

photographs are scientifically accurate and relevant.

Finally, I very much enjoyed the historical introduction to gravity. Having taught a course on the subject, I found his treatment very balanced and easy to read. I may use his book as a text for my undergraduate course on black holes.

Perhaps it is because Nicolson is not a working relativist that he has been able to give such a clear account. However, I am very impressed that an outsider would be aware of the subtleties in the field. For example, he has a very clear discussion of the fact that Seyferts (spiral radio galaxies) do not have double radio lobes, while elliptical radio galaxies do, which tells us that the gas content of galaxies (spirals have a lot, ellipticals very little) may be crucial in the formation of such lobes. This is an obvious point, but one that many researchers in the field would be hard pressed to put forth so succinctly.

My thanks to Nicolson. I took forward to his next book!

LARRY SMARR
University of Illinois
Champaign-Urbana

Science Observed: Essays Out of My Mind

J. Bernstein
Basic Books, New York, 1982. \$16.95

Physics—and science in general—is extraordinarily fortunate in having Jeremy Bernstein to interpret us to educated nonphysicists. I find great and continued pleasure in reading his clear and literate writing about us.

I have always felt that the profile by Jeremy Bernstein is the ultimate biography from the subject's point of view: respectful, clear, nearly impersonal. His wart-free portraits of the great scientists show them as they must wish to be seen. In this mixed collection of profiles, essays, capsule biographies and even a story, Bernstein takes several steps away from his too-generous portrayals and toward being a writer rather than an apologist: He reveals at least a few of his own emotions and his own "warts." There is, for instance, an account of Los Alamos of considerable power, especially in the description of his own immature attempt to dissuade Adlai Stevenson from supporting a test ban treaty; in another essay he discloses his own anger at a college president's stupidity at closing down a research reactor. The minor pieces are, in fact, unexpected and almost unalloyed sources of delight: the wonderfully accurate skewering of *The Tao of Physics* and its phony ilk, the revelation of what we all know about cranks but couldn't express as well, a concluding piece on artificial intelligence not

in the manner of Douglas Hofstadter but how he might have written with sufficient prodding and editing.

About half the book returns to Bernstein's more familiar turf, writing for *The New Yorker*: a long, expanded profile on Marvin Minsky introducing the artificial intelligence world; a shorter piece on Stanley Kubrick's 2001, and chess (the only "padding" in the book, I felt, was the extra bit here about covering Fischer-Spassky for *Playboy*); and a profile type of piece on Harold Furth and plasma physics. With Minsky, as with the pieces on J. Robert Oppenheimer, Erwin Schrödinger, and plasma physics, one is still left looking for the warts and the clay feet, aspects which some of Minsky's colleagues in the computer world would have happily supplied. Scientists do compete, backbite, carry on personal feuds, ride hobbyhorses, bluff, puff themselves up, make egregious mistakes in judgment: Why do we never hear of these things except 300 years later (or in the only honest book I know about science, the *Double Helix*)? In the case of Minsky, one is left with far too positive a view of the scientific field itself; the notable failures, as in speech recognition, pattern recognition, linguistics, the game of Go, not to mention the simple economic mess of software glut, are not visible. In the case of Oppenheimer, why were the "wonderfully productive" years 1930-1940 so devoid of major achievements? Why has his handpicked faculty at the Institute of Advanced Study been so surprisingly sterile in the actual event? In the case of fusion, several real problems are glossed over, one explicitly: It is not at all true that tritium is harmless; quite the opposite. There has to be—and there is in all of these cases—a different side which Bernstein in his enthusiasm seldom probes. For the good of the our public images let this be a best-seller! For the good of informing the public about what scientists do, let Bernstein take a few more critical steps.

P. W. ANDERSON
Bell Laboratories
Murray Hill
and Princeton University

Foundations of Optical Waveguides

G. H. Owyang
245 pp. Elsevier, New York, 1981. \$45.00

This book presents a treatise on the wave propagation in planar and cylindrical waveguides from the field point of view. Gilbert H. Owyang, a professor of electrical engineering at the Worcester Polytechnic Institute, points out in his preface, "this text is the result of notes developed for undergraduate and

NOW Grazing Incidence..... Tailor Made and Affordable



The GIMS 551.5 is the Tailor-Made instrument for your GRAZING INCIDENCE experiments. It is a 1.5 meter instrument that provides you with high resolution, ruggedness and features of a 2.2 meter and the convenience and portability of a 1 meter instrument. Like all of the ARC GRAZING INCIDENCE instruments it has Tailor-Made optics for this wavelength region.

The Tailor-Made instrument is available as a monochromator, spectrograph, scanning monochromator, and polychromator that can utilize the latest multi-channel-plate detectors. All are rapidly interchangeable in your laboratory.

Features:

- Low cost & high performance
- Rapid, easy conversion from photoelectric to photographic operation
- Wavelength range 10Å to 1800Å (300 G/mm grating)
- Computer compatibility

Send today for information on the Acton Research GIMS 551.5. Or send specifications for your own Tailor-Made instrument.

ARC ACTON RESEARCH CORPORATION

BOX 215 525 MAIN STREET
ACTON, MASSACHUSETTS 01720
TEL: (617) 263-3584
TELEX: 940787 ARC ACTO

PLASMA/FUSION SHOW-BOOTH 70
Circle number 52 on Reader Service Card