann, Teller and Wigner were politically rather

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conservative, whereas Szilard was liberal and engaged in political activities of which Wigner disapproved. Still, his disapproval is lovingly and admiringly expressed in the book. He sympathizes very much with Teller and tries to explain and defend those actions that alienated Teller from the majority of his friends. Perhaps he goes a little too far when he maintains that Teller was unhappy in Los Alamos because "discussions were nearly forbidden even among close friends." Certainly that was not the case; the atmosphere was full of intellectual excitement shared by almost all of us in hefty discussions. Teller kept himself aloof because he disapproved of the program.

In the last part of the book Wigner reveals his personal views on science, politics and people. He expresses his unhappiness about the use of the A-bomb on Hiroshima and Nagasaki. After the Nazi defeat he wanted an end to secrecy and the establishment of an international body to decide what to do with the bombs. Many other scientists, including myself, were in favor of this but our ideas about the political situation of that time were much too unrealistic. The cold war was in the making, and any effort to create an international committee to deal with nuclear weapons was doomed to failure.

Wigner tells us about his fight against exaggerated secrecy in nuclear and other military matters and argues strongly that more openness would have been good for all sides. As is well-known, he strongly supported civil defense in the decades after the breakdown of internationalization. His point of view is eloquently presented in the book, but it may no longer be as relevant as it was during the cold war. Here one must admire Wigner's way of expressing himself, even when one does not agree with his ideas. His love of freedom and his loyalty to the United States shine through most of his arguments. (Of course, he is critical of many developments in this country; for example, the student upheavals during the late 1960s, which he condemns in the strongest terms.) The reader will also be impressed by the sketches of some of his colleagues outside the Hungarian circle and by his unbounded admiration of Einstein.

One would have wished for more about Wigner's ideas on physics and on the significance and relative importance of different subfields. But he does discuss the limitations of present-day physics in explaining biological and psychological phenomena, in particular the elusive concept of consciousness.

Some of the physics statements seem bungled. For example, Von-Neumann is quoted as saying that the angular momentum is always an integer multiple of h if all particles are at rest. Another poorly expressed statement is this: "In the group theory of quantum mechanics, electron orbits were now represented not as orbits but as spheres."

Altogether it is a pleasure to read this book. It is the nearest equivalent to spending some time in Wigner's company and savoring his honesty, his thoughts and his devotion not only to physics, but also to so many other human concerns.

Cardinal Choices: Presidential Science Advising from the Atomic Bomb to SDI

Gregg Herken
Oxford U. P., New York, 1992. 317 pp. $24.95 hc
ISBN 0-19-507210-3

This is an important book. It traces in a scholarly manner the sequence of decision-making by the President's science advisory system on a number of key military items. It is not intended to give a full overview of the science advisory roles at the Presidential level nor is it an analysis of the merits of this system. It touches only casually, if at all, on the role of science advice in environmental matters, in establishing priorities for government support and in more routine military matters, such as antisubmarine warfare, tactical nuclear weapons and military aircraft. The "cardinal choices" are primarily the nuclear test ban, the wartime decisions to build and use nuclear weapons, the hydrogen bomb, the uses and abuses of the electronic barrier in Vietnam and the debates about ballistic missile defense.

The book is based on extensive interviews and correspondence. To the extent that I am personally acquainted with the episodes cited, the reporting is accurate and comprehensive and there are only a few minor errors. One strength of the work is its thoroughness in tracing the steps at which science advice has influenced these momentous decisions. Another is how it delineates the gradual erosion in the impact of science advice at the Presidential level.

The author documents the series of conflicts that led to the demise of the President's Science Advisory Commit-