relatively little concerned with the larger context of the growth of physics and its institutions; and their strongly narrative, descriptive approach to their subject matter allows certain hard interpretative problems to escape systematic formulation and discussion. The authors tell us nothing directly about what was unique to the organization and practice of theoretical physics in Germany vis-à-vis other nations or how the academic organization of physics compared to or was influenced by that of other disciplines, and little about how physics per se was affected by the larger development of the university system in which it was embedded. The study largely takes for granted the factors that created a growing demand for specialized instruction in physics and that allowed physics in general, and theoretical physics in particular, to command the resources and the prestige it had come to possess by 1910. Nor is the changing relationship of theory and experiment analyzed in depth, although the authors point tantalizingly to the search for the blackbody radiation formula as emblematic of a new, closer interaction between specialists for theory and experiment that had come to exist by 1900. Finally, though the relationship of physical theory to mathematics naturally occupies the authors' attention and their study contains a wealth of important new information bearing on the matter, "the torch of mathematics" serves the book more as a slogan than as a sustained thesis. How early resistance to mathematical formulation was overcome, whether innovation in mathematics determined changes in the nature of physical theory, how physicists' collective attitude toward their mathematical tools changed over the period in question—on these issues the book leaves readers to draw their own conclusions from the rich veins of material exposed.

For most of the period covered by the study the authors' deemphasis of contextuality acts merely as a prudent and justifiable self-limitation. But for the era before 1850, when both the field and the university system were still evolving rapidly toward their definitively "modern" forms, the want of a broader or more theoretical perspective on these processes of change serves the study badly. There the work adopts and retails too uncritically the views and assumptions of highly interested actors in its story, as well as espousing many of the attitudes embodied in older heroic biographies and institutional histories. It takes "physics" and the physicist's professional role as fixed and implicitly existing entities, assumes the triumphant institute system of the late 19th century as an organizational ideal, and proceeds to chronicle the heroic efforts of a few great physicists to establish themselves and their science in the face of obscurantist forces. These include a familiar roster: *Naturphilosophie* and Hegelianism, humanistic educational philosophies, ill-prepared students, and state ministries hostile or indifferent to the experimental sciences and their often costly requirements for teaching and research. There is, of course, much truth in this perspective, but it lacks the historical distancing necessary for analyzing the complex formative period of the discipline or for understanding the counterforces that allowed its victories finally to be won. The book reaches surer ground in describing the "now mighty theoretical physics" emerging by the 1860's. Its coverage of this era attains its full promise of insight, thoroughness, and rich historical understanding.

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Genotoxicants

Monitoring of Occupational Genotoxicants. MARJA SORSA and HANNU NORPPA, Eds. Liss, New York, 1986. xiv, 250 pp., illus. $42. Progress in Clinical and Biological Research, vol. 207. From a symposium, Helsinki, June 1985.

There is an explosion of interest in the use of biological markers to study human cancer and other diseases. Scientists are increasingly able to assay human cells and tissues for genetic damage caused by exposure to chemicals and radiation. The rapidly expanding armamentarium includes relatively well established methods to measure chromosomal aberrations, sister chromatid exchange, and micronuclei, as well as newer methods to quantify DNA and protein adducts, somatic cell mutations, and DNA repair and to detect oncogenes possibly activated by chemical attack.

These biological markers have a dual potential: to reveal mechanisms involved in the causation of disease and to provide an early warning system by indicating elevated risk. It is in the latter context that *Monitoring of Occupational Genotoxicants* is offered. As the editors note in their preface, biological monitoring of chemical exposure began in the occupational setting, and the field will continue to be strongly centered there, given the opportunity that setting provides to validate methods under higher exposure and more controlled conditions than are found among the general population. Moreover, as Hooper and Gold point out, exposure of workers to carcinogens remains substantial, sometimes at levels close to those that induce tumors in laboratory animals.

The book is not intended as a comprehensive review of the field. It presents proceedings of a satellite symposium following the Fourth International Conference on Environmental Mutagens and highlights subjects discussed there in more detail. Most of the papers describe progress to date, technical advances, or pilot studies. Exceptions are a valuable discussion of markers of reproductive toxicity in sperm by Wyrobek and an interesting proposal by Environmental Protection Agency researchers, Waters *et al.*, on how biological markers could be used in quantitative risk assessment.

Even though the book is most useful as an update for researchers in the field, it will provide others with general insights into this exciting research area. The first chapter, by Evans, sounds themes applicable to all types of biological monitoring: the need for sound study design, validated laboratory procedures, and consistent interpretation of results. Despite a 10-year history, cytogenetic monitoring in the workplace has had only patchy success. Studies are frequently flawed by absence of baseline data, lack of controls, and failure to ascertain levels and patterns of exposure or to take medical and exposure histories in order to allow for confounding variables.

A paper by Albertini *et al.* updates an assay for monitoring somatic gene mutations that uses cloned HPRT-human T-lymphocytes. Messing *et al.* describe a pilot study in which increased mutant frequencies were observed in medical technicians exposed to ionizing radiation. The authors note a major unanswered question, namely the significance of mutant frequency to reproductive outcome. Not only are few epidemiological data available, the assay measures a single initial step in the causative process. The uncertainties this report points up are characteristics of the field.

Two other promising and sensitive biomarkers, carcinogen-DNA and carcinogen-protein adducts, are also discussed in some detail. Studies concerned with the detection and characterization of adducts or their relationship to oncogene activation in animals are reported. A review of the growing body of data regarding these chemical-specific biomarkers in humans would have been useful.

The true benefit of biomarkers should come from their use in combination with environmental monitoring and epidemiological methods. Sforzolini *et al.* and Garry *et al.* describe novel attempts at integrated assessment of genetic toxicity in the workplace. To identify the most significant genotoxicants in their workplaces, the researchers

related the chemical composition and mutagenicity of substances present to markers of genetic toxicity in biological samples from workers.

