that proofreading may still not be very high on Kadanoff's priority list.

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Making Waves: Stories from My Life

Yakov Alpert
Yale U. Press, New Haven, Conn., 2000. $30.00 (260 pp.). ISBN 0-300-07821-8

"I am not a Soviet man!" That simple declaration was Yakov Alpert's answer in 1980 to my question, "Why do you want to leave the Soviet Union?" How he came to this decision is one of the main threads of his memoir, *Making Waves: Stories from My Life*. His straightforward and touching account of making it in science (radio waves in the ionosphere and magnetosphere) and life (defiance waves in the Sovietsphere) is a well-documented account by a radio and plasma physicist whose unique life path transcends the birth and death of Soviet Communism.

Alpert was born in 1911 into a poor Jewish family in Ivnitsy, near Zhitomir, Ukraine. He warmly recalls his Hebrew school ("Cheder") training, as well as developing "survival strategies" during the violent anti-Semitic pogroms of 1919.

In 1931, with nothing but a high-school diploma in carpentry, and home experience with crystal radio sets, Alpert went to Moscow. Starting as a laborer in construction, he was propelled by his obvious intelligence onto an upwardly mobile science path. In 1934, he learned that the Lebedev Physics Institute of the Academy of Science (PhIAN) was moving to Moscow, and with characteristic chutzpah, or as he calls it "an optimistic temperament," he asked for and was given a technician's job based on his interest in the burgeoning wireless communication, radio. His creative experimental work there under Nikolai Papalexei and director Leonid Mandelshtam ("one of the most distinguished scientists of Russia . . ."), on the velocity and phase structure of radio waves over land and sea using radio interferometry, led to his maturation and a 1939 *kandidat* (PhD) degree. In 1944 he began experimental and theoretical studies of the fine structure of the ionosphere.

Following World War II, when Joseph Stalin's campaign against "cosmopolites" (Stalin's word for Jews) accelerated, Alpert was verbally abused, and in 1951, finally dismissed from PhIAN for being "unsuitable." However, with characteristic luck, in 1952 he was offered a position ("a brave and noble step") by Nikolai Pushkov at the Institute of the Earth's Magnetism, Ionosphere, and the Propagation of Radio Waves of the Academy of Science (IZMIRAN), where he headed his own department and had his own building. In 1958, he worked with radio data from Sputnik 1, the world's first artificial satellite, and showed that electron density in the ionosphere decreases slowly at levels above its main maximum. He also produced a theory—validated by satellite data—explaining "atmospherics," 50–30 000 Hz electromagnetic signals produced by lightning discharges.

Alpert's attitudes toward the Soviet system abruptly soured following the ruthless invasion of Czechoslovakia in 1968. He resolved to emigrate, and in 1974 he and his second wife, Svetlana Pikova, formally applied for permission to leave the USSR—thereby becoming refuseniks. Svetlana was fired from her job, and he was demoted at IZMIRAN.

Alpert then entered into the activities of the existing community of refuseniks, most of whom had lost their jobs and suffered harassment and terrorization by the Soviet secret police. For support, the refusenik scientists began to hold regular "Moscow refusenik physics–mathematics seminars" at selected apartments, including the Alpert's apartment from 1981 to 1987. These seminars provided moral support, stimulus for continued scientific productivity, and international attention.

Alpert's stories are replete with commentaries on the accomplishments and moral standing of Soviet scientists. He focuses particularly on the courageous people who endured prison, from the earliest dissidents to Anatoly (now Natan) Sharansky, Yuri Orlov, and "the singular saint" Andrei Sakharov. Alpert also discusses (in Appendix C) the craven "mores of Soviet physicists."

Alpert and his wife were allowed to emigrate, and in 1987 they departed for the US, a new life, and continued fruitful research. (Alpert is a research scientist at the Harvard–Smithsonian Center for Astrophysics and was a consultant at Bell Laboratories. His wife is undergraduate studies coordinator in the department of mathematics at Harvard University.)

Alpert has been blessed with good health, perceptive intelligence, an optimistic personality, many friends, supportive colleagues in the international community, and the love of two wives. As his friend and colleague Lev Pitaevsky notes in his informed "appreciation," a foreword to Alpert's opus on the resonance nature of the magnetosphere, in *Physics Reports* volume 339, page 323, 2001:

> Alpert has made pioneering and distinguished contributions to theoretical and experimental investigations in radio and plasma physics and is the author of several excellent books. He was honored by a special URSI (International Union for Radion Science) symposium in 1974 "in recognition of his prominence in this field."

