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.

WOLFGANG K. H. PANOFSKY
Stanford Linear Accelerator Center

High Energy Radiation from Magnetized Neutron Stars

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

ISBN 0-226-52094-3

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

neutron star.

In the first half of his book on neutron stars, Peter Mészáros, an expert on radiative transfer in magnetic neutron star atmospheres, derives in varying degrees of technical detail the processes found in a strong magnetic field. He uses nonrelativistic quantum mechanics to discuss much of the relevant physics, such as the quantum states of a free electron and of an atom when the magnetic force exceeds the electric force. The most advanced and detailed discussions require an understanding of relativistic quantum mechanics. These discussions cover the dielectric tensor in a strong magnetic field for the vacuum and for a plasma; fundamental radiative processes such as cyclotron emission and resonant Compton scattering; unique processes such as photon splitting and single photon pair creation; and the solutions of radiative transfer equations for a polarizing medium.

Mészáros devotes the second half of his book to a survey of the astronomical systems that motivate strong magnetic field physics: accretion-powered pulsars, spin-powered pulsars and gamma-ray bursts. This discussion is accessible to all graduate students in astrophysics. As an introduction to pulsars this book is adequate, but those conducting research on pulsars will want additional references, such as the recent books by F. Curtis Michel (U. Chicago P., 1991) and by A. G. Lyne and Francis Graham-Smith (Cambridge U. P., 1990), which cover the subject in much greater detail. The once-favored galactic neutron star model of gamma-ray bursts, which spurred many researchers, including myself, to develop the physics of processes in strong magnetic fields, is the only gamma-ray burst model discussed in Mészáros's book. Unfortunately for Mészáros, after he had finished writing this book, the Compton Gamma Ray Observatory produced evidence favoring cosmological models. This book is foremost a book on accretion-powered pulsars. The link between theory and observation is strong for these systems, and Mészáros nicely presents the relevant observations and discusses the most recent theoretical work.

Two additional topics discussed in this book are the models for gamma rays observed above 1 TeV from x-ray binaries and the evolution of accreting pulsar systems. The references are fairly complete for the past two decades. On balance this is a fine book that draws together much of the recent research literature, and it will be a standard reference for those working on accretion-powered pulsars.

JEROME J. BRAINERD
Marshall Space Flight Center
and
University of Alabama at Huntsville

NEW BOOKS

Astronomy and Astrophysics

Accretion Power in Astrophysics. *Cambridge Astrophysics Series 21.* Second edition. J. Frank, A. King, D. Raine. Cambridge U. P., New York, 1992 [1985]. 294 pp. $79.95 hc ISBN 0-521-40306-5. *Monograph*

Annual Review of Astronomy and Astrophysics. G. Burbidge, D. Layzer, A. Sandage, eds. Annual Reviews, Palo Alto, Calif., 1992. 765 pp. $57.00 hc ISBN 0-8243-0930-8