In summarizing the proceedings, Hogstedt expresses optimism that biological monitoring methods can be effective in preventing environmental cancer and other serious diseases. He cites the story of ethylene oxide as an illustration. In 1959–60, Ehrenberg and Gustafsson warned, on the basis of its mutagenicity and the finding of chromosomal aberrations in accidentally exposed workers, that ethylene oxide posed a cancer hazard. Ten years later, Hogstedt found excesses of leukemia and stomach cancer in the worker cohort originally studied. Here, biomonitoring data from well-conducted studies were able to provide valuable early warning of carcinogenic hazards.

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Coastal Trees

The Botany of Mangroves. P. B. TOMLINSON. Cambridge University Press, New York, 1986. xii, 413 pp., illus. $69.50. Cambridge Tropical Biology Series.

Mangroves are diverse and important components of tropical ecosystems in coastal areas. In addition to being able to exist in, or survive inundation by, seawater, they feature unique characteristics like vivipary, aerial or stilt roots, pneumatophores, knee roots, salt excretion, and plank roots. Indigenous people use them for firewood and timber and also benefit nutritionally by the increased fish and shellfish productivity afforded by the mangal communities. Nonindigenous people find them fascinating for bird watching and ecology field trips. The literature on mangroves is voluminous, and Tomlinson has done a great service by synthesizing the massive amount of information available into a concise, well-illustrated, and, with some lapses, very readable book. The author states that the book is designed for the beginning student or nonspecialist, but unfortunately he tends to use specialized terminology without definition.

The first section of the book provides an overview of the mangrove ecosystem and the biology of the individual plant species that constitute it. It includes an integrated discussion of ecology, floristics, biogeography, anatomy, morphology, and physiology. The author indicates that many ecologists have difficulty accepting the fact that on a given site *Rhizophora* may be the most seaward species while on an adjacent site *Avicennia* or *Sonneratia* may be the most seaward. They tend to see mangroves as a successional stage leading to some climax terrestrial community; however, Tomlinson notes that some mangal communities have been documented to exist as such for as much as 2000 years. The advent of climax may parallel that of the many paradisaical mythologies prevalent in the wider cultural milieu.

The second and largest part of the book (p. 173ff) is a systematic survey of mangrove plants and associates by family. The information it gives is much broader than that given in most systematic works because, in addition to habitat and ecology, salient morphological, physiological, and developmental features are included. Many of the figures are original, and there is no doubt that this volume will be used and valued for many years.

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Some Other Books of Interest

Applications of Social Science to Clinical Medicine and Health Policy. LINDA H. AIKEN and DAVID MECHANIC, Eds. Rutgers University Press, New Brunswick, NJ, 1986. xii, 588 pp., illus. $35; paper, $14.95.

In compiling this volume produced under the auspices of the Medical Sociology Section of the American Sociological Association the editors were motivated by the belief that the contributions of the social sciences to clinical medicine and health policy are insufficiently appreciated by medical educators and practitioners and government policy makers. "By examining where we have been, the progress we have made, and the gaps in our knowledge that continue to exist," they write, "we hope this book can help set the stage for enhanced contributions in coming decades." The volume opens with a group of papers addressing broader issues relevant to medical care: effects of science and technology (Fox), social class differences (Dutton), the state of the medical profession (Freidson), the role of the hospital (Stevens), the health care system generally (Altman), and the role of research in policy formulation (Davis). The second section of the book contains reviews of epidemiological and other knowledge of cardiovascular disease, cancer, and mental illness and discussions of the assessment of health status and "social experiments" (randomized clinical trials) in health. Part 3 deals with issues specific to particular stages of the life cycle—the social management of reproduction, infant mortality, teenage childbearing, and problems of old age. Part 4, under the heading Prevention and Caring, discusses psychosocial and behavioral risk factors, the healthfulness of the work environment, the functions of social support, patient-practitioner relationships, and medical error. A final section, devoted to the organization and delivery of health services, includes discussions of payment systems, economic factors affecting clinical practice, cost containment, and ethical issues.—K.L.

Evolution and Creation. ERNAN MCMULLIN, Ed. University of Notre Dame Press, Notre Dame, IN, 1986. xvi, 307 pp. $24.95. University of Notre Dame Studies in the Philosophy of Religion, no. 4. From a conference, Notre Dame, March 1983.

Science and Creation. Geological, Theological, and Educational Perspectives. ROBERT W. HANSON, Ed. Macmillan, New York, and Collier Macmillan, London, 1986. xiv, 224 pp., illus. $24.95; to AAAS members, $19.95. AAAS Issues in Science and Technology Series. Based on a symposium, Washington, DC, Jan. 1982.

In response to efforts to require that creationist views be represented in school curricula, a number of scientists have provided expositions for the layperson of the scientific rationale for evolution. (A group of such books was reviewed in *Science* **220**, 851 [1983].) The present volumes bring together critical commentary on creationism from other perspectives.

Evolution and Creation stems from a conference that "was inspired by the conviction that [the] opposing of evolution to creation betrays a fundamental misunderstanding of one or both concepts." Most of the 12 contributors to the book are theologians or philosophers. Rather than focusing on particular claims of the current creationism movement, as have most other recent books on the subject, they are concerned with ideas of evolution and creation from a broader perspective, examining them in the light of scientific, philosophical, and theological ideas and their historical development.

Science and Creation is a collection of 11 papers derived from sessions of the 1982 AAAS meeting that includes among its contributors historians, theologians, specialists in science education, and a sociologist. It is distinguished from other volumes on the subject principally by the attention it gives to practical measures by which the problems presented by creationism have been addressed. It includes, for example, reports on