Adding interest and documentation to the story are numerous black-and-white photographs of people and pages of scientific data, scientific journal pages, and letters. Also important are four appendices, two of which deal with his involvement with high-altitude atomic bomb explosions, and a detailed listing of seminars, titles, and international visitors to "The Moscow Refusenik's Physics–Mathematics Seminar."

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Cosmological Inflation and Large-Scale Structure

Andrew R. Liddle and David H. Lyth
Cambridge U. Press, New York, 2000. $80.00, $34.95 paper (400 pp.). ISBN 0-521-66022-X, ISBN 0-521-57598-2 paper

In *Cosmological Inflation and Large-Scale Structure*, Andrew R. Liddle and David H. Lyth present a comprehensive overview of inflation, the gravitational growth of density perturbations, and predictions of the properties of the microwave background radiation, all in the context of the standard, hot, Big Bang cosmological model. A few other topics are touched on, but these three key topics are covered in great detail in a superb, rigorous presentation.

Both Liddle and Lyth have been active contributors to important developments in the fields of inflation and large-scale structure for well over a decade. Their depth of knowledge and expertise provide a rock-solid foundation for this book, which is carefully constructed, well-written,

well-organized, and crystal clear in its presentation of what can appear to be a complex and broad range of topics. The narrow, deep focus of the book allows the reader to study the main topics in careful detail. Working through the book, including the problems at the end of each chapter, should give readers a thorough and mathematically rigorous grasp of the basic elements of cosmological inflation, including the formation and evolution of different types of density fluctuations in the context of this model. Readers will also understand the way that the microwave background radiation can be used to test the basic model and determine the values of various parameters, including classic cosmological parameters.

The book is ideal for an advanced undergraduate or graduate course in cosmology that focuses on inflation and large-scale structure. A series of problems is presented at the end of each of its 15 chapters. These guide the reader through steps and material in the main text in such a way as to leave the reader to dot some of the i's and cross some of the t's. This approach adds to the book's usefulness to its target audience. Four chapters cover topics related to inflation or the hot Big Bang cosmological model, and six cover large-scale structure formation, evolution, and observations; two chapters revolve around the cosmic microwave background, and the remaining three—"Introduction," "Putting Observations Together," and "Outlook for the Future"—are rather comprehensive overviews of combinations of topics.

Detailed astrophysics, often important on smaller length scales than are addressed in this book, are left for another day. A brief mention is made of observational constraints obtained by applying some of the classic cosmological tests. References are included throughout the text, so the interested reader can follow up on topics. Thus, the authors have not attempted to present an all-encompassing treatise on cosmology.

In sum, Liddle and Lyth have produced a highly focused, fantastically useful book. The text maintains the focus and covers the topics in enough depth to enable an advanced student to begin a research project in any of the fields covered on the basis of this book alone. Inflation and large-scale structure are fast-moving, rapidly developing fields, yet the basics are unlikely to change in the near future. Thus, the fundamental concepts and constructs presented in this book should be useful to students and prac-

titioners in the field for many years to come.

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Reading

Introduction to General Relativity

Gerard 't Hooft
Rinton Press, Princeton, N.J., 2001. $38.00 (86 pp.).
ISBN 1-58949-000-2

What precisely are the goals of an introductory textbook on general relativity? In conversations with my colleagues over the years, I received many and varied answers. Some physicists feel that material should first be introduced at a deep but intuitive and unsophisticated level. Others prefer an axiomatic approach with all tangents and distractions saved for later. A third group wants the maximal list of topics surveyed, with each receiving the minimum necessary treatment.

The best way to understand the particular goals of Gerard 't Hooft's *Introduction to General Relativity* is to read the prologue (and to ignore the publisher's comments on the cover). In the prologue, 't Hooft states plainly that this book consists of his notes from a set of lectures on the subject, and that he wishes to address fairly sophisticated students who will be able both to deal with changes in notation between chapters and to pursue the literature on their own in search of further details. Such students should already have had some exposure to the ideas of general relativity or should be able to bring questions to a more advanced student or professor. Students of that caliber will indeed enjoy and benefit from 't Hooft's treatment.

With many books, one obtains a sufficient impression of the text by simply picking up the book and flipping through the pages. I was pleasantly surprised to learn that this is not the case here. At first glance, the book appears to be quite brief and densely packed with equations. However, reading through the text, I found that it displayed significant physical insight and contained many useful analogies to other branches of physics. In particular, 't Hooft makes elegant use of Rindler space and the equivalence principle in a manner that is typically found only in much longer introductions to the subject. As a result, I found this text to be far superior to P. A. M. Dirac's *General Theory of Relativity* (Wiley, 1975). Fans of Dirac's nondiscursive style should also appreciate 't Hooft's book, and the additional physical insight will be useful in solidifying their grasp of the subject.

