ries of public issues with strong scientific-technological components, ranging from the atomic bomb to genetic engineering. The second was the eagerness of news media to cover lively science stories. Television made it possible for the popularizing scientist to reach a new and large audience. Compare the number of readers of one of George Gamow's popular works with the audience reached by Carl Sagan when he makes one of his regular appearances on the Johnny Carson show.

Rae Goodell has read and synthesized most of the literature produced by those who have studied the impact of these two forces and has added a valuable concept of her own: the visible scientist. A scientist's visibility is not dependent upon spectacular scientific achievement. Neither need he have the ability to popularize abstruse scientific ideas or the power to marshall the opinion of the scientific community. Visibility hinges upon his involvement in the controversies surrounding science-related political and social issues and upon his talent for making the most of the media of mass communication.

From a list of 45 visible scientists Goodell has chosen to discuss eight in detail: Paul Ehrlich, Barry Commoner, Glenn Seaborg, Linus Pauling, B. F. Skinner, Margaret Mead, Carl Sagan, and William Shockley. These names remind us what are the major scientific issues in the minds of the educated populace. Environmental problems, control of human behavior, space science, and nuclear weapons are the critical ones.

What common characteristics do diverse individuals, ranging from Shockley to Mead, possess to make them visible scientists? The answer is that they all deal with hot topics like pollution, overpopulation, or life on other planets. These subjects are well suited to the needs of journalists, who spend more time on the coverage of science policy issues than they do in the popular exposition of new scientific advances.

There are many scientists working on relevant policy issues, but the visible scientist does it with a special flair. He or she makes news as a result of being simultaneously controversial, colorful, and articulate. When Ehrlich responds to Commoner, or vice versa, it is newsworthy, as is virtually any public appearance or statement by Shockley. Skinner is remembered for raising his infant daughter in one of his specially contrived boxes and teaching pigeons to play Ping-Pong, and Pauling claims to have found the cure for the common cold in massive doses of vitamin C. Ehrlich, Commoner, Skinner, Mead, and Sagan all have written popular books and magazine articles; Ehrlich and Mead are sought after for the lecture circuit; and Sagan, forced to ration his time as a public figure, relies upon television to reach his very large audience. In addition to being able to speak and write well the visible scientist is able to manipulate reporters, editors, publishers, and television commentators in order to get a forum for his point of view. Indeed, in some cases science writers have come to feel that they are being exploited by the more adroit visible scientists.

Whatever other characteristics contribute to the visibility of this select group of scientists, we can be certain that they have a solid reputation in their fields of research. They might stray from their bailiwick—Shockley is the prime example—to make pronouncements on other areas of science and on war, peace, and the good life, but they have a recognized scientific base from which to meander and return as they please. No matter how outré their statements or actions they can be identified, for purposes of quotation in the media, as a leading population biologist, Nobel prize winner, or foremost American anthropologist.

With the exception of Glenn Seaborg, the visible scientists Goodell discusses are not part of the U.S. scientific establishment. They include in their ranks Nobel prize winners and past presidents of the AAAS, but they are essentially outsiders who are prone to take controversial stands and use the personal traits that have made them popular to advance their side of the argument. In short, they make good witnesses at a congressional hearing but are not likely to find a place on blue ribbon scientific panels, which are reserved for statesmen of science.

Visible scientists might, at times, become an embarrassment to the silent majority of American scientists. They adopt extreme, sometimes untenable, positions on sensitive matters and deliberately cultivate public attention. Society, however, benefits from the existence of a group of scientists ready to engage in open discussion and dispute. They provide the American people with alternatives to the official responses of the scientific establishment. Science also benefits in the long run. Science policy debates held in public, even if acrimonious and divisive, present a more realistic picture of scientific practitioners. They are seen as men and women capable of coupling logic and reason with commitment to a cause.

All of this and more will be found in Goodell's well-written and fast-paced book. Much of the supporting material on scientific communication is well known to students of the field and to close readers of *Science*. The concept of the visible scientist, however, is welcome as a new tool to be used by those concerned with determining how science issues become political ones and assessing the role played in their resolution by a new breed of scientific spokesmen.

To my mind one important question about the visible scientist has not been adequately dealt with (although it might be in the doctoral dissertation upon which the book is based). Precisely to whom are these scientists visible? Goodell's original list was garnered from two surveys made of science-news experts and college students (journalism majors). The bias was clearly on the side of news media and the educated middle-class public likely to buy and read a new book by Sagan or Mead. Would a truly broad public survey generate these same names? I doubt it.

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Developmental Genetics

Gene Activity in Early Development. ERIC H. DAVIDSON. Second edition. Academic Press, New York, 1977. xvi, 452 pp., illus. $18.50.

Eric Davidson's book is an attempt to summarize our present knowledge of cell differentiation in the early stages of embryonic development. It is firmly based on the proposition that development is directed by an unfolding program of changing gene expression and hence that an understanding of cytodifferentiation must be sought in the detailed mechanism of gene regulation. In recent years the importance of the relation between developmental biology and genetics has been reemphasized, but there has been interplay between them since their early days. T. H. Morgan, one of the founding fathers of modern genetics, was a developmental biologist and an important member of the American school that believed that early events in cell differentiation depended on the activity of heterogeneous egg cytoplasm in setting up spatially and temporally diverse patterns of gene expression. Eric Davidson is a descendant of this school. His approach is to examine the evidence for changing patterns of gene expression in the embryo, to quantify them, and to

consider to what extent they can be explained by the activity of morphogenetic determinants in embryonic cytoplasm. The book is thus a true synthesis of cell biology and molecular biology. As such, it should prove valuable and stimulating to students of both disciplines, from the senior undergraduate to the specialized research worker.

When the first edition of the book was published nine years ago, our knowledge of eukaryotic molecular biology was rather shallow. In particular, almost nothing was known of eukaryotic messenger RNA molecules, indeed they had not been isolated, and much weight was placed on misinterpreted nucleic acid hybridization experiments. In the light of our increasing knowledge, much of the book has been completely rewritten—so much so that those who bought the first edition should also acquire the second. The classic experiments of cell biology remain, supplemented with much new information, and still form one of the threads that hold the synthesis together. Another thread is the quantitative approach to molecular aspects of development, applied on a unique scale. The use of this approach has meant reworking many previously reported data and integrating them to answer such questions as what is the rate of nucleic acid or protein synthesis at particular stages of development, how many genes are active at particular times, how do these populations of genes change, and how does the efficiency of the information transfer process change in development. In this respect the book should be seminal, for in the past there has been much loose thinking when data have been interpreted in purely qualitative terms. The reader may criticize some of the numerical arguments presented because the data used are rather inadequate. But the author makes the basis of his calculations clear and points out where potential error may exist. I believe that his assumptions are largely justified and that the approach will color our thinking for some time to come. The approach is also likely to stimulate work to improve and extend our existing knowledge.

This is not a comprehensive textbook in any sense. Important later events in cell differentiation, for example hemopoiesis and myogenesis, are not covered, nor are interactions between cells and morphogenesis. There is something to be gained from such omissions, however, for Davidson has written a coherent essay, which I read from beginning to end with enjoyment and unflagging interest. One inevitable defect is that the mechanism by which varying cytoplasmic environments cause changes in gene activity is not considered in any depth. Unfortunately, this is wholly the fault of our general ignorance of the way in which eukaryotic genes are controlled. Let us hope that in another nine years a third edition will appear to repair this defect.

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