

investigators of materials at cryogenic temperatures.

Dietrich's valuable contribution will provide a taste of the potential that is available in the marriage of cryogenics and electron optics. Anyone interested in electron optics and in particular high-resolution or high-voltage electron microscopy should be stimulated by this tightly written and exciting introduction to the subject.

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The Key to the Universe

N. Calder

198 pp. Viking, New York, 1977. \$14.95

When the reporters wanted to follow the triumphs of space technology, they knew the calendar of the events exactly. Major events were programmed years in advance. The 1969 Moon landing was programmed to the hour, years ahead of time. With the aid of the television cameras one could make the technological history happen in front of the eyes of all mankind. Why not, then, follow in the same manner the discovery of a major kind of event in the field of elementary-particle physics? After all, the necessary props of the high technological drama are there: giant accelerators, hordes of people, exotic equipment, computers and so on. Major research centers of the US and Europe, such as Fermilab, SPEAR, Brookhaven, and CERN, know their schedules of experiments with ponderous precision. One only has to direct several TV crews to the most promising experimental set-ups, and *Eureka!* "One small particle per microsecond, one giant heart-beat for mankind." The recent drama in the discovery of the new ψ/J particle at Stanford and Brookhaven appeared to promise a repeat. A similar new drama of discovering the "Naked Charm" offered an opportunity to be duly recorded on magnetic tape. This could be a television first: a scientific discovery and the drama surrounding it would be captured forever. To quote the writer of this book, Nigel Calder, former editor of *New Scientist*, winner of the UNESCO prize for the Popularization of Science, and producer of the NET-BBC TV program "The Key to the Universe:" "This book and the associated television program was intended to lay before the public the splendid fruits of recent research into the working of the universe."

In that sense both the TV program and the book have failed. The drama of instant distant discovery, the elusive moment of scientific exuberance, smiles, handshakes, champagne, did not happen.

The discovery of Naked Charm squeaked in timidly after months of careful analysis and re-analysis of data recorded on magnetic tapes almost a year earlier at the SPEAR electron colliding rings.

But both the two-hour TV program and this book—*The Key to the Universe*—are an enormous success. Starting with the most elementary concepts, Calder introduces the reader to the up-to-date and most novel ideas of elementary-particle physics and astrophysics. The language used and the explanations given are always very simple, understandable, and sometimes novel. From the chapter "Electricity as the Life Force," followed by "Alchemy of the Weak Force," leading to the strong interactions called "Sun-fire," one gets readily immersed into the "Color Force" and the problems of "Freedom and Slavery among the Quarks." In the unique newspaper style, resembling in some way the Walter Cronkite "You Are There" format, the readers are introduced to all of the modern ideas of high-energy physics. This is best illustrated by reading the synopsis of the fourth chapter on Charm: "Another quark needed; Caution at Brookhaven; Champagne at Stanford; the Possibly Charmed Gypsy; the Marks of Charm; Signs of Relief; Charmed Universe; Still More Particles?; The Ultimate Decay; The End of the Road?"

In this mixture of explaining new concepts and ideas, personalities and life histories of researchers, research laboratories and localities, Calder competently and steadily leads you toward the goal: the modern cosmology. Before the reader grasps the enormity of compaction, a 3/8-inch black circle stares at him as the only symbol on an empty page, this being the size of the black hole into which the whole Earth has collapsed. The reader is introduced to exploding black holes, the first split second, the Big Bang, and after. Is this a palpable key? Any new idea throughout the book, no matter how complex or abstract, when introduced for the first time is explained in simple language or reduced to some simple concepts. The illustrations in the book are excellent, and the photographs and text in the margins contribute to the readability of the book.

Sometimes the simple explanations, lacking the rigor of mathematics or even being somewhat misleading oversimplifications, can offend the purist. As an example: "... and while Mother Nature blinked almost anything could happen provided it is quick enough," is given on page 24 as an explanation of the principle of uncertainty. But such spots are rare and are far apart and always given in the context of other reiterated explanations.

This book can be highly recommended to a very broad spectrum of readers. At one end of the spectrum would be an intelligent, science-oriented high-school

student, and at the other end the well-informed particle physicist. To the first the book would provide insight and inspiration to learn more about particle physics and astrophysics. To the second it is the best synopsis of high-energy physics' status of ideas of 1976-1977 and the most current gossip of the field. To quote Calder himself: "Detailed accounts of parts of it [the book] are to be found in scientific magazines ... and in learned journals such as *Physical Review Letters*, *Physics Letters*, *Nature*, and *Reviews of Modern Physics*, but almost always using a more technical vocabulary than I have permitted myself." A historian of science is well advised to read this book too. It accurately portrays an era in the 1970's that may be later described as the "dawn of new discoveries," or more sarcastically as the "peak in government spending in the area of basic research."

Lastly, this book should be compared to the TV program bearing the same title. It is not the script of the TV broadcast. While the two-hour broadcast contains many "live" pronouncements of the main characters of the drama such as Abdus Salam, Steven Weinberg, Gerard 't Hooft, Murray Gell-Mann, Sheldon Glashow and Richard Feynman (not in the order of appearance), the book is strictly Calder. The impact of the live performance may be of a more lasting duration, but it lacks the cohesion of this well-organized book. To this reviewer it appears, however, that the poignancy and deep message of the closing moments of the TV program are missing from the book. The closing remarks of the TV program were issued by a young, brilliant astrophysicist, Stephen Hawking; his words barely discernable because of severe neuromuscular disease handicapping the young man: "The mind will triumph over matter."

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An Introduction to Biophysics

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\$19.50

This book fulfills the needs for an introductory one-term course in biophysics for students in the physical sciences at the college sophomore or junior level. The approach is such that the book would probably be less appealing to undergraduate biology majors. After two chapters of introductory material, there are sections covering molecular structure, molecular interactions, bioenergetics, the biophysics of the sensory systems and theoretical biology. One appendix is a useful summary of the elements of equilibrium thermodynamics; another ap-