While 't Hooft makes very efficient use of his 86 pages, the reader will no doubt recognize that such a brief treatment cannot provide complete coverage of the subject. The book is not intended to compete with either Robert Wald's *General Relativity* (U. of Chicago Press, 1984) or Charles Misner, Kip Thorne, and John Wheeler's *Gravitation* (W. H. Freeman, 1970). A number of choices have been made as to what material is included, and many of 't Hooft's chapters contain only a sketch of the ideas, with the reader being referred elsewhere for details and proofs.

Introduction to General Relativity lacks some of the standard amenities that one may expect from a textbook. It contains only a few homework exercises and has no index at all. As a result, one might best use the book together with another text. The equations also contain some rather annoying typographic problems, which is surprising for such a short book.

I would be tempted to use this book in combination with, for example, *A First Course In General Relativity* (Cambridge U. Press, 1985) by Bernard F. Schutz. While more sophisticated than Schutz's book, 't Hooft's *Introduction* might serve as a useful guide for students who become lost in Schutz's more physical treatment and more discursive style. While 't Hooft provides greater physical insight than one would expect after a brief look at his book, the extent of that insight is nevertheless limited by the length of the book and the very direct style. Simultaneous study of Schutz's book would offset this limitation. The two books cover a similar range of topics (the basics, the Newtonian limit, Schwarzschild black holes, and gravitational radiation) and would complement each other well.

The style used by Schutz is more geometric, while that of 't Hooft is distinctly algebraic, somewhat in the vein of Steven Weinberg's *Gravitation and Cosmology* (Wiley, 1972). The texts of 't Hooft and Schutz are similar in that both pass only briefly over the full introduction to differential geometry that sometimes constitutes the first semester material for a two-semester graduate general relativity course at US institutions. Schutz's more lengthy introduction and discussion of relativistic fluids would also assist those not already intimately familiar with stress–energy tensors in special relativity to better appreciate 't Hooft's comments.

While it is not particularly elementary, particularly advanced, or particularly complete, I am sure that 't Hooft's direct and rather elegant style will find many supporters. The role currently played by Dirac's *General Theory of Relativity* may well come to be filled by 't Hooft's new *Introduction*.

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NEW BOOKS

Astronomy and Astrophysics

Accretion Processes in Star Formation. L. Hartmann. *Cambridge Astrophysics Series 32*. Cambridge U. Press, New York, 2000 [1998, reissued]. $74.95, $39.95 *paper* (237 pp.). ISBN 0-521-43507-2, ISBN 0-521-78520-0 *paper*

Astronomy and Astrophysics in the New Millennium. Astronomy and Astrophysics Survey Committee, National Research Council. National Academy Press, Washington, DC, 2001. $49.95, $34.95 *paper* (246 pp.). ISBN 0-309-07312-X, ISBN 0-309-07031-7 *paper*

The Deep-Sky Observer's Year: A Guide to Observing Deep-Sky Objects throughout the Year. G. Privett, P. Parsons. *Patrick Moore's Practical Astronomy Series*. Springer-Verlag, New York, 2001. $32.00 *paper* (253 pp.). ISBN 1-85233-273-5

Deep-Space Probes. G. L. Matloff. *Springer–Praxis Books in Astronomy and Space Sciences*. Praxis/Springer-Verlag, New York, 2000. $89.95 (184 pp.). ISBN 1-85233-200-X

Organizations and Strategies in Astronomy. A. Heck, ed. *Astrophysics and Space Science Library 256*. Kluwer Academic, Norwell, Mass., 2000. $103.00 (221 pp.). ISBN 0-7923-6671-9

Polarization of Light and Astronomical Observation. J.-L. Leroy. *Advances in Astronomy and Astrophysics 4*. Gordon and Breach Science, Amsterdam, the Netherlands, 2000. $79.00 (221 pp.). ISBN 90-5699-219-8

Star Clusters. B. W. Carney, W. E. Harris. *Swiss Society for Astrophysics and Astronomy, Saas-Fee Advanced Course 28, Lecture Notes 1998*. Proc. sch., Les Diablerets, Switzerland, Mar.–Apr. 1998. Springer-Verlag, New York, 2001. $69.95 (417 pp.). ISBN 3-540-67646-5

Very Low-Mass Stars and Brown Dwarfs. R. Rebolo, M. R. Zapatero-Osorio, eds. *Cambridge Contemporary Astrophysics*. Proc. conf., La Palma, Tenerife, Spain, May 1998. $69.95 (265 pp.). ISBN 0-521-66335-0

Atomic and Molecular Physics

Positron Physics. M. Charlton, J. W. Humberton. *Cambridge Monographs on*