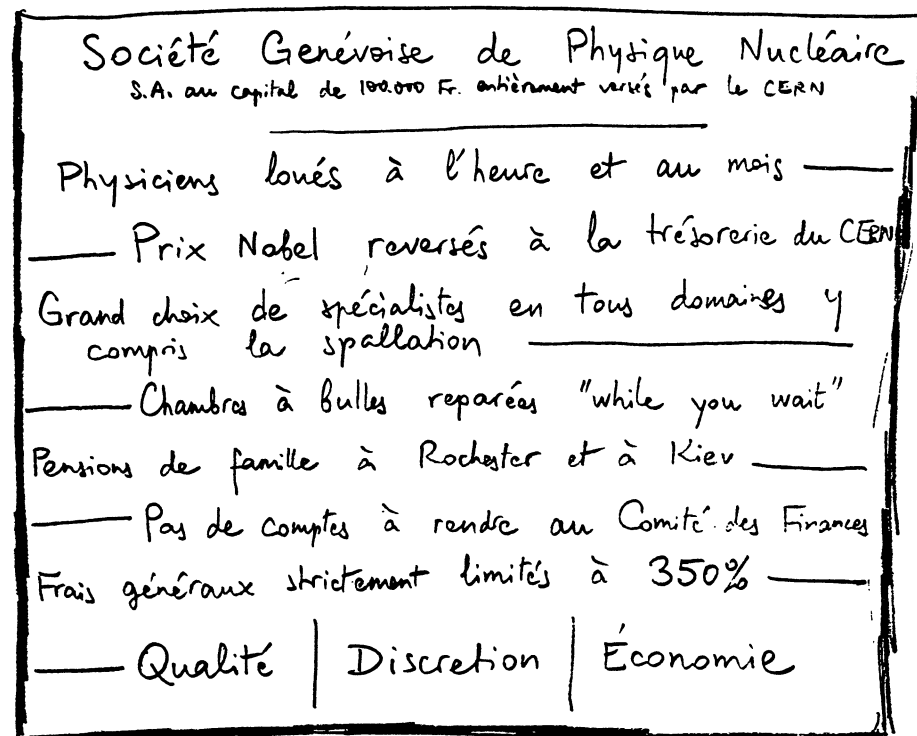


that "this key question of 1959 was 'resolved' in practice: *de facto*, some priority was always given to those who had constructed big equipment. This was never formalized or defined as a right but no one ever openly disputed it." CERN was one of the first laboratories to confront the "visitor problem," the conflict between inside laboratory and outside "user" groups. By the early '60s, Pestre asserts, senior physicists trying to preserve their earlier "certain way of working" in which they had "functioned rather like an aristocracy," were shocked to find themselves "under attack" from bubble chamber specialists, counter groups, visiting researchers, and even the directorate. Eventually the tensions were absorbed by "the idea of CERN as a 'central' laboratory available to all." At this point the balance between inside and outside groups began to shift. By the mid-'60s, "the house-physicists in fact represented little more than 20–25% of the experimenters working at Geneva." By the '80s, "CERN physicists were reduced to 4–5% of the total, and were simply an auxiliary force."

High energy physicists tend to measure the success of their laboratories only by major discoveries, an attitude that has led to the sacrifice of in-depth studies in favor of the more glamorous pushing of frontiers. From this distorted perspective, CERN seriously lagged behind American laboratories in the early '60s, for example missing the discovery of the two types of neutrinos (Brookhaven, 1962), the  $\Omega^-$  particle (Brookhaven, 1963), and violation of CP (or equivalently, time-reversal) invariance (Brookhaven, 1964). To the long list of explanations for why CERN lagged in that period (a list that includes inexperience, lack of equipment and qualified experimentalists, conservatism, and the committee problem), Pestre and Krige add a bold new interpretation: a greater mismatch in Europe between the engineers' desire for perfection and the physicists' more urgent need "to have an 'imperfect' piece of equipment ready at the right moment than a 'perfect' one ready when the dust of the battle had settled." In the United States, Pestre and Krige claim, the gap between physicist and engineer had closed some time between the '30s and '60s by the emergence of a "profound symbiosis previously unknown in basic science," involving "a new kind of researcher," at once a "physicist, i.e., in touch with the evolution of the discipline and its key theoretical and experimental issues," a "conceiver of apparatus and engineer, i.e., knowledgeable and innovative in the most advanced techniques," and an "entrepreneur, i.e., capable of raising large sums of money [and] of mobilizing several kinds of human, financial,



