A Puritan of Science

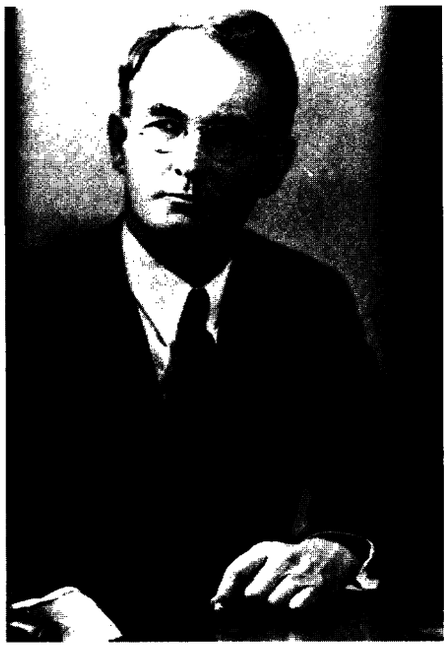
Science and Cultural Crisis. An Intellectual Biography of Percy Williams Bridgman (1882–1961). MAILA L. WALTER. Stanford University Press, Stanford, CA, 1990. xii, 362 pp., illus. $42.50.

P. W. Bridgman a "scientific puritan"? This tag seems more befitting of one of those high-collared colonial divines who dabbled in natural philosophy. "Puritan" seems an inappropriate label for a modern, down-to-earth Harvard physicist who not only parlayed painstaking studies of high pressures into a Nobel Prize but also pushed a hard-nosed scientific philosophy known as operationalism. However, historian of science Maila Walter argues convincingly that Bridgman was a puritan, not in his religious outlook (he was anything but a God-fearing zealot) but in his general intellectual disposition.

We can capture the essence of this disposition by leaving Walter's book for a moment and recalling George Santayana's 1935 novel, *The Last Puritan*. Santayana found in his Boston-bred protagonist "hatred of all shams, scorn of all mummeries, [and] a bitter merciless pleasure in the hard facts." Walter finds similar traits in Bridgman, a "scientific puritan" who also, coincidentally, grew up in Boston environs. The traits appear as Walter tells the story of the physicist's life, especially his personal response to a 20th-century crisis of meaning—a crisis having both intellectual and moral dimensions.

Bridgman's exposure around 1920 to the emerging theories of relativity and the quantum signaled a heightening of his personal crisis of meaning. Rattled by the erosion of traditional meanings of scientific concepts, the young Harvard professor sought clarification in "operational analysis." Convinced of the human rather than transcendental basis of knowledge, Bridgman contended that the meanings of all physical concepts, when correctly formulated, are synonymous with corresponding sets of actual operations.

As he continued to struggle with the meaning of measurement in thermodynamics, relativity, and the new quantum mechanics, he soon distanced himself from earlier versions of operationalism. Because of his classical, empiricist background, however, he never could grasp the full epistemic import of quantum mechanics. Rather, he responded to the new physics by becoming preoccupied with the limits of human knowledge—limits that he increasingly viewed as moral imperatives. His earlier emphasis on the personal aspect of operational inquiry hardened into a "radical existential subjectivism" in which he extended his rejection of metaphysical absolutes from the cognitive realm to religious, social, and political realms. "In the last analysis," he wrote in 1936, "science is only my private science, art is my private art, religion my private religion, etc." Unfortunately for him, his view of the private and subjective nature of science met with indifference if not disdain. And ironically, the radically subjective operationalism to which he had turned for direction ultimately left him stranded under a "shadow of existential despair." In his novel, Santayana identified the tragedy of his "last puritan": "a moral nature burdened and over-strung, and a critical faculty fearless but helplessly subjective." Unwittingly, Santayana had written an epithet for Bridgman.



Percy Williams Bridgman. [Niels Bohr Library, American Institute of Physics]

Walter tells the story of her last puritan more as a commentator than a chronicler, willing to correct Bridgman's analyses when they were wrong and to complete his chains of inquiry when he left them dangling. In effect, Walter offers an expansive interpretative essay rather than a constrained scholarly biography. Bridgman is her vehicle for a discerning tour of the intellectual and moral issues that troubled scientifically minded Americans during the first half of the 20th century.

ALBERT E. MOYER
Department of History, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0117

Medical Assessment

Effective Care in Pregnancy and Childbirth. IAIN CHALMERS, MURRAY ENKIN, and MARC J. N. C. KEIRSE, Eds. Two volumes, boxed. Vol. 1 (parts 1–4), Pregnancy. Vol. 2 (parts 5–10 and index), Childbirth. Oxford University Press, New York, 1989. xxxiv, 1516 pp., illus. $400.

A Guide to Effective Care in Pregnancy and Childbirth. MURRAY ENKIN, MARC J. N. C. KEIRSE, and IAIN CHALMERS, with the editorial assistance of Eleanor Enkin. Oxford University Press, New York, 1989. xiv, 376 pp., illus. $45; paper, $24.95. Oxford Medical Publications.

