noted, this technique may be regarded as an algebraic version of the Bethe ansatz. The pivotal role of the Yang–Baxter equations, derived from Rodney J. Baxter's deep exploitation of commuting transfer matrices, is well explained. The approach is then applied to the one-dimensional Hubbard model and also used to solve the Kondo problem. Some of the related further developments are sketched briefly.

The mathematical methods that have grown from the Bethe ansatz are unfamiliar to many theorists; they are subtle but powerful, and undoubtedly their applications are not yet exhausted. Yuri Izyumov and Yuri Skryabin deserve thanks for providing an accessible overview and introduction to this significant field and its original literature.

The book lacks an index (despite the assertion on the fly page), but has a detailed list of contents. The translation is competent although some infelicities and inappropriately translated terms appear. Despite its various shortcomings, this volume warrants a place in all libraries serving condensed matter theorists.

Creation of the Universe

Fang Lizhi and Li Shuxian
World Scientific, Teaneck, N.J., 1989. 180 pp. $41.00 hc ISBN 9971-50-600-9; $25.00 pb ISBN 9971-50-601-7

Fang Lizhi, China's leading cosmologist, and his wife Li Shuxian, a well-known Beijing University physics professor, present a unique approach to cosmology in *Creation of the Universe*. In this book Fang, one of the first scientists to recognize the excitement at the interface of cosmology and particle physics, and Li give their overview of an active and dynamic new field.

Fang and Li became internationally famous after they were forced to seek asylum in the US Embassy in Beijing this past spring. However, this book, except for a brief paragraph in the preface, is about cosmology, not politics. And well it should be since Fang and Li are first and foremost physicists, not politicians.

Creation of the Universe is an English edition of the authors' popular 1987 Chinese book. It was written for a general audience of educated Chinese. This in itself is quite revealing, since the book uses exponential notation and has many algebraic equations. A book written for an "equivalent" audience in the US would have to write out "billions" and "trillions," and, as Stephen Hawking noted, no equation other than $E = mc^2$ would be acceptable. Unfortunately this difference in the mathematical competence of what is considered a "general audience" means that in the US, the book's audience is restricted to, perhaps, technically oriented people from physics and other fields and college students taking introductory physics and astronomy courses. The book is also worthwhile for the specialist, not because of new science, but because the logic and order of presentation are unique to Fang and Li.

The book has a fine mix of ancient Chinese stories and some nice cartoons and sketches that give it a special quality that no other cosmology book has. Cosmology has become a very active area of physical research and is probably the subdiscipline that captured the most column inches of popular science writing in the 1980s. While there are many popular cosmology books written by both journalists and active researchers, Fang and Li take a unique approach. They develop Big-Bang cosmology as a natural consequence of the answer to the worries of the ancient men of Qi as to when the sky would fall and the earth collapse. This exercise in logic contrasts sharply with the more empirical approach used by most Western authors (including myself). Eventually, Fang and Li introduce some empirical evidence, such as the background radiation and the light-element abundances (my own "unbiased" favorite), but they do not focus on the empirical approach.

The problem with such a purely logical development is that it is counter to the recent historical development of the field, which has been dominated by experimental and observational information. In fact one key reason for so much recent interest in cosmology is that we have so many new ways to actually probe the universe and test our ideas, including both accelerator experiments and astronomical observations at a variety of wavelengths. Rearranging things for pedagogical reasons to make the development look purely logical—is an interesting approach. But could we really deduce the Big Bang from worrying about the sky falling if we didn't already know about the success of cosmological nucleosynthesis in explaining light-element abundances and the observation of the 3-K background radiation? I worry that casual readers might miss the fact that cosmology is an experimental as well as a theoretical field and that progress has occurred through a combination of approaches.

Most popular Western science books tend to include anecdotes about the individual researchers. This book mentions very few living scientists (which is a bit demoralizing for those of us who love to see our names in print), but instead livens things up with ancient Chinese stories. For example, "Gong-Gong the Destroyer" is invoked to describe how *CP* violation can explain the origin of the net excess of matter over antimatter in the universe.

The book also has some nice catch phrases such as this comment on stellar nucleosynthesis: "Never would the ancient alchemists have thought that all stars were the furnaces they were looking for." There are also some cute miswordings such as "sky telescope" for "space telescope." The text contains some minor errors and an excessively awkward explanation of Olber's paradox (why is the night sky dark?). Perhaps the book's biggest problem lies in mixing well-established material with very speculative material and not differentiating between the two to any great degree. For example, Fang and Li's discussion of periodicity in quasar redshifts would not find resonance with many other cosmologists.

The book's final speculations on Planck time and quantum gravity and making universes from nothing are up-to-date and more complete than those in most other popular cosmology books. The discussions of the creation of space-time and the wave function of the universe are particularly nice.

As the book wanders into "philosophical" areas, the "anthropic principle" is unfortunately brought forth. The anthropic principle argues that our existence as thinking beings selected the initial conditions and laws of the universe. I personally have difficulty in viewing the anthropic principle as a scientific argument, because in my view scientific progress occurs when we search for "natural" ways to enable a wide range of initial conditions to yield the observed universe, not when we throw our hands up and invoke the anthropic priciple as an explanation. However, others without my prejudice might not be as irritated by the anthropic approach.

I have mentioned several points where I question the presentation in *Creation of the Universe*; however, I would no doubt find comparable quibbles with any of the multitude of popular and semipopular cosmology books on the market. All in all, I think this book is a worthwhile addition to the field. It presents Big-Bang cosmology from a different orientation and shows us Fang's and Li's scientific perspectives and biases.

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Optical Waves in Layered Media

Pochi Yeh
Wiley Series in Pure and Applied Optics.
Wiley, New York 1988.
406 pp. $44.95 hc
ISBN 0-471-82866-1

The science of thin films for optical applications is certainly not new, and there are several fine books on the subject. The question then is, Do we need another one? The answer is yes; *Optical Waves in Layered Media* by Pochi Yeh does successfully fill a void in the current literature.

In the past, the major application of optical thin films has been to make filters, such as antireflection coatings and dielectric mirrors. Since the advent of optical communications and integrated optics, a significant use of thin films has been the fabrication of waveguides and integrated optical components. This book develops the theory of thin-film optics in a general manner, making it applicable to the diverse modern field.

The first 100 pages of the book are devoted to a review of electromagnetic theory, along the lines of that in *Principles of Optics* (Pergamon, New York, 1959) by Max Born and Emil Wolf. Next Yeh develops the matrix theory of thin-film optics. In earlier books the usual approach treats the characteristic matrix of each film. Yeh, on the other hand, generates a matrix for each dielectric interface and propagation distance; this matrix is then more easily applied to different structures. Yeh applies the matrix to analyze the transmission properties of filters and interferometers and gives examples.

Other subjects not found in most books on thin-film optics are also covered. Inhomogeneous films are discussed, and approximate (WKB) and exact solutions are presented. The text also treats anisotropic films and their applications. The final topics are single- and multilayer waveguiding, which are important in optical communications, and semiconductor quantum wells, which are used in integrated laser fabrication.

Optical Waves in Layered Media brings the field of thin films up to date. The book covers its subject in a more general way than is usually done and includes more advanced