60. T. Wodzicki, *J. Exp. Bot.* **15** (45), 584 (1964); *Annu. Rep. U.S. Dept. Agr. Forest Serv. Proj. E21-FS-24* (1966).
61. R. H. Lawrence, Jr., thesis, Univ. of Georgia (1967).
62. G. S. Fraenkel, *Science* **129**, 1466 (1959).
63. J. P. Vite, *Contrib. Boyce Thompson Inst. Plant Res.* **21** (2), 37 (1961).
64. F. S. Santamour, Jr., *U.S. Dept. Agr. Forest Serv. Res. Note NE 38 and 39* (1965).
65. R. H. Smith, in *Proc. World Consultation Forest Genet. and Tree Improvement* (Stockholm, 1963); *J. Econ. Entomol.* **54** (2), 365 (1961).
66. J. A. Rudinsky, *Science* **152**, 216 (1966).
67. David White, *Prof. Pap. U.S. Geol. Surv. No. 85-E* (1914); David White and R. Thiessen, *Bull. U.S. Bur. Mines* **38**, 381 (1913); W. S. Gresley, *Fuel* **1** (1), 29 (1922); R. M. Kosanke and J. A. Harrison, *Circ. Ill. Div. Geol. Surv. No. 234* (1957).
68. B. Eske Koch, personal communication.
69. G. Troost, *Amer. J. Sci.* **3**, 8 (1821); F. H. Knowlton, *Science* **3**, 582 (1896).
70. A. Hollick, *Trans. N.Y. Acad. Sci.* **16**, 124 (1897); E. W. Berry, *Annu. Rep. N.J. Geol. Surv.* (1906), p. 135.
71. J. Finch, *Amer. J. Sci.* **7**, 31 (1824).
72. R. L. Langenheim, J. D. Buddhue, George Jelinek, *J. Paleontol.* **39**, 283 (1965).
73. A. Tschirch and E. Stock, *Die Harze* (Borntraeger, 1936) Bd. II, H. 2, T. 2.
74. H. Bauerman, *Quart. J. Geol. Soc. London* **16**, 198 (1860).
75. J. J. Chydenius, *Geol. Foeren. Stockholm För.* **2** (13), 549 (1875); A. C. Seward, *Phil. Trans. Roy. Soc. London (B)* **215**, 1 (1926).
76. S. Froes Abreu, *Bolm. Inf. Inst. Nac. Technol. Rio de Janeiro* **2**, (4) (1937).
77. J. F. W. Johnston, *J. Prakt. Chem.* **16**, 102 (1838); J. Frondel, *Nature* **215**, 1361 (1967).
78. T. D. A. Cockerell, *ibid.* **109**, 713 (1922).
79. J. D. Vine, *Rept. Wash. Div. Mines Geol.* **21** (1962); J. Wolfe, personal communication.
80. J. Murdoch, *J. Geol.* **42** (3), 309 (1934).
81. H. Klinger and R. Pitschki, *Deut. Chem. Ges. Berlin* **17**, 2742 (1884); K. A. Jurasky, *Brennst.-Chemie* **12**, 161 (1931); H. Steinbrecher, *Angew. Chem.* **48**, 608 (1935); P. L. Henderson, *Brown Coal* (Melbourne Univ. Press, Parkville, 1953).
82. J. Cortelezzi, *Rev. Fac. Cienc. Quim. Univ. Nac. La Plata* **5**, 25 (1928).
83. W. Lengweiler, *Rocks Minerals* **14**, 212 (1939); P. A. Brouwer, *Econ. Dominicana, Año 2, No. 16* (1959); M. W. Sanderson and T. H. Farr, *Science* **131**, 1313 (1960).
84. P. Dahms, *Zentralbl. Mineral.* **7-8**, 102 (1920); O. Protescu, *Soc. Romana Geol. B* **3**, 65 (1937).
85. J. W. Durham, *Pan. Pac. Entomol.* **32**, 51 (1956).
86. W. P. Evans, *N.Z. J. Sci. Technol.* **15** (5), 365 (1934).
87. J. Cortelezzi, *Rev. Fac. Cienc. Quim. Univ. Nac. La Plata* **6**, 33 (1930).
88. J. F. W. Johnston, *Lond. Edinb. Dubl. Phil. Mag.* **13**, 329 (1938); *J. Prakt. Chem.* **17**, 107 (1839); J. Frondel, *Nature* **215**, 1361 (1965).
89. H. H. Müller-Neuglück, *Angew. Chem.* **46**, 751 (1933).
90. C. Iwaski, *Tohoku Imp. Univ. Tech. Rep. 6* (1926), p. 169.
91. J. Paclt, *Israel Exploration J.* **3** (4), 242 (1953).
92. I thank E. S. Barghoorn, C. W. Beck, J. W. Durham, J. Frondel, J. Latting, S. Martin, K. V. Thimann, and R. H. Wetmore for reading the manuscript. Supported in part by NSF grants GB-2397 and GB-5816, the Radcliffe Institute and the Maria Moors Cabot Foundation of Harvard University.