"A facetious 'advertisement' devised by Lew Kowarski during a meeting of the CERN Management Committee in January 1961." [From *History of CERN*, vol. 2; CERN archives]

and technical resources." Strong American laboratory leaders, such as Ernest Lawrence, Luis Alvarez, Edward Lofgren, Edwin McMillan, Wolfgang Panofsky, and Robert R. Wilson, "who imposed their rhythm on world science," shared a characteristic "pragmatic and utilitarian approach notable for its clear stress on 'getting numbers out.'" Studies of American laboratories, such as the team histories of Los Alamos and Fermilab, now in preparation, explain how this "symbiosis" was fostered by the American empirical tradition, institutional structures, and military pressures. They also document the transplantation of this American approach from military big science to high energy laboratories during the '60s and '70s, supporting the CERN group's hypothesis.

The appearance of this volume marks a point at which the pioneering efforts of the 1980s to employ team research in historical studies of large-scale scientific subjects can begin to be evaluated. The CERN Study Team's achievement underscores the power of the collaborative approach in writing well-documented, deep histories of complex developments over decade-long spans of time. The only serious difficulty concerns presentation. The group early on made the reasonable decision to publish the work as a collection of individually authored papers, thus allowing the younger scholars on the team to establish themselves. But the separate voices do not always harmonize, and the reader must struggle to extract the themes.

Rewriting the studies in one voice would have yielded a more elegant and readable history, but in this case the multiauthored presentation effectively mirrors the extent to which the committee approach dominates the enterprise under examination.

This volume is a basic text for historians of big science, large laboratories, particle physics, and particle accelerators. It will be of cultural and intellectual interest to "big" scientists eager to grasp the underpinnings of their cultural heritage, as well as to "small" scientists still flourishing in research marked by individual identity and freedom of action apart from committees.

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## Some Other Books of Interest

**A Statistical Model.** Frederick Mosteller's Contributions to Statistics, Science, and Public Policy. S. E. FIENBERG, D. C. HOAGLIN, W. H. KRUSKAL, and J. M. TANUR, Eds. With the collaboration of Cleo Youtz. Springer-Verlag, New York, 1990. xviii, 283 pp., illus. \$39. Springer Series in Statistics.

The statistician Frederick Mosteller achieved his 70th birthday in 1986, and to mark the occasion his colleagues, with apologies for the delay, have now produced this

tribute. The book opens with a short and elliptical biography of Mosteller by John Tukey, who notes along the way Mosteller's interests in such works as the *Annals of Mathematical Statistics*, the Kinsey Report, and the *Federalist* papers. Chapter 2, to which subsequent contributions make much reference, is a bibliography of Mosteller's publications, categorized as books to which he has made a contribution ( $n = 56$ ), "papers" he has published ( $n = 182$ ), "miscellaneous" ( $n = 36$ ), and reviews ( $n = 25$ ). William Kruskal then provides some observations on Mosteller as a "scientific generalist," and more technical aspects of his work are addressed by Persi Diaconis and Erich Lehmann, who discuss systematic statistics, slippage tests, mathematical learning theory, and number theory, and by Stephen Fienberg, who discusses Mosteller's concerns regarding statistical methodology and its application in other fields. "Fred as educator" is the title of a contribution by Judith Tanur, who notes that Mosteller was (statistically) assessing new teaching techniques even in the introductory statistics course he taught just before retirement, and in "Fred at Harvard" Fienberg and Hoaglin marshal the assistance of some 20 associates of Mosteller's to provide an account of his 40 years there. A collection of photographs precedes a final chapter edited by Hoaglin, consisting of book reviews of a sort—assessments, *ex post facto* in some cases by over 40 years, of works that have borne Mosteller's name. The assessments are friendly, and, overall, humor and a sense of statistics as being "fun" pervade the volume.—K.L.