Effective Care in Pregnancy and Childbirth ("*ECPC*") is very different from the traditional clinical textbook its title might suggest. Such texts emphasize what care-givers know (the signs, symptoms, pathogenesis, natural history, and prognosis of diseases encountered in a particular clinical discipline). *ECPC* focuses on what they do, that is, on their diagnostic, prophylactic, and therapeutic interventions. But what makes *ECPC* unique scientifically is its systematic review of the existing evidence bearing on the effectiveness of those interventions.

The book opens with a discussion of different epidemiologic research designs and their merits or otherwise in reducing systematic and random errors in estimation of treatment effects, and the second chapter summarizes the "materials and methods" used to collect and synthesize the evidence bearing on those effects. Following the principles laid out in the first chapter, the editors have chosen to base their syntheses primarily on evidence from randomized controlled clinical trials. The trial results used as the data for these syntheses are contained in the electronic *Oxford Database of Perinatal Trials*, the first version of which was released by Oxford University Press in 1988 and which has been regularly updated ever since (for an account of the project see I. Chalmers *et al.*, *Controlled Clinical Trials* 7, 306 [1986]). The database of course contains results of trials published in the conventional medical literature. But in an effort to avoid bias stemming from the tendency of investigators to submit and journal editors to accept reports that demonstrate "positive" treatment results, the book's editors have also surveyed over 40,000 obstetricians and pediatricians in 18 countries to find out about trials that may have been completed but not published. Moreover, authors responsible for the syntheses of individual topics were encouraged to write to the original investigators for any information obtained that was not provided in the published reports.

The chapter authors were also asked to

evaluate the methodologic quality of the trials they reviewed. These evaluations were based on three criteria: control for bias in treatment allocation, control for bias in losses to follow-up or in exclusion of subjects from the analysis of the results, and blind assessment of outcome. Those trials with the highest ratings are given the most weight. For each treatment and effect analyzed, the outcome is assessed dichotomously (yes or no, present or absent), and the treatment effect is expressed as the odds ratio (experimental vs. control) for obtaining that outcome. Odds ratios (and their 95% confidence intervals) are displayed in both tabular and graphic form, along with a pooled ("typical") odds ratio based on a meta-analysis of the trial-specific odds ratios. (The quality ratings are ignored in the pooling.)

The results of these evaluations are presented in approximately 75 chapters on particular aspects of pregnancy and childbirth care, each chapter with its own author or team of authors who review and synthesize the available evidence based on the methods previously outlined. Despite the multiplicity of authors, with their inevitable variations in style, the majority of the chapters succeed admirably. Of the 21 of these chapters I read in preparing this review, I particularly liked those on ultrasound during pregnancy, management of post-term gestation, fetal monitoring during labor, variations in operative delivery (cesarean section, forceps or vacuum extraction), and the effects of intrapartum care on condition at birth and subsequent cerebral palsy.

The three final chapters form a conclusion to the book, with four appendixes summarizing (in tabular form) those aspects of care that are clearly established as beneficial and should therefore be adopted; those that appear promising but require further evaluation; those whose effects are unknown owing to insufficient evidence; and those for which the evidence—absence of benefit or preponderance of harm—indicates that they should be abandoned.

The editors' emphasis on randomized trials has led to a few notable omissions. Weight gain during pregnancy receives very little discussion, for example, except with respect to its relationship to pre-eclampsia. Women cannot, of course, be randomized to gain different amounts of weight during pregnancy. But as has been reported in a recent review (*Nutrition During Pregnancy*, part 1) by the Institute of Medicine/National Academy of Sciences, a large number of observational (that is, nonexperimental) studies demonstrate rather convincingly that low weight gains are associated with impaired fetal growth and high gains with fetal macrosomia and maternal weight retention postpartum. Given the remarkable changes in gestational weight gain that have occurred during this century as obstetricians have varied their advice concerning restriction or liberalization, there seems little doubt that care-givers can indeed influence women's weight gain during pregnancy and thereby affect several important pregnancy outcomes.

In the preface, the editors make explicit their focus on evaluating the evidence concerning risks and benefits. But this focus leaves open the question of what practitioners should do when a given treatment is beneficial for one outcome and harmful for another—electronic fetal monitoring, for example, appears to reduce the risk of neonatal seizures but to increase the risk of cesarean section. A brief chapter on how techniques such as decision analysis can be used to help balance risks and benefits would be a welcome addition. The absence of such a chapter is curious, given the presence of one dealing with economic evaluation, where the benefits of treatment are discussed in relationship to their economic costs.

