government laboratories are well described, and the account can be profitably read by those concerned with similar programs in the United States. The limited success of the Rothschild reforms in redirecting the work of the research councils is clarified. And the few paragraphs on the decision to participate in the European 300-GeV particle accelerator do more to reveal the limits of scientific self-government than several pages on the machinery of the Advisory Board for the Research Councils.

The focus on institutional arrangements limits somewhat the book's contribution to the field of science and public policy studies. Much of the material will be familiar to those already acquainted with the general features of British science policy organization. The author's narrow purview also excludes a more far-reaching inquiry into the special status of science and technology in both the processes and policies of modern British government, an inquiry that would have linked organizational features both to the achievements and failings of British science and technology and to underlying transformations in British society, government, and the economy. Though Gummett chronicles and comments upon the involvement of scientists in the administrative apparatus with considerable competence and good judgment, one regrets that he did not more often step back from his subject to gain a position of broader perspective and deeper insight.

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A Prospectus of Knowledge

Knowledge. Its Creation, Distribution, and Economic Significance. Vol. 1, Knowledge and Knowledge Production. FRITZ MACHLUP. Princeton University Press, Princeton, N.J., 1981. xxx, 274 pp. $17.50.

This first volume in a projected eight-volume study of *Knowledge: Its Creation, Distribution, and Economic Significance* might best be approached as if it were part of a great formal garden—Machlup's Garden of Knowledge—and not a mere publication. In that frame of mind, the reader will be prepared for a leisurely stroll, with side excursions to study cultivated areas ranging from "a priori knowledge" to "zoology." There will be stops along the way at "peace" and "playing" and a thorough visit to the area one might expect to find in an economist's garden, one planted with considerations of "value" and "marginal utility" and "price."

The guide for this trip, Fritz Machlup of Princeton University, will probably be as interesting to many readers as the garden. They will perhaps be surprised to learn that he is a professor emeritus with the energy and confidence to start such a lengthy project—no blue hills of retirement for this man. They will find it interesting that he ignores the "rules" of his own professional culture, with its high degree of specialization; in my own university we have separate departments for history, for the history of science, and for the history of medicine, but Machlup turns his back on these petty professional distinctions and declares his domain to be simply "knowledge." The reader should put aside any fears this might arouse and spend the day seeing what this learned guide and his garden have to offer.

Machlup makes the tour enjoyable with his careful analyses of knowledge, with his asides, and with his evaluations of others and of himself. When he stops a bit too long in that part of the garden reserved for reviews of his previous work—and you should be familiar with the fact that this project builds on Machlup's one-volume study *The Production and Distribution of Knowledge in the United States* (1962)—you may get impatient. But you will probably find engaging his recognition that some distinctions he has just made were "not very entertaining" or his acknowledgment that all he has been able to do is make something "less obscure." As these asides and other evaluations make clear, the author feels no acute pressure of either time or space. With seven volumes to go, he can afford to explore dead ends, probe alternative modes of explanation and categorization, play with an idea just because it is interesting.

That is why it is best for the reader not to be in a great hurry to get on with it. Machlup has not built an interstate highway designed to get you from A to B to C with dispatch. In his type of garden you can turn aside to look at the two-cultures controversy made famous by C. P. Snow. You will learn that in Machlup's judgment his own specialty, economics, "is equally far removed from the ready grasp of most molecular biologists as it is from the ready grasp of most Romance philologists" (pp. 80–81). After having narrowed Snow's argument substantially (and bolstered the ego of the Romance philologist), Machlup strolls on to look at the humanities and social sciences. Why do this or that particular subject? The author explains: Because it fascinates him. Whether your particular fascination is with business machines, with pornographic materials—yes, he stops in that part of the garden too—or with the proper definition of scientific knowledge, Machlup will provide you with interesting insights and a good sense of how each particular type of knowledge relates to the whole.

