Professional Problems

Scientists and Journalists. Reporting Science as News. SHARON M. FRIEDMAN, SHARON DUNWOODY, and CAROL L. ROGERS, Eds. Free Press (Macmillan), New York, and Collier Macmillan, London, 1986. xviii, 333 pp., illus. $24.95; to AAAS members if ordered from AAAS, $19.95. AAAS Issues in Science and Technology Series.

The goal of this collection of essays is to investigate the symbiotic-adversarial relationship that exists between scientists and science reporters. Members of all professions promote their professions and, more often than not, believe their own propaganda. This is as true for science reporters as it is for scientists. Scientists claim to be interested primarily in truth for its own sake and benefiting humankind, while the "primary goal of journalists is to get information out as accurately and quickly as possible" (Joann E. Rodgers, p. 110). After all, the public has a right to know. Early on in the book, Dunwoody remarks that "scientists don't *need* the media to advance in their fields" (p. 9), and several commentators note that scientists risk censure from their colleagues if they try to enhance their reputations through the mass media. If they help journalists to educate the general public, it must be for more altruistic reasons. Even so, Cristine Russell warns her fellow reporters that "some researchers are interested in popularizing not only science, but also their own reputations" (p. 85). But, as Friedman acknowledges, science reporters are also trying to survive, possibly even to succeed in the newsroom. Might not they also be interested in advancing their own reputations? For instance, over a third of this volume is devoted to papers by the three editors, and two of the editors moderated a panel discussion that is also reproduced.

Scientists have a variety of interests, including a desire to further their own careers. Scientists are leery of being interviewed by science reporters, not simply because they fear that their views will be misrepresented but, more important, because even if their views are reported accurately and intact they run a risk of being "saganized." Science reporters also have their problems. Few have professional training in any of the sciences, and if they do they cannot begin to possess the expertise necessary in all the areas of science they are called on to investigate. They depend on scientists as their sources. One restraint on slipshod or overly sensationalized reporting is that these sources can quickly dry up if scientists find themselves burned too often, but the opposite extreme is even more dangerous. The relationship between scientists and science reporters can become too cozy. Rae Goodell, among other contributors, finds particularly troubling the extent to which the scientific community has shaped press coverage of science.

One reason journalists give for any shortcomings in their productions is the need to meet deadlines. Both scientists and journalists work under severe time constraints. If a scientist spends too much time working up a particular theory, technique, or set of data, someone else is liable to publish first and get all the credit. Frantic as the pace has become in certain areas of science, it nowhere approaches the deadlines that journalists must meet. Whether correctly or not, reporters view the general public as not wanting to know very much about science but as wanting to know what they do want to know immediately. A second reason for unsatisfactory reporting of science is lack of space. The editor's pencil is always poised, ready to delete a paragraph here, a sentence there, to make room for one more advertisement. But from my reading of the papers in this book, the chief problem that confronts science reporters is the absence of a sufficiently strong internal reward system in journalism to encourage the sort of accurate, informative, and socially responsible reporting that everyone would like to see.

Several authors complain about the "elitism" that is pervasive in science. Scientists strive to produce work that other scientists will incorporate into their own contributions. As a result, their reputations are enhanced. But the work had better stand up. When a physician malpractices, only the patient suffers. When a scientist makes a mistake or, worse yet, publishes results that he or she has fudged too extensively, everyone who uses these results suffers. Scientists do check each other's work, but not indiscriminately. They concentrate on that work which bears most closely on their own research. As a result science tends to be both self-corrective and cumulative.

