health care, education, crime, economy, income, labor, business, and government. Each of these chapters begins with the identification of key data sources. Since there is usually more than one source for obtaining statistics in each area, there are often differences in the conclusions one would make because of the differences in the way these statistics are defined or measured.

The heart of each chapter is a presentation of key controversies in that social area. Alternative (often conflicting) understandings are reached, each side being supported by the data. Among the sixty or so controversies discussed in the book are issues of life expectancy, homelessness, illiteracy, race and ethnicity, and budget. While only some of these topics are directly relevant to the activities of information professionals, reading about any of them will, if my experience is typical, serve to reinforce what we know in principle but often forget in practice—to interpret social statistics skeptically.

In addition to these substantive features, the book's attractiveness is significantly increased by its format and style. The chapters can be profitably read and enjoyed in any order. Many of the examples will hit home—because of their relevance to policy issues being discussed in the public arena, or because they add to our ability to interpret and use social science statistics as information professionals.

No doubt, *The Data Game* will be useful to managers and directors of libraries and information centers as they engage in planning, policy-making, and fundraising. However, I believe that this book's major value to our field lies in its ability to make the reader take a harder, more skeptical, look at social science statistics and the conclusions derived from them. Because of this, and because the book is so easy to read, it would be a valuable supplement in almost all management-related or research-related courses.

Jeffrey Katzer, *School of Information Studies, Syracuse University*

Science and Its Fabrication. By ALAN CHALMERS. Minneapolis: University of Minnesota Press, 1990. Pp. xii + 142. $39.95 (cloth); $14.95 (paper). ISBN 0-8166-1887-9 (cloth); ISBN 0-8166-1888-7 (paper).

In this sequel to *What Is This Thing Called Science?* (St. Lucia, Quebec: University of Queensland Press, 1976), Alan Chalmers continues his challenges to both the philosophy of science and the ideology of science that pervade contemporary Western society and thinking. His aims are to illuminate the debates concerning the status and "fabrication" of legitimate scientific knowledge and to set the record straight about his own views, particularly what is implied—and also what is not implied—in the rejection of orthodox philosophical construals of science and scientific method.

The author offers a middle ground between science glorified as universal method and science degraded as radical relativism, rejecting both of these epistemological polarities in favor of a portrayal of science as an objective and progressive enterprise based on historically contingent standards and methods. Besides, he argues, philosophers of science have little other choice, for they do not have at their disposal the resources necessary to establish a universal method.

The central thesis of the book is captured in the following passage:

> In a fairly pragmatic way, and with an eye to what physical science has been able to achieve, I attempt to specify what the *aim* of science is. The aim of physical science is to

establish highly general laws and theories applicable to the world. The extent to which those laws and theories are indeed applicable to the world is to be established by pitching them against the world in the most demanding way possible given existing practical techniques. Further, it is understood that the generality and degree of applicability of laws and theories is subject to continual improvement. [P. 7]

Having specified the aim of physical science to be the extension and improvement of our general knowledge of the workings of the natural world, the author argues that the extent to which various methods and standards serve science is not a matter of subjective opinion but a matter of objective fact to be practically established by "pitching our knowledge claims against the world by way of the most demanding observational and experimental tests available" (p. 115). In his view, this imperative is not compromised by a recognition that standards are subject to change in the light of practical achievement over time: objective observation is a practical achievement.

In swift succession, Chalmers demolishes the claims of commonly held epistemological positions about the nature of science and how it progresses: positivism, falsificationism, empiricism, relativism, and the sociology of science. Finally, he addresses the social and political dimensions of science and the politics of scientific practice and ends by "cutting science down to size." He notes:

Much influential, but unfounded, ideology of our time involves an extension of science well beyond its legitimate limits, so that social and political problems are construed as scientific ones and "solutions" offered in a way that obscures the social and political issues at stake. For example, we have illegitimate extensions of biology and evolutionary theory in the form of social Darwinism and sociobiology posing as explanations of social phenomena, thereby disguising the political realities and serving to justify various kinds of oppression such as that of the poor or women or racial minorities, and in recent times we witness an increasing tendency to reduce social issues to economic ones to be dealt with by a (pseudo)science of economics. It is well beyond the scope of this book to explore such important issues. But a prerequisite for adequately dealing with them is an adequate grasp of the nature of science, of the kinds of achievement it is capable of as well as of its limits. [P. 125]

This is a useful volume in at least three important respects: it presents a new viewpoint from which to understand science and scientific progress, rejecting the procrustean mold into which orthodox epistemology and sociology have tried to fit all scientific endeavors; it offers refreshing insights into traditional philosophies of science; and it distinguishes between science and its applications.

