

discussion of general principles all the way to the scheme for the detection of hypothetical magnetic monopoles.

At the end of each chapter, there is a set of excellent "real-world" problems.

One final criticism: The author has a tendency to make flat assertions without detailed justifications or derivations. This would not be so bad, if there were adequate references given to sources of more detail. Although there are references at the end of each chapter, it is often unclear which reference one should consult, and many questions fall outside the scope of the references given. I believe any instructor assigning Kadin to students should personally have a copy of van Duzer and Turner, which offers very detailed references.

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Einstein's German World

Fritz Stern

*Princeton U. P., Princeton, N.J.,
1999. 335 pp. \$24.95 hc
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The title—and the author—of Fritz Stern's *Einstein's German World* might lead a reader to expect an authoritative, exhaustive account of the topic, similar to well-known books like Allan Janik and Stephen Toulmin's *Wittgenstein's Vienna* (Touchstone, 1974). Yet, German-born Fritz Stern, a recent winner of the German publishers' prestigious Peace Prize, approaches the topic with far less ambition. Rather than giving the detailed facets of an enormously rich period of middle European culture in the first decades of the twentieth century, he assembles a small series of fine, mostly previously published essays on eminent personalities surrounding Albert Einstein in pre-Hitler Germany, and some considerations illuminating the changes that followed each of the two world wars. Einstein serves as the central point of reference.

To characterize Einstein's Germany, the author profiled Paul Ehrlich, the founder of chemotherapy, and four of Einstein's special friends: Max Planck, the senior colleague and first active supporter; Fritz Haber, the chemist; Walther Rathenau, the industrialist and politician; and Chaim Weizmann, Zionist, scientist and politician and the only non-German treated. The strength of these portraits does not lie so much in

revealing new features in the professional biographies, but rather in bringing out personal attitudes of the portrayed, their relations to friends and colleagues, and their social embedding. So, while we learn nothing about Planck's physics in the epoch considered, Stern does tell us how he dealt with delicate situations in the Germany of World War I and the Nazi epoch.

In the longest (and strongest) chapter, on Haber and Einstein, the author draws on new material to depict sympathetically his (Stern's) godfather, Haber, the scientist who organized both civil and military efforts in Germany during World War I. By contrast, Stern takes the information on Einstein's life and science from known sources. In the case of the social revolutionary Rathenau and the Zionist Weizmann, he restricts himself to describing their political motivations.

Stern emphasizes the role of World War I as the turning point from "the promise [for Einstein] of German life" to "the consequent terrors." Thus he argues that the responses of some German historians prepare the later Nazi ideology. The final chapters dealing with post-World War II Germany (problems of reunification of the two Germanys, the Goldhagen controversy—whether all Germans were Hitler's obedient helpers—and the German-Polish reconciliation) depict a Germany quite different from Einstein's. Still, in spite of all the troubles and miseries, the period of Einstein in Germany maintains the gloriole of a great epoch of the human spirit.

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Quasars and Active Galactic Nuclei: An Introduction

Ajit K. Kembhavi

and Jayant V. Narlikar

*Cambridge, U. P., New York, 1999.
463 pp. \$80.00 hc (\$34.95 pb)
ISBN 0-521-47477-9 hc
(0-521-47989-4 pb)*

A quiet revolution has been occurring in the field of extragalactic astronomy. Extraordinary images from the Hubble Space Telescope and data from such high-energy astrophysics missions as the Advanced Satellite for Cosmology and Astrophysics (ASCA) and the Chandra X-ray telescope are changing the way we view the central

engines that power quasars and active galactic nuclei (AGN). At the hearts of these objects are supermassive black holes that convert matter into energy and help form enormous, galaxy-sized jets that expand outward at amazing speeds.

As researchers gain increased access to data from across the electromagnetic spectrum, some basic truths are emerging, such as the existence of massive accretion disks that store the matter needed to fuel the AGN. Yet these objects are still enigmatic; challenging puzzles include the way energy is actually extracted from accretion disks. The field is ripe for insight into what may be the ultimate physics—extreme gravity near the event horizon of a black hole.

Following these strides in AGN research, new books that seek to summarize the state of current research are welcome. Ajit Kembhavi and Jayant Narlikar's *Quasars and Active Galactic Nuclei* is one such book. It is written more from an observer's than a theorist's perspective, although the authors handle both equally well. Intended as an introduction to quasars and AGN, this book is targeted at the advanced undergraduate or beginning graduate student seeking a basic knowledge of the field. As such, it is more advanced than Bradley Peterson's *An Introduction to Active Galactic Nuclei* (Cambridge, 1999) but does not contain the rigid mathematics of more advanced texts such as Julian Krolik's *Active Galactic Nuclei: From the Central Black Hole to the Galactic Environment* (Princeton, 1999). The first third of *Quasars and Active Galactic Nuclei* easily meets its authors' objectives. Within a historical background and cosmological framework, and with an easy-to-read style, the authors state their ideas clearly, introduce important physical and astronomical concepts, and explain their relevance to AGN. In particular, I found the discussion of radiative processes refreshing.

The rest of the book is written in review style, with its primary emphasis on quasars and secondary emphasis on other AGN. The authors present a detailed discussion of quasar surveys, multiwavelength properties, and recent observational results.

