

FRITZ MACHLUP

Knowledge

*Its Creation, Distribution and Economic
Significance, Volume II*



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KNOWLEDGE:
ITS CREATION, DISTRIBUTION, AND
ECONOMIC SIGNIFICANCE

VOLUME II
THE BRANCHES
OF LEARNING

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VOLUME II
THE BRANCHES OF
LEARNING

BY FRITZ MACHLUP

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PREFACE

IN VOLUME I of *Knowledge: Its Creation, Distribution, and Economic Significance* (Princeton University Press, 1980) I attempted to give a rough outline of the planned eight-volume series. I warned the reader then that the outline was tentative and likely to change, but I did not expect that I would alter my plans so early as with Volume II. With the sympathetic understanding of the editorial board of the Princeton University Press, I decided to limit the material first intended for the second volume to the first two parts originally assigned to it—"The Branches of Learning" and "The Departments of Erudition." I had completed much of the manuscript for these two parts in 1978 and was anxious to get them into print. They make a self-contained book.

At this juncture I may with some confidence "predict" that Volume III will contain the two economic parts originally planned for inclusion in the second volume: "The Economics of Knowledge and Information" and "Knowledge as Human Capital." Organized in some twenty chapters, the manuscript for these parts is now complete and ought to be published without undue delay, especially because the literature on these topics is growing at a rapid rate. "The Economics of Knowledge and Human Capital" is the tentative title for Volume III.

I am still working on "The Disciplines of Information," largely a descriptive and methodological survey of recently developed, and still developing, fields of study dealing with information, intelligence, and communication. As a result of this "cell division," the whole work is likely to become a series of ten volumes.

The research for the volume on "Education," now probably Volume V, is in an advanced stage of development. Some of the research projects on various aspects of education are still in progress, but hundreds of folders of working papers are ready to be written up in more than forty chapters.

At the end of Volume I, a table recorded the number of lines retained from various pages of my earlier book, *The Production and Distribution of Knowledge in the United States* (Princeton University Press, 1962). No such table appears in this Volume II, for the simple reason that it contains not a single line from the earlier book. Nothing in the present volume has been prepublished anywhere. Readers who

want to know what they may expect to find in this volume may look for a preview in the brief Chapter 1, "Introduction."

My acknowledgments of financial support are complicated by the fact that no fewer than nine agencies and foundations have been sponsoring my research: the National Science Foundation, the National Endowment for the Humanities, the Ford Foundation, the John and Mary Markle Foundation, the Alfred P. Sloan Foundation, the Exxon Education Foundation, the Spencer Foundation, the Earhart Foundation, and the National Institute of Education. The largest part of the funds was awarded for the research on education and for the statistical work on some of the later volumes. The research on the materials used for the present volume was financed chiefly by the Ford Foundation and the Earhart Foundation.

As I mentioned in the preface to Volume I, more than sixty research assistants have been involved in the work on the forthcoming volumes. Only two, however, can be credited with significant assistance in the research for Volume II: Jessica Kennedy, who helped me on several chapters on "The Branches of Learning," and Mary Taylor Huber, who did much of the research on academies and universities for "The Departments of Erudition" and also on some of the philosophers discussed in Part One. The editorial care for the volume was again entrusted to Peggy Riccardi; fortunate is the author who can work with such a sensitive and perceptive editor.

Princeton University and
New York University

FRITZ MACHLUP

VOLUME II
THE BRANCHES
OF LEARNING

INTRODUCTION

IN THE INTRODUCTION to Volume I of this work I called it an interdisciplinary and transdisciplinary undertaking. I did not specify all the disciplines that would be called upon in carrying out the project. After a good deal of further reading and thinking about the unity and division of the sciences, I feel better prepared to indicate which of the established disciplines will be involved in the work according to my present plans.

The Disciplines Involved in This Work

That economics is one of the relevant disciplines is clear; indeed, “economic significance” is part of the title of the series of volumes. I shall, however, defer talking about the roles assigned to economics, leaving it till the end of this *tour d’horizon*. This is the polite thing to do for an author whose professional home is economics.