When you finish, say, the section on "scientific knowledge," you will know more. You will know, for instance, something about the different ways different societies over the centuries have defined science. I, for one, did not know that Descartes thought that " 'any knowledge that can be questioned ought not to be called science' " (p. 63). Nor did I recall that Kant had had something very important to do with creating our modern concept of what science is. Of particular interest to me was the manner in which English-speaking peoples during the 19th century came to restrict the use of the word "science" to the study of natural phenomena. As Machlup points out, however, in other societies science kept its broader, less restrictive meaning and referred to "systems of knowledge acquired by sustained study" (p. 67). Thus if I were a German or Japanese or Russian historian, instead of an American one, I would be recognized as a scientist and could, I guess, ignore the two-cultures controversy entirely.

This bit of semantic lore may not interest you, and I doubt that it will be of great practical value to me. You just may not care to know what science or history or humanism means and how the meanings have changed over the years. For those who love interstate highways of the mind, I recommend a shortcut through the garden. You will want to race past a good bit of the first two parts of the book, Types of Knowledge and Qualities of Knowledge. For you it will be part 3, Knowledge as a Product, that will be of greatest interest. It is this part

of the volume that adheres in spirit to the author's previous book and to most of the work done in his profession. Here he forcefully and fully delineates how he will extend his previous quantitative estimates on the creation and distribution of knowledge. For those readers who might have hoped that he would make their jobs easier by making the estimates consistent in every way possible with the received knowledge of our national income and product accounts, the news is bad; refusing to follow the lead of Marc Uri Porat, whose *The Information Economy* does exactly that, Machlup decides instead to make his forthcoming estimates consistent with his own previous work. In that way, as he carefully explains, he will capture aspects of the knowledge-creating industries and occupations that are lost if one uses the alternative techniques.

While the actual quantitative work is far down the path yet, Machlup sketches for us the outlines of what will be involved. The subject matter will be an information explosion. In the years between 1958 (the cut-off point for his previous volume) and 1975 (the cut-off point for the current study), the knowledge industries experienced astonishing growth and the knowledge occupations came to play a greater and greater role in our national economy. For the present all Machlup can do is describe these changes in general terms and set forth the categories he will use in his subsequent volumes (each of which is tentatively described). But already you can see how important the subject is and how significant the results of his project will be.

Those of us who are deeply concerned about the declining rate of productivity increase in America in the last decade and a half will await Machlup's estimates with particular interest. We need to know far more than we do about the knowledge industries and occupations, about their roles in the private and public sectors of our society, about their growth rates, and about their economic impact. We need a study that combines, as this one does, quantitative measures with qualitative and historical evaluations. Whether you are an impatient highway traveler or a stroller, you will thus find something to enjoy in this, the entranceway volume to Fritz Machlup's garden.

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The Publishing Enterprise

Development of Science Publishing in Europe. A. J. MEADOWS, Ed. Elsevier, New York, 1980. x, 270 pp. $48.75.

The first Elsevier publishing company, established in 1580, expired in 1712. The second was founded in 1880 by J. G. Robbers, who perceived the advantage of attaching to his firm a name other than his own. The book under review commemorates the first centennial of the newer and the fourth of the older Elsevier. Its disconnected essays cover the development of scientific publishing in Europe about as well as the Elsevier firms fill the centuries.

The ten contributors, most of whom are British, survey European scientific journal and monograph publishing to 1850 (A. A. Manten, D. M. Knight), journal publication in natural history, 1800–1939 (J. G. Shaw), scientific publishing in the 20th century (A. J. Meadows, J. K. W. van Leeuwen), and newspaper reporting of science since the Second World War (B. Dixon). They give special attention to dissemination of science in Victorian England (Meadows), the International Scientific Series (R. M. MacLeod), commercial science journals in Victorian England (W. H. Brock), monograph publishing in France around 1900 (H. W. Paul), and the *Philosophical Transactions* of the Royal Society of London (M. F. Katzen). The collection is evidently skewed toward British de-

Frontispiece from Thomas Sprat's *History of the Royal Society* (London, 1667). "Just as publishers today not infrequently bring out a cased and a paperbound edition of a book simultaneously, so, in the past, editions of different quality of the same book have often appeared. Some copies were often printed on larger paper, often, too, of better quality than that used for the ordinary edition. Sometimes, the large paper copies might be superior in other ways," as in the inclusion of this frontispiece, "which did not appear in ordinary copies" of Sprat's work. [David Knight, in *Development of Science Publishing in Europe*]