The social structure of the scientific community and the internal mechanisms that give science its peculiar character have been investigated at great length. Very little attention has been paid to the social conventions that govern the fourth estate. Nearly all the contributors to this collection are science reporters. (Three scientists get 22 pages near the end of the book to present their side.) And yet we are not told nearly enough about the mores that govern journalists in general and science journalists in particular. Scientists through a system of mutual exploitation police each other. Who polices science reporters? Stephen Schneider urges "stricter forms of internal controls within journalism that would warn, punish, and ultimately fire people" who repeatedly publish substandard work. What exactly did he have in mind? I can imagine a journalist being let go for continuing to submit boring stories, but I would be surprised to discover such drastic measures being taken in the case of a reporter who submitted stories that caused considerable comment but turned out to be inaccurate. Joann Rodgers observes that "the good science journalist will *always* strive to be 100 percent accurate," but she candidly admits that there comes a time when a science journalist must " 'go with what she's got,' even if in her heart of hearts she suspects that it won't stand the test of time" (p. 115).

In a tantalizing aside, Friedman quotes an observation from an unpublished manuscript that the "reporter's source of reward was located among his peers in the newsroom" (p. 32). At greater length Dunwoody describes how, in the early years, an informal network of science writers formed in the United States that set the tone for science journalism. In 1980 Dunwoody predicted that the intense sort of cooperation that characterized the "inner club" would decrease. In a postscript, she notes that this inner club has proved much more resilient than she had expected. The existence of such a clique is not surprising, but we need greater information about its effects. How do science reporters react to their colleagues who "malpractice"? Although external constraints have some effect on professions, the most effective kind of policing comes from within on standards beneficial to the individuals doing the policing.

This volume grew out of a set of sessions held at the 1982 meeting of the American Association for the Advancement of Science. The AAAS was established on the model of the British Association to make science more readily available to the general public. In the interim both science and the general public have expanded considerably. Very few scientists can today expect to reach the general public very directly. A group of scientists from Wabash College who published a regular column for local papers in Indiana for 13 years eventually gave up because readers just did not seem interested. For better or for worse, science journalists are our only hope for explaining to the general public not only the latest scientific advances but also what science itself actually is, creation "sci-

ence" and the shroud of Turin notwithstanding. Although the authors in this collection devote most of their attention to the problems inherent in science reporting, occasionally they do remark that at its best it is better than anyone has a right to expect. I could not agree more.

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Important Fossils

The Burgess Shale. HARRY B. WHITTINGTON. Published in association with the Geological Survey of Canada by Yale University Press, New Haven, CT, 1985. xvi, 151 pp., illus. $25.

The Burgess Shale is a geologic formation in the Rocky Mountains of Canada that has yielded a diverse assemblage of exquisitely preserved marine plants and animals, providing a unique record of the marine organisms that lived during the middle Cambrian Period, about 530 million years ago. This book summarizes the anatomy and natural history of the Burgess biota and the history of its study from its discovery to the designation of the field area as a World Heritage Site in 1981.

The Burgess Shale crops out in a small area on the side of a high ridge in Yoho National Park near Field, British Columbia. The deposit preserves a biota that lived on the seaward edge of a shallow-water, tropical marine algal bank and on the steep bank face and muddy slope below the bank. The fossil assemblage was transported by turbidity currents and other sediment-gravity processes, which rapidly buried the organic remains in deeper-water anoxic sediments on the slope below the bank, thereby protecting them from destruction by scavengers and bacterial action. Few if any of the organisms are considered to be indigenous to the hostile environment in which they were preserved.

The biota of the Burgess Shale was discovered in 1909 by Charles D. Walcott, then secretary of the Smithsonian Institution. Walcott devoted a major part of his research time for the next 18 years to the collection, description, and classification of the Burgess fossils. His results were published from 1911 to 1931 by the Smithsonian Institution in a series of systematic monographs. Recently, several other outcrops have been discovered on nearby ridges by Desmond Collins, of the Royal Ontario Museum, and his associates, but these have far less prolific faunas than the original outcrops.

Harry B. Whittington, now professor emeritus of geology at Cambridge University, began a restudy of the Burgess fossils in 1966, while on the faculty of Harvard University, with the support and collaboration of the Geological Survey of Canada and the National Parks of Canada. New collections were made from Walcott's original quarry and were comprehensively studied by both paleobiologists and sedimentologists. The new collections and Walcott's original collections, over 60,000 specimens housed in the U.S. National Museum of Natural History, became the focus of a nearly 20-year-long research project.