Philosophy, the “science of the sciences,” should come first in the order of introductions at an interdisciplinary party. Philosophy, as a matter of fact, was given pride of place in Volume I. The first two parts of that volume involved epistemology, analytic philosophy, and a few morsels of history of the philosophy of science. More such morsels will be found in the present volume. Volumes III and IV will include long discussions of methodology. The volume on Education (probably Volume V) will contain chapters explicitly concerned with the philosophy of education in general, and with social philosophy and ethics in particular. Political philosophy will be involved in the discussions of academic freedom and, again, in the volume on Research and New Knowledge, Cognitive and Artistic. That the parts devoted to discussions of artistic creation and communication will draw upon aesthetics should be understood.

Psychology will have a prominent role to play in several of the planned volumes. In the survey of the Sciences of Information, cognitive psychology will be one in the cluster of disciplines to be examined. In the part on Knowledge as Human Capital, the psychologists’ controversy about genetic and acquired abilities—heredity versus environment (nature versus nurture)—will be discussed. In the volume on Education learning theory will be involved both explicitly and implicitly. And in the volume on The Media of Com-

munication psychological research on the effects of TV-watching on reading ability and reading habits, on youth violence and criminality, and on intellectual and emotional development will be reviewed.

Sociology will be implicit throughout the work. My earlier book, *The Production and Distribution of Knowledge in the United States*, published in 1962, has been credited with laying "the foundations for a theory of growth of knowledge as part of the sociology of knowledge."¹ Much of what will be learned in the volumes to come will have implications for the sociology of knowledge, and much of what will be examined must draw on various areas of sociology. As I see it, the notions of social knowledge, or a social stock of knowledge, and its social usefulness and valuation, are sociological concepts before they are economic concepts. Moreover, the social priorities in evaluating and promoting the creation and distribution of knowledge, in general and of particular kinds, are issues of sociology as much as they are issues of economics.

At several junctures in this work anthropology will be called upon in various ways. There will be a brief section on the anthropology of education; but anthropological research will be of the essence in such inquiries as how young people spend their time as students enrolled in different types of colleges, majoring in different fields, and living in different social environments. An inquiry into bilingual education will in significant aspects rely on techniques of anthropological interpretation.

Political science will be the point of reference in a section on the politics of education and will inform discussions of various problems of education, such as the question of the length of compulsory schooling, the financing of schools by federal, state, and local governments, the tax treatment of expenses for nonpublic schooling, and general issues of school reform. Political principles will likewise be involved in evaluating questions of government support for research in the natural sciences, the social sciences, engineering, and in the humanities; of government support for the performing arts, for literature, music, the visual arts. In the volume on *The Media of Communication* politics will underlie discussions of industrial organization and regulation of the print media and, even more manifestly, the electronic media. Political science, jointly with economics, will provide the tools for the analysis of patent monopolies and copyrights. The discussion of governmental information services will include implications of the growth of government and the overgrowth of

¹ Moshe Sarell, Book Review, *American Sociological Review*, vol. 28 (October 1963), p. 841.

bureaucracy. Perhaps the most important participation of political science will be in evidence in the last volume of the planned series, when some fashionable theories of the distribution of political power in the knowledgeable society will be examined.

I have previously mentioned the cluster of disciplines that I called "the sciences of information." They include information science, library science, computer science, informatics, mathematical theory of communication, systems theory and systems analysis, operations research, cognitive psychology, artificial intelligence, robotics, cybernetics, decision sciences, semiotics, and cognitive science. My task will be to analyze the topology of these fields of study, their contents and techniques, and their methodological interrelationships. At the time I am writing these lines, I cannot yet say whether some of these disciplines are overlapping, cognate, or complementary. I shall have to examine mutually inconsistent claims to the effect that one of the fields includes, or is included in, another. This methodological investigation is interdisciplinary in a sense different from that used earlier in this introduction: previously the various disciplines were expected to be of help in studying various problems and issues, now the disciplines themselves are the objects of analysis. They are the problems to be examined.