However, there are some points where further clarification would be welcome. While the author delimits his analysis to the physical sciences (and indeed, primarily to physics), in this respect the title of the book is overly ambitious if not a little misleading. Indeed, he explicitly states that his account is not intended to have much to offer to other fields such as social theory and history, whose aims may be somewhat different and whose methods and standards would therefore also differ. But why the focus on physics? It is among the simpler domains to explain.

Another troublesome point relates to Chalmers's analysis of relativism. While he rejects it, there is little in this volume that elucidates his position. In particular, his reliance on contingent standards for scientific achievement does not seem an adequate criterion for ruling out the claims to scientific status that are urged upon us by enthusiasts of astrology, UFOs, and creationism, among other mischievous "empirical" domains.

One further observation: given the author's support for an evolutionary view

of the nature of scientific knowledge and its observational procedures, it is surprising to me that he does not acknowledge the landmark work of Stephen Toulmin in *Human Understanding: The Collective Use and Evolution of Concepts* (Princeton, N.J.: Princeton University Press, 1972).

Chalmers, who is on the faculty of arts at the University of Sydney and has written a number of papers on the philosophy of science, appears to have produced the present volume for his critics rather than for the more general reader (there is no explicit mention of an intended audience). Prior familiarity with the ideas of Karl Popper, Paul Feyerabend, Imre Lakatos, Thomas Kuhn, Larry Laudan, M. Mulkay, David Bloor, Barry Barnes, Karin Knorr-Cetina, among others, is recommended, if not exactly obligatory, as context for appreciating Chalmers's analysis. Nonetheless, he has succeeded in avoiding the multisyllabic style that characterizes so much of the language of philosophic discourse and, in so doing, has brought to life a broad sweep of conceptions of science, from Aristotle to Karin Knorr-Cetina.[1]

Alvin M. Schrader, *Faculty of Library and Information Studies, University of Alberta*

History and Communications: Harold Innis, Marshall McLuhan, the Interpretation of History. By GRAEME PATTERSON. Toronto: University of Toronto Press, 1990. Pp. 251. $40.00 (cloth); $16.95 (paper). ISBN 0-8020-2764-4 (cloth); 0-8020-6810-3 (paper).

This is an awkward combination of ingredients: some discussion of the work of Innis and McLuhan, and some history and historiography of Upper Canada (Ontario). The first three chapters are primarily about Innis, the fourth is about one of McLuhan's books, the fifth and part of the sixth are political history, the rest of the sixth returns to Innis and McLuhan, with an odd section on the political scientist and humorist Stephen Leacock. The final chapter is an afterword explaining the origin and aims of the book. The author wants to set Canadian historians right about the relation of the early to the late work of Innis. The usual view is that after twenty years of writing economic history—of the Canadian fur trade and cod fisheries, prominently—Innis turned to a new and different subject, communications, which has little relationship to Canadian history. Patterson wants to persuade us of the unity of early and late Innis and of the mutual relevance of history and communications. Further, he wants to show the utility to historians of some of McLuhan's ideas; he says that he is most interested in McLuhan's "understanding of figure/ground relations" (p. 225), but actually he seems to be more interested in what McLuhan says about cliché and archetype. McLuhan's book *From Cliché to Archetype* (New York: Viking, 1970) gets most of a chapter to itself, but there is no sustained discussion of the figure/ground relationship. A chapter on the political history of Upper Canada (Ontario) in the early nineteenth century is devoted to "the development, permutation, and fragmentation of the story of the overthrow of the family compact and the triumph of responsible government" (p. 165). This is offered as an illustration of the study of "formal causality" characteristic of the work of Innis and McLuhan: the effects of the form of a medium of communication (pp.

1. My grateful thanks to Peter Wons for sharing with me his insights into the volume under review.