discussed, and the Leibniz–Clarke (that is, Leibniz–Newton) debate on the foundations of physics is ignored.

These omissions will not only be disturbing to historians and philosophers of science, but will also reduce the value of the book even to those readers whose primary interest is in the development of modern physics. Segrè avoids extended discussion of theoretical issues in the first part of the book (except for the sections on the nature of light) and does not do justice to the role of mathematical techniques such as calculus. He changes his approach markedly when he gets to electromagnetism, thermodynamics and kinetic theory, freely introducing vectors, derivatives and integrals. Readers who have taken courses on calculus and intermediate physics will have no difficulty understanding the text, but others may be mystified.

Rather than a history of classical physics, *From Falling Bodies to Radio Waves* is really a history of optics, electricity, magnetism, heat, and gas theory in the 18th and 19th centuries, preceded by essays on Galileo, Huygens and Newton. It can be a valuable supplement to advanced undergraduate physics courses by showing how these areas of physics were developed. But another book or collection of articles will be needed to explain the origin and establishment of the more fundamental concepts of matter, motion, and force.

Three Degrees Above Zero: Bell Labs in the Information Age

Jeremy Bernstein
241 pp. Scribner, New York, 1984. $17.95

The Bell Telephone Laboratories are arguably the oldest as well as the most productive of industrial research laboratories. Growing out of the original engineering staff formed in Boston in the wake of growing acceptance of the telephone in 1885, and becoming a true research department in 1911, the laboratories (there are now several locations) in 1983 employed 25 000 and cost AT&T $1.63 billion a year. Responsible for a plenitude of contributions to telecommunications technology—including, among 20 000 patents, essential work leading to the application of the triode as repeater amplifier, the solid-state rectifier, the transistor and fiberoptics transmission—the question, raised by many, is whether divestiture of the Bell monopoly will change or destroy the particular institutional conditions at Bell Labs that have been so successful in promoting research (see PHYSICS TODAY, May 1984, page 77).

Jeremy Bernstein, whose apt popular characterizations of modern science, scientists and technology have appeared in *The New Yorker* and in several books, has here provided a very useful snapshot of present activity at the Labs. Throughout the book lurks the shadow of the future and the fear that Bernstein might be writing the Labs' epitaph. This fruitful plant had been nurtured on several unique institutional precepts; among them, encouragement (to a cautious extent) of basic research not connected with the telecommunications mission of the parent telephone company, and an industrial environment in which informal discussion between experimenters and theorists is actively promoted.

These features—to which the Labs' many successes are often linked—are widely seen to be vulnerable in the transition to a new postdivestiture mission in AT&T long-line service.

Bernstein spent weeks at the Labs, asking many persons at several levels of the hierarchy about their work, methods, experiences, and attitudes toward this unique institution. The result might have been unfocused, but is in fact unified by the widespread appreciation of the creative environment the Labs provide. This appreciation provides the common theme for Bernstein's subjects, whether they are engaged in discovering the microwave background radiation from the Big Bang (this discovery provides the title of the book), in developing quality control for new fiberoptics cables with vastly increased telecommunications capacity, in analyzing the logical structure of language for voice-activated control, in recalling the events that led to the transistor and Bell Labs' interest in integrated circuits for telephone switching arrays, or in studying means to keep telephone poles from rotting.

Along the way we are treated to some rich stories from the careers of several of Bell Labs' leading lights, such as Philip Anderson and Arno Penzias, as well as those from several younger members—among them, Suzanne Nagel and Mitchell Marcus—of the Laboratory staff. This is not intended as a history of the Labs, but rather as a characterization of the diversity of predivestiture laboratory effort and research conditions. It makes for interesting reading for those who are already familiar with the Labs' work in solid-state physics but perhaps less aware of other aspects of the wide-ranging program. And it can be used as supplementary reading by undergraduates eager to understand the actual conditions and breadth of research in telecommunications-related topics.

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