There are, however, a few more disciplines to be drawn upon in the elucidation of problems of knowledge, especially in the category now commonly designated as the humanities. These disciplines will be indispensable in the discussion of artistic creation and communication. I shall have to consult studies of the classics, literary criticism, musicology, art criticism, and architecture when I write about the production of literary works such as novels, novellas, and plays, about composition and performance of musical works, about dance and ballet, paintings, drawings, sculptures, and architectural designs and structures. To confine illustrations to the last-mentioned subject, architectural design is undoubtedly production of knowledge, but the preparation of blueprints and builders' instructions must not be treated as equivalent to the artistic creation by an original, inventive and imaginative architect. I have recently read some fascinating treatises on the combination of engineering and sculpturing that can produce an architectural structure—a cathedral, music hall, office building, great library, or spectacular bridge—that "speaks to us," at least to the more perceptive among us. Adding up the figures that may represent the annual cost of "architectural information" would be a dull job indeed if the results were not associated with an appropriate qualitative interpretation of the knowledge produced.

I have mentioned the classics as one of the auxiliary disciplines

in my work; perhaps I should add some words of explanation. No knowledge of classical languages is needed for a report on the number of students enrolled in courses in Latin or Greek, or on the total cost of teaching these languages. On two occasions, however, my (modest) knowledge of Latin was of help: when I had to consult the Latin version of Bacon's *Advancement of Learning* in order to check Bacon's meaning of some words or sentences, and when I had to prepare an accurate statement of the classification of disciplines proposed in Johann Heinrich Alsted's *Encyclopaedia*, published in Latin.

History is the discipline most extensively involved in this series of volumes. For every branch of knowledge production, from education and research to artistic creation and communication, to the media of communication, the information services, and the information machines, historical sketches will be provided. Volume III will offer a history of economic doctrines relating to information and knowledge. Volume I contained exercises in historical semantics regarding the meanings of scientific and humanistic knowledge. The heaviest concentration of historical research is embodied in the present book, Volume II. Its first part presents intellectual history, its second part institutional history. Later on in this introduction I shall have more to say about my historical endeavors.

In at least six volumes of this work statistics will play a leading role. The statistics employed will not be of any complex mathematical type, using correlation and regression analyses. Primitive time series will do the required job; some of the data will be culled from primary and secondary sources, though other data will have to be developed by estimation on the basis of appropriate indicators. The detective work needed in some instances to obtain the relevant figures for the annual cost of activities instrumental in knowledge acquisition or in rendering information services may call for ingenuity, but not for mathematical sophistication. The only references to regression analysis will occur in connection with attempts by analysts of the formation of human capital to separate the effects of schooling from those of other factors contributing to the improvement of human productive capacity.

Now, having finished the round of disciplines participating in this ambitious undertaking, I may return to economics. Among the tasks assigned to economic analysis will be an examination of the production of knowledge as an economic activity—both creating new knowledge and disseminating existing knowledge, including current, timely information of merely transitory relevance or usefulness. To ascertain how much of the nation's total economic resources is being devoted to various kinds of knowledge production and infor-

mation in different sectors of the economy, public and private, represents quantitative analysis of interest to many—to some in the capacity of developers of public policy, to some as concerned taxpayers, to some as producers of knowledge or providers or users of information, and to some merely as curious observers of the economic scene. However, to ascertain the cost of knowledge production is only a part of the economic problem at issue; the benefits derived have to be valued in some fashion before one can judge whether they were worth the costs incurred. Alas, the valuation of benefits is often a highly delicate, perhaps insoluble problem; but even if rigorous answers are not attainable in instances where market prices fail to give acceptable clues, the problem has to be scrutinized and reasonable approximations have to be arrived at. Besides the benefits and costs of knowledge and information services, many other aspects of incomplete and vague information, of misperception and of misinformation, of different speeds of diffusion, and of lags in the revision of expectations have to be investigated, especially with regard to the working of the market mechanism and the function of market prices as guides in the allocative processes of the economy. The economics of information and knowledge has become an important specialty in the discipline, with a literature that is growing by leaps and bounds. More about all this in Volume III; none of it in this Volume II.

Economists Invited, Together with All Others

The present volume will not be on economics; this need not mean that it is out of bounds, or off limits, for economists. Good economists, ordinarily, are educated people, that is, they have acquired intellectual knowledge in areas other than economics.² They will perhaps welcome a book that takes them across disciplinary frontiers. In expressing my trust in the intellectual curiosity of economists, I do not mean to say that most of my readers are economists. Indeed, I am counting on a multidisciplinary readership of my volumes reporting on multidisciplinary research.

