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-

tee. He identifies the clash in values when the recipient of the advice wished to establish policy first and then use the science advisor to justify and publicly support the policy, rather than the other way around. The author also documents the failures that are inevitable when Presidents "instruct" the scientific community to solve problems in a specified time even though fundamental knowledge is lacking or the problem is much more social than scientific.

The book clearly demonstrates both the value and the limitations of scientific advice. Presidents and other decision makers have been guilty of either overestimating or underestimating the value of science. Instances are cited of outright disdain for scientific advice as not meeting "practical" needs. Conversely, the author cites recurring episodes, such as the "war on cancer" or the "impenetrable" antiballistic missile shield, where confidence that science can perform on command is unwarranted. What is not explicitly discussed in the book is that science advice requested by an executive can only rarely be based on established scientific fact alone; rather, it requires projecting future expectations, starting from a scientific and technical basis. It is therefore not surprising that such a forecast must have a subjective element. This subjectivity should not leave the adviser open to charges of bias. It is interesting that concern over bias and ideology has led to political litmus tests for science advisers during recent administrations, while under Eisenhower and Kennedy the political persuasions of the advisory committee members were not at issue and were generally undocumented.

The book is possibly weakest when drawing broad lessons from the experiences cited. While science advising now has a well-documented history extending over half a century, the author does not avail himself of that history to draw conclusions as to which classes of advice and which advisers have accumulated a good record—and which have proven to be unwise. The benefits from such hindsight could indeed be valuable.

The recital in Herken's book reveals the periodic resumption of debates of essentially the same issues in the cases of the ABMs and the Test Ban. For instance, whenever a Comprehensive Test Ban Treaty seemed possible, opponents tended to cite a success that was just around the corner, be it a clean weapon, the neutron bomb, directed-energy weapons, enhanced radiation, increased ABM effectiveness or whatever. Yet while the specific rationale kept changing, the nature of the debate remained the same. Similarly, in the ABM debate there continues little recognition of the basic fact that in the nuclear age the burden on a system of defense is greater than that on a highly damaging nuclear offense. The debates cited by Herken center around the wisdom of implementing just the next system in view—be it Nike-Zeus, Nike-X, Sentinel, Safeguard, the Astrodome Defense or recently, Brilliant Pebbles—as part of global protection against limited strikes.

But possibly most important is the lesson that whatever the formal organization of the science advice at the Presidential level, its success ultimately rests on the "chemistry" between the President and the adviser. If the President really desires independent advice and has a good personal relationship with his or her adviser, the process is extremely valuable. If not, decisions are made with scientific and technical reality taking a back seat to political agendas.

There are many other lessons to learn from reading the book carefully, and I strongly recommend it.

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High Energy Radiation from Magnetized Neutron Stars

Peter Mészáros
U. Chicago P., Chicago, 1992. 531 pp. $39.95 pb

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Most of neutron star physics, like most of the physics of exotic astrophysical systems, is hidden from view. The equation of state of the neutron star interior can only be inferred from the relationship of the stellar mass to the stellar radius, which is virtually unknown. The nuclear runaway responsible for x-ray bursters occurs far below a neutron star's surface, ensuring that direct information of the fusion processes is lost as the radiation thermalizes. But the group of physical processes in a magnetic field exceeding 10^{12}G is *not* invisible and is directly responsible for the appearance of the most interesting neutron star systems: the spin–powered and accretion–powered pulsars. Some of this physics is classical, taken to the relativistic quantum mechanical regime. Much of the physics is unique to strong fields and therefore only exists near the surface of a magnetic