Editing a Scientific Encyclopedia

Planning and preparation of the *International Encyclopedia of the Social Sciences* are recounted.

David L. Sills

The thousands of "encyclopedias" written since the age of Greece and Rome have two attributes in common. They have all claimed to provide a comprehensive survey of knowledge (either all knowledge, or one branch of knowledge), and they have all been based upon some explicit or implicit scheme for classifying knowledge.

In their other attributes encyclopedias vary widely. Most of them are multiauthored, but a number of great encyclopedias have been written by one man. Most are multivolumed, but a number of important one-volume encyclopedias have been published. Most present the articles in alphabetical order, but this fairly modern practice is by no means universal even today.

Because of the claim to be comprehensive and the explicit or implicit schemes used for classification, the study of encyclopedias provides a vast (and largely untapped) opportunity for research into both the history of science and the sociology of knowledge—the study of the relation between the characteristics of a society and the origins and nature of what it considers to be "knowledge." Consider the most famous encyclopedia ever produced, the 17-volume *Encyclopédie* edited by Diderot and D'Alembert. The very fact that it was prepared, to say nothing of its contents, is often taken as an indicator of the broad social and intellectual movement called the Enlightenment. The aim of the *Encyclopédie* was to treat all subjects, those related to social arrangements no less than those of the physical environment, in terms of a rational, scientific approach—nothing was to be considered too sacred to be questioned by the rationalist iconoclasts of the Enlightenment.

The *Encyclopaedia of the Social Sciences* was edited by two economists, E. R. A. Seligman and Alvin Johnson, and was published in 15 volumes by the Macmillan Company between 1930 and 1935. It reflects the prevailing notion of the late 1920's and early 1930's that social ills can be cured if knowledge from the social sciences is both widely dispersed among the public and is brought to bear on these ills; it also reflects the fact that the social science most highly developed at that time was economics (largely pre-Keynesian). The historicist insight that the *Encyclopaedia* is a document of its time, not simply a compilation of more or less obsolete articles, is in part the result of the effort to create a new encyclopedia of the social sciences.

The recently published *International Encyclopedia of the Social Sciences*, (*IESS*) was published in April 1968 in 17 volumes by the Macmillan Company and the Free Press. As its editor, I am presumably well qualified, perhaps overly qualified, to tell its story. Nevertheless, I have handicaps, some self-imposed and some that I cannot avoid. In spite of Watson's example in *The Double Helix* (*1*), I am not willing to expose all the conflicts and frailties that are part of the story, even though many of these are an essential component of the sociology of knowledge. Also, my account can be only a partial one because I obviously did not know everything that was going on. Each of my fellow editors has his own story to tell, as do many of our contributors. Finally, this is only a partial story because we *encyclopédistes* of the 20th century, no less than those of the 18th, constitute part of the data that some future sociologist of knowledge will analyze if he studies the *IESS*. The

The author, a sociologist, is associate director of the Demographic Division, The Population Council, New York.

thousands of "rational" decisions we made to solve intellectual or practical problems may well reveal both the blind spots and the unwitting prescience of social scientists of the 1960's.