ECPC is clearly oriented toward industrialized, developed-country settings. Although health workers who care for pregnant women in developing countries would undoubtedly learn a great deal from the material contained in the book, they face many issues—pertaining for example to availability and regionalization of prenatal care, training of midwives and other birth attendants, and home vs. institutional delivery—about which there is very little scientific evidence on which to base clinical or public health decisions. A chapter outlining these issues, as well as suggesting priorities for future randomized trials (or other studies), should also be considered for a future edition.

The book is written in a clear, lucid style and is remarkably free of medical or epidemiologic jargon. Its emphasis on mothers' attitudes and preferences and on the social context in which care is provided gives the book a democratic and "caring" flavor that lends a refreshingly human backdrop to its scientific rigor. Despite its length (over 1500 pages in two volumes), *ECPC* should be considered "must" reading by all clinicians who provide care to women during and immediately after pregnancy and childbirth, including obstetricians, family physicians, general practitioners, midwives, and nurses; by perinatal epidemiologists and other researchers; and by public health policy makers. Besides the two main volumes, a 376-page companion volume, *A Guide to ECPC*, summarizes the book's methods and principal conclusions; it is this shorter summary that will probably be most used day to day by clinicians. But those who wish to see the "raw data" upon which the conclusions are based will need to refer to the larger text. *ECPC* is a remarkable achievement. As is discussed in Archie Cochrane's foreword, the book not only has moved obstetrics from the rear to the forefront of scientifically based clinical disciplines but has charted a course for sister disciplines as well. It will be a hard act to follow.

MICHAEL S. KRAMER
Departments of Pediatrics and of Epidemiology and Biostatistics, McGill University Faculty of Medicine, Montreal, H3A 1A2, Canada

Books Received

Bodily Communication. Michael Argyle. International Universities Press, Madison, CT, 1990. xii, 363 pp., illus. $45. Reprint, 1988 ed.

Breaking the Mind Barrier. The Artscience of Neurocosmology. Todd Siler. Simon and Schuster, New York, 1990. 416 pp., illus. $24.95.

Confronting Climate Change. Strategies for Energy Research and Development. Committee on Alternative Energy Research and Development Strategies, National Research Council. National Academy Press, Washington, DC, 1990. xvi, 127 pp., illus. Paper, $17.95.

The Cartoon History of Time. A Beginner's Guide to Quantum Physics, Relativity and the Beginning of the Universe. Kate Charlesworth and John Gribbin. Plume (Penguin), New York, 1990. 64 pp., illus. Paper, $9.95.

Centennial Articles. R. D. Harcher, Jr., and William A. Thomas, Eds. Geological Society of America, Boulder, CO, 1990. vi, 463 pp., illus. Paper, $24.50. Reprinted from *GSA Bulletin,* vol. 100. GSA Special Paper 253.

Electrocardiography. Past and Future. Philippe Coumel and Oscar B. Garfein, Eds. New York Academy of Sciences, New York, 1990. xii, 403 pp., illus. Cloth or paper, $105. Annals of the New York Academy of Sciences, vol. 601. From a conference, Nice, France, Sept. 1989.

The Endothelium. An Introduction to Current Research. John B. Warren, Ed. Wiley-Liss, New York, 1990. xii, 317 pp., illus. $54.95.

Enzyme Technology. M. F. Chaplin and C. Bucke. Cambridge University Press, New York, 1990. xvi, 264 pp., illus. $59.50; paper, $24.95.

Genetic Variation and Disorders in Peoples of African Origin. James E. Bowman and Robert R. Murray, Jr. Johns Hopkins University Press, Baltimore, MD, 1990. xiv, 473 pp., illus. $59.50. Johns Hopkins Series in Contemporary Medicine and Public Health.

The Geometry and Physics of Knots. Michael Atiyah. Cambridge University Press, New York, 1991. x, 78 pp., illus. $39.50. Lezioni Lincee.

Global Forest Resources. Alexander S. Mather. Timber, Portland, OR, 1990. x, 341 pp., illus. $45.

Interacting Electrons in Reduced Dimensions. Dionys Baeriswyl and David. K. Campbell, Eds. Plenum, New York, 1989. xii, 403 pp., illus. $92.50. NATO Advanced Sciences Institute Series, vol. B213. From a workshop, Turin, Italy, Oct. 1988.

Interfacial Transport Phenomena. John C. Slattery. Springer-Verlag, New York, 1990. xvi, 1159 pp., illus. $89.

International Environmental Diplomacy. The Management and Resolution of Transfrontier Environmental Problems. John E. Carroll, Ed. Cambridge University Press, New York, 1990. viii, 291 pp. Paper, $24.95. Reprint, 1988 ed.

International Perspectives in Schizophrenia. Biological, Social and Epidemiological Findings. Malcolm Weller, Ed. Libbey, London, 1990. viii, 327 pp., illus. $78. From two conferences, London.

An Introduction to Laboratory Automation. Victor Cerdá and Guillermo Ramis. Wiley, New York, 1990. xiv, 321 pp., illus. $69.95.