I admit that not all of my excursions into so many different fields

² “. . . an economist who is only an economist . . . is a pretty poor fish.” Lionel Robbins, *An Essay on the Nature and Significance of Economic Science* (London: Macmillan & Co., 2nd ed., 1935), p. ix. — “. . . nobody can be a great economist who is only an economist—and I am even tempted to add that the economist who is only an economist is likely to become a nuisance if not a positive danger.” Friedrich A. Hayek, “The Dilemma of Specialization,” in Leonard D. White, ed., *The State of the Social Sciences* (Chicago: University of Chicago Press, 1956), p. 463. The gradation from “pretty poor fish” to “nuisance” and to “positive danger” suggests degrees of risk or injury similar to those used in medical or criminal evaluations.

are “really necessary.” I may repeat from my introduction to Volume I what I said after defending several of my expansionist moves as being dictated by developments in economics and other disciplines:

None of this explains why I deal in Volume II with the history of ideas about the branches of learning. The answer is simply that it fascinates me, and I think that others may be interested too. Moreover, the intellectual history is closely connected with the institutional history of higher learning—academies, libraries, and universities—and can explain some of the systems of classification and departmentalization at present. Useless knowledge? Perhaps. But knowing for fun is a respectable human activity; and having fun need not be judged useless.³

Useful and Useless Knowledge

To raise the question what knowledge is useful or useless invites a quibble—one, I am afraid, that I cannot properly dodge. For if we call “useful” any knowledge that gives some knowers some pleasure to learn or to have, then almost all knowledge is useful. On the other hand, if we call “useful” only those bits of knowledge that help the knower carry out his job and earn a living, then only small fractions of what people know may be called useful. The question cannot be approached before we decide what is meant: useful to whom and for what?

If the knower’s own judgment is taken as the criterion, his subjective evaluation of his subjective knowledge will count. In the scheme that I adopted and explained in Volume I, I distinguished five types of knowledge:

- (1) Practical knowledge: useful in the knower’s work, his decisions, and actions; can be subdivided, according to his activities, into
 - a) Professional knowledge
 - b) Business knowledge
 - c) Workman’s knowledge
 - d) Political knowledge

³ Fritz Machlup, *Knowledge: Its Creation, Distribution, and Economic Significance*, vol. I, *Knowledge and Knowledge Production* (Princeton: Princeton University Press, 1980), p. 23.

- e) Household knowledge
- f) Other practical knowledge

(2) Intellectual knowledge: satisfying his intellectual curiosity, regarded as part of liberal education, humanistic and scientific learning, general culture; acquired, as a rule, in active concentration with an appreciation of the existence of open problems and cultural values.

(3) Small-talk and pastime knowledge: satisfying the non-intellectual curiosity or his desire for light entertainment and emotional stimulation, including local gossip, news of crimes and accidents, light novels, stories, jokes, games, etc.; acquired, as a rule, in passive relaxation from "serious" pursuits; apt to dull his sensitiveness.

(4) Spiritual knowledge: related to his religious knowledge of God and of the ways to the salvation of the soul.

(5) Unwanted knowledge: outside his interests, usually accidentally acquired, aimlessly retained.⁴

The word "useful" appears only in the description of the first type, practical knowledge; three other types, however, intellectual, pastime, and spiritual knowledge, are deemed to satisfy some personal needs. If "useful" knowledge is meant to exclude some types of knowledge besides clearly "unwanted" knowledge, it seems most reasonable to make useful equivalent to practical knowledge.

This materialistic interpretation of usefulness has implications that may accord with the preconceptions of some people but offend the preconceptions of others. For example, the same bundle of knowledge will be practical, professional knowledge for some—the practitioners or teachers professing the field—but intellectual knowledge for others. Not being a professor of music or physics, I derive purely intellectual satisfaction from whatever I know of music or physics. Similarly, if my friends in the departments of music or physics know anything about economics, it will be their intellectual knowledge; for them only the knowledge of the field they practice or profess is practical. On these grounds I have sometimes distinguished between training and education: the former, instrumental in the acquisition of practical knowledge; the latter, promoting the acquisition of intellectual knowledge. These distinctions, all based on personal attitudes and subjective considerations, are, however, not what scholars, legislators, and public functionaries have in mind when they