The book succeeds as a comprehensive account of quasars, but misses its mark as an up-to-date account of active galaxies. In particular, the section on x-ray astronomy does not accurately reflect the state of the field. A minor problem is that some subjects are covered in almost grueling detail

(quasar luminosity functions), while others are barely covered (quasar absorption lines; these are treated more thoroughly in Peterson's *An Introduction*). Kembhavi and Narlikar claim to give a neutral overview, but their specialties receive the most complete treatment.

To write a book on a rapidly evolving field is a challenge, and it is understandable that no textbook can follow the very latest developments. However, given the amazing technological leaps in high-energy astrophysics in the 1990s, the field deserves better treatment than it gets in this book. It is easy to be critical of what one knows best, so I preface the following by admitting that I may be expecting too much.

The discussions of observational results on AGN are outdated, with much of the information not carried beyond what was known in the early 1990s. There is little discussion of recent observational evidence for accretion disks or reliable black-hole mass measurements. In particular, important results such as the masing disk in NGC 4258 and the relativistically broadened iron K fluorescence lines in AGN are overlooked. For the last seven years, ASCA has been instrumental in changing x-ray spectroscopy, making a sudden leap from data with almost featureless continua to real spectral diagnostics; however, most discussions are based on missions that have long since ended (Ginga, Einstein, Exosat). This section leaves one with the impression that little progress has been made in the field of high-energy astrophysics, when exactly the opposite is true.

I also found the writing style and presentation to be uneven. While some chapters succeed, others include lots of facts but no logical framework within which the facts can be understood. The book would have benefited from a clear comparison of the various results rather than a somewhat disjointed discussion. There are also some conceptual errors that do not seem purely typographical, such as incorrect references to x-ray-telescope instrumental capabilities. In particular, the spatial resolution of the Rosat high-resolution imager is given as 1.7 arcmin, when it should be 5 arcseconds.

This book serves well as an introductory text for the advanced undergraduate or beginning graduate student who wishes general knowledge of the field of AGN research. It contains a nice overview of AGN theory, a comprehensive account of quasars, and a valuable historical review, but with a

train of thought that unfortunately stops in the early 1990s. The book therefore doesn't meet one of its goals: to be an up-to-date review of the field.

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Fiber Bragg Gratings: Fundamentals and Applications in Telecommunications and Sensing

▶ Andreas Othonos
and Kyriacos Kalli
Artech House, Norwood, Mass.,
1999. 440 pp. \$89.00 hc
ISBN 0-89006-344-3

Ken Hill and colleagues at the Canadian Communication Research Center discovered photosensitivity in optical fibers approximately twenty years ago. (Upon exposure to intense ultraviolet light, there is an induced change as large as 10^{-2} in the refractive index of doped silica optical fibers. This refractive index change is associated with defect transformations in the glass.) In 1989, researchers at United Technologies developed the side-writing of gratings into optical fibers, allowing grating properties to be easily varied. This led to increased activity in the fields of both photosensitivity and fiber gratings, as research groups attempted to understand the fundamental mechanisms as well as to fabricate practical devices for both telecommunications and sensing applications.

Fiber Bragg Gratings: Fundamentals and Applications in Telecommunications and Sensing, by Andreas Othonos and Kyriacos Kalli, reviews the work to date from the multiple perspectives of fundamentals of photosensitivity, devices for telecommunications, and applications in sensing. It follows closely another book devoted exclusively to the subject: Raman Kashyap's *Fiber Bragg Gratings* (Academic, 1999). Whereas Kashyap's book is almost entirely devoted to gratings for telecommunications with little discussion of photosensitivity, the book by Othonos and Kalli broadly details research in all areas of fiber gratings. With the authors' background primarily in the area of grating sensors, it is not surprising that sensing is covered in the most detail.

The authors state in the preface that the intended audience includes

researchers and academics in optoelectronics. Since fiber gratings and photosensitivity remain very active areas of research, it is not possible to provide a textbook type of introduction to the field while simultaneously providing a thorough review. The authors have emphasized completeness, making the book a challenging read for those with little previous familiarity with the subject matter.

Given the continued debate on the origins of photosensitivity in glass, the authors chose to summarize all the research to date, resulting in over 200 references for one chapter alone. This extended review-article format is used for many of the chapters, including those on applications of gratings in telecommunications and on grating sensors. While this amount of information may be overwhelming or confusing to readers new to the field, it provides a valuable reference—a single point of departure for what in the past few years has become a vast quantity of literature. This is particularly true for the chapter on photosensitivity, which covers the relevant work and organizes it in a logical manner.

The book provides an amount of mathematical detail and figures appropriate to the text. The various grating architectures employed in both telecommunications and sensing applications are particularly well illustrated. In an attempt to have each section relatively independent, the authors occasionally repeat some information or treat different aspects of the same topic in different portions of the book. For example, different types of photosensitivity (i.e., Type I, Type II, etc.) are treated in both the chapters on photosensitivity and on grating properties. This is a consequence of the extended review-article format that the book utilizes. The thorough index largely overcomes this drawback.

One notable omission is the relative lack of information on grating apodization, both in terms of theory and fabrication. This is a critical aspect of gratings for most telecommunications applications and deserved a more thorough treatment. The placement of the grating-theory chapter after the sections on grating properties and fabrication is unusual. The chapter on grating theory is also quite brief and not sufficient for a reader without some prior familiarity with the subject. As the title suggests, the book concentrates on gratings in optical fibers and does not include many references to the vast literature on planar gratings, except when presenting grating theory.