**Launching the Antibiotic Era.** Personal Accounts of the Discovery and Use of the First Antibiotics. CAROL L. MOBERG and ZANVIL A. COHN, Eds. Rockefeller University Press, New York, 1990. xii, 97 pp., illus. \$25. From a symposium, New York, Oct. 1989.

A key event in the "launching of the antibiotic era" was René Dubos's discovery, in 1939, of gramicidin, "the first antimicrobial agent to be obtained from natural sources through rational pursuit." This retrospective volume, stemming from a symposium commemorating that event, brings together essays by some of those who were active in the early developments leading to effective antibiotic therapy. The volume opens with an introduction by Joshua Lederberg that includes an appreciation of Dubos's 1945 treatise *The Bacterial Cell*. Rollin Hotchkiss, who participated in the effort to purify gramicidin, then offers his own recollections, noting that prior to the appearance of sulfanilamide in 1937 the dominant approach to chemotherapy of bacterial disease

had been through the use of toxic agents that had to be rendered less harmful to their recipients by "artful chemical group substitution or modification" and explaining the relevance of soil microbiology (an early interest of Dubos's) to the work on antibiotics. The much-written-about early history of penicillin is the focus of the next two contributions, by Edward Abraham and Norman Heatley, both of whom worked with Howard Florey. Among other matters, Abraham describes the survey of antimicrobial agents undertaken by Florey and Ernest Chain and discusses his own discovery, with Guy Newton (1953), of cephalosporin C; Heatley's essay includes an account of the difficulties of obtaining the needed culture vessels and other equipment during wartime, as well as some comments on the controversy surrounding the contributions of Alexander Fleming. Shifting from the laboratory to the field, the next chapter is an account by Theodore Woodward of the search, in collaboration with the late Joseph Smadel, for a cure (chloramphenicol) for typhus and typhoid fever, an effort centered in Malaya in the years following World War II. In the next chapter George Mackaness describes how his work with mononuclear phagocytes, under Florey, led him to become involved in the development of isoniazid as a therapy for tuberculosis. Bernard Davis, who early in his career also was engaged in tuberculosis research, provides an account of that work in the context of a discussion of microbiological research more generally and of Dubos's research style. Among the matters he comments on are the "macho" risk-taking attitude that prevailed in research on infectious diseases, Dubos's onetime skepticism regarding the promise of antibiotics, and his own initial skepticism concerning some of the early work on drug resistance. All the authors provide some reminiscences of Dubos or comment on his work, and in an epilogue to the book Carol Moberg discusses him in his capacity as a "friend of the good earth," referring to his last writings on human ecology. Each of the main chapters includes a brief reference list, and the book contains a number of photographs and other illustrations.—K.L.

## Books Received

**Best Science Writing.** Readings and Insights. Robert Gannon, Ed. Oryx, Phoenix, AZ, 1991. vi, 194 pp. Paper, \$19.95. Selections by 12 writers who have won awards, with brief commentary by the editor.

**Beyond Belief.** Randomness, Prediction and Explanation in Science. John L. Casti and Anders Karlqvist, Eds. CRC, Boca Raton, FL, 1991. xii, 334 pp., illus. \$39.95. From a workshop, Abisko, Sweden, May 1989.

**Current Issues in Condensed Matter Spectroscopy.** A. M. Stonham, Ed. Hilger, Philadelphia, PA, 1990 (distributor, American Institute of Physics, New York).

xii, 317 pp., illus. Paper, \$50. Current Issues in Solid State Science.

**Development According to Parents.** The Nature, Sources, and Consequences of Parents' Ideas. Jacqueline J. Goodnow and W. Andrew Collins. Erlbaum, Hillsdale, NJ, 1990. viii, 190 pp. \$36; paper, \$17.50. Essays in Developmental Psychology.

**Diet, Life-style, and Mortality in China.** A Study of the Characteristics of 65 Chinese Counties. Chen Junshi *et al.* Oxford University Press, Oxford, U.K., Cornell University Press, Ithaca, NY, and People's Medical, Beijing, P.R.C., 1990. xviii, 894 pp., illus. \$172.50.

**The Explorations of Antarctica.** The Last Unspoiled Continent. G. E. Fogg and David Smith. Cassell, London, 1990 (U.S. distributor, Sterling, New York). 224 pp., illus. \$24.95.