Most of the laboratory studies were conducted at the Sedgwick Museum after Whittington moved to Cambridge. Major studies were made by Derek E. G. Briggs, David L. Bruton, Christopher P. Hughes, and Simon Conway Morris under Whittington's supervision. The result of this collaboration is a series of major monographs that document the anatomy, systematic relations, and paleoecology of many of the soft-bodied marine organisms that make up the Burgess biota. *The Burgess Shale* is an excellent overview and summary of results from these highly detailed studies.

Originally Walcott classified the Burgess fossils into existing phyla and the catch-all group Vermes, which obscured the anatomical and taxonomic uniqueness of the biota. Restudy of the fossils show that the biota contains numerous invertebrate body plans that do not fit within living phyla. Many extant phyla are also represented in the biota, but in proportions different from those encountered in living faunas.

A major part of the book summarizes the anatomy and problems of systematic relations of the fossils. The taxonomic groups recognized to date from the Burgess, and number of species in each, include: Algae, 20 (8 Cyanophyta, 1 Chlorophyta, 7 Rhodophyta, and 4 others); Porifera, 31; Brachiopoda, 7; Lophophorata, 1; Cnidaria, 2; Mollusca, 2; Priapulida, 7; Polychaeta, 6; Trilobita, 22; Crustacea, 21; unassigned Arthropoda, 22; Echinodermata, 6; Hemichordata, 2; Chordata, 1; and other unassigned animals, 17—for a total of 167 species.

Representatives of the biota are illustrated by high-quality photographs and line drawings. Other photographs show the general setting of the field area and the quarry operations. Well-constructed diagrams help explain the geological context of the Burgess Shale and the paleoenvironmental setting of the fossil assemblages. A bibliography of primary literature on the Burgess fossils published through about 1984 is a useful addition. Two important publications that appeared after *The Burgess Shale* went to press are a monograph on the Burgess sponges by J. Keith Rigby (*Palaeontographica Canadiana no. 2*, Canadian Society of Petroleum Geologists and Geological Association of Canada, 1986) and a well-illustrated pamphlet for a general audience by Conway Morris and Whittington ("Fossils of the Burgess shale," *Geol. Surv. Can. Misc. Rep. 43*, 1985).

The Burgess biota is of great importance to studies of the early evolutionary history of complex animal groups. Such analyses are still being made by paleobiologists. However, the success of the Burgess studies is in the meticulous preparation, observation, and description of the fossils by Whittington and his colleagues. The resulting data will serve as reference points for theoretical discussions of the early evolution of life for many years to come. The summary Whittington has provided has broad appeal for teachers, scientists, and general readers interested in the latest information on the Burgess biota and, more generally, the variety of early life on the earth.

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Californians at Risk

Waiting for Disaster. Earthquake Watch in California. RALPH H. TURNER, JOANNE M. NIGG, and DENISE HELLER PAZ. University of California Press, Berkeley, 1986. x, 446 pp., illus. $35.

Early in 1977 geologists discovered a bulge or uplift at Palmdale in the desert near Los Angeles. It suggested plate movement that could lead in months or a few years to an earthquake, which was already "overdue" in the general area. A year later a team of sociologists interviewed a large sample of Los Angeles residents and conducted five smaller telephone surveys over the next two years. They also carefully monitored the media and interviewed leaders of all the relevant organizations they could find.

The purpose of the study was to see how people reacted to "the severe threat of earthquake disaster represented by the uplift," and to "refine our understanding" of what people will do when "true earthquake predictions" are released in the future (p. 9). The data, exhaustively analyzed, show that people had little understanding of or reaction to, or even awareness of, the news of the uplift and are doing little to prepare themselves for the receipt of "true earthquake predictions."

The authors seem shocked by what they