**Fast-Scan Magnetic Resonance.** Principles and Applications. Felix W. Wehrli. Raven, New York, 1990. xii, 164 pp., illus. \$45. Reprinted from *Magnetic Resonance Quarterly*, vol. 6, no. 3 (1990).

**Human Change Processes.** The Scientific Foundations of Psychotherapy. Michael J. Mahoney. Basic Books, New York, 1991. xiv, 590 pp., illus. \$45.

**A Journey Into Gravity and Spacetime.** John Archibald Wheeler. Scientific American Library, New York, 1990 (distributor, Freeman, New York). xiv, 257 pp., illus. \$32.95.

**Knowing and Remembering in Young Children.** Robyn Fivush and Judith A. Hudson, Eds. Cambridge University Press, New York, 1991. x, 354 pp., illus. \$39.50. Emory Symposia in Cognition, 3. From a conference, Atlanta, GA, Oct. 1987.

**Knowledge and Inference.** Makoto Nagao. Academic Press, San Diego, CA, 1990. xvi, 304 pp., illus. \$42.50. Translated from the Japanese edition (Tokyo, 1988) by Richard Weyrauch and Yasuko Kitajima.

**Laboratory Experiments for Introduction to Chemistry.** T. R. Dickson, 6th ed. Wiley, New York, 1991. xii, 241 pp., illus. Paper, \$22.95.

**Prospierity without Pollution.** The Prevention Strategy for Industry and Consumers. Joel S. Hirschhorn and Kirsten U. Oldenburg. Van Nostrand Reinhold, New York, 1990. xiv, 386 pp., illus. Paper, \$19.95.

**Recombinant DNA Technology and Applications.** Ales Prokop, Rakesh K. Bajpai, and Chester S. Ho. McGraw-Hill, New York, 1991. xvi, 619 pp., illus. \$49.50.

**Risk Assessment in Genetic Engineering.** Morris A. Levin and Harlee S. Strauss. McGraw-Hill, New York, 1991. xii, 404 pp., illus. \$39.95. McGraw-Hill Environmental Biotechnology Series.

**Saving the Mediterranean.** The Politics of International Environmental Cooperation. Peter M. Haas. Columbia University Press, New York, 1990. xxviii, 303 pp., illus. \$42. Political Economy of International Change.

**Sweeteners.** Discovery, Molecular Design, and Chemoreception. D. Eric Walters, Frank T. Orthofer, and Grant E. Dubois, Eds. American Chemical Society, Washington, DC, 1991. x, 333 pp., illus. \$79.95. ACS Symposium Series, 450. From a symposium, Boston, MA, April 1990.

**Tell Me A Story.** A New Look at Real and Artificial Memory. Roger C. Schank. Scribner's (Macmillan), New York, 1990. xvi, 253 pp., illus. \$19.95.

**The Telling Image.** The Changing Balance Between Pictures and Words in a Technological Age. Duncan Davies, Diana Bathurst, and Robin Bathurst. Clarendon (Oxford University Press), New York, 1990. xviii, 166 pp., illus., + plates. \$55. Science, Technology, and Society Series, 6.

**To Catch a Dream.** Exploration of Dreaming. David Koulack. State University of New York Press, Albany, 1991. xii, 218 pp. Paper, \$14.95. SUNY Series of Dream Studies.

**The Toxics Directory.** References and Resources on the Health Effects of Toxic Substances. Hanafi Russell, Ed. California Department of Health Services, Berkeley, CA, 1990 (distributor, California Department of General Services, North Highlands). Various pages, illus. Paper, \$5.15. Publication no. 7540-958-1300-3.

**The Vertebrate Olfactory System.** Chemical Neuroanatomy, Function and Development. Norbert Halász. Akadémiai Kiadó, Budapest, 1990. xviii, 281 pp., illus. \$39.

**Viewing the Earth.** The Social Construction of the Landsat Satellite System. Pamela E. Mack. MIT Press, Cambridge, MA, 1990. xii, 270 pp., illus. \$27.50. Inside Technology.

**Wetlands.** A Threatened Landscape. Michael Williams, Ed. Blackwell, Cambridge, MA, 1991. x, 419 pp., illus. \$79.95. Institute of British Geographers Special Publications Series, 25.