Background

The story begins with the several efforts, immediately after World War II, to encourage the publication of a new or a revised edition of the "old" and much-respected *Encyclopaedia of the Social Sciences* (hereafter called the *Encyclopaedia*). In 1950, Alvin Johnson prepared a report on the proportion of the articles in the *Encyclopaedia* that would have to be revised or rewritten for a new edition. In 1951, Bert F. Hoselitz, an economist at the University of Chicago, prepared a memorandum proposing a new or revised edition. And in 1954, in response to a suggestion made by Johnson, Bernard Berelson, then director of the Behavioral Sciences Program at the Ford Foundation, asked several dozen social scientists and librarians to comment on the desirability of a new or revised edition. The responses to these inquiries were generally favorable, and Berelson asked his associate Francis X. Sutton to undertake a study of the feasibility of such a project.

At Berelson's suggestion, and with Ford Foundation funds, several ad hoc meetings were held, and a study group was formed under the aegis of the University of Chicago. W. Allen Wallis, a statistician and economist then at the University of Chicago, served as chairman (*2*).

The study group met during the summer of 1955, and, with the assistance of Hoselitz and a small staff, it prepared "A Study of the Need for a New Cyclopedic Treatment of the Social Sciences." This thorough report, which examined both the need for a new encyclopedia and the administrative problems that would be involved in meeting the need, was submitted in August 1955 (*3*).

The Chicago study group also inquired into the relevance of producing an encyclopedia in the mid-20th century. "What is an encyclopedia about?" and "What is an encyclopedia for?" were two of the questions examined. They are also quesions that my editorial colleagues and I discussed at great length, and our implicit answers are an integral part of this account.

By 1955, the *Encyclopaedia* was 20 years old, and the frequency with which individuals consulted it had undoubtedly declined. (The increase in the number of social scientists may well have led to an increase in total use.) It is difficult to obtain objective measures of the use made of reference books, although one member of the study group, Frederick Mosteller, did attempt to measure the use of the *Encyclopaedia* by examining the wear and tear of seven sets located in six libraries at Harvard University and the University of Chicago. Applying a four-point scale ("clean," "well used," "heavy use," and "very heavy use"), Mosteller found the articles that seemed to have been consulted most frequently. The study demonstrated that the *Encyclopaedia* had been used frequently in these libraries, and that conceptual articles were more frequently consulted than descriptive ones.

The study group also obtained interviews with 66 social scientists (at 19 colleges and universities) concerning the desirability of a revised or new encyclopedia. Naturally enough, there was general agreement about the overall obsolescence of the *Encyclopaedia*; it would have been quite remarkable if this had not been the case. And a majority (39 of the 66 respondents) favored either a revised edition or a completely new encyclopedia. By and large, undergraduate teachers (except for psychologists) in colleges favored the project, but research-minded university professors did not. I myself believe that the plan to prepare a revised or new edition had, at best, the lukewarm support of leading figures in the social sciences in the mid-1950's, although the study group was not so explicitly pessimistic in summarizing the reactions it uncovered.

Given the difficulty of the task of preparing a new encyclopedia that many people thought would not be worth the effort, the study group considered various alternatives—supplements to the *Encyclopaedia*, dictionaries, handbooks, and a new loose-leaf encyclopedia. But none of these alternatives seemed to have as much merit as another encyclopedia. Although Sutton's many interviews on the subject revealed doubt, indifference, and a feeling that "the reference needs of the social sciences in the mid-20th century called for something radically new—something that would be as typical of this century as Diderot's and D'Alembert's encyclopedia was of the eighteenth," Sutton found that "no brilliant, modern invention to supersede an encyclopedia emerged in the many discussions" (*4*).

Berelson and his immediate superior, William McPeak, a Ford Foundation vice president, gave sympathetic attention to the report, and the Social Science Research Council (which had sponsored the earlier *Encyclopaedia*) devoted two sessions to the subject during its meeting in the fall of 1955. But others in the foundation were cool to the proposal, and the project lay dormant for 5 years until late 1960, when the Macmillan Company decided to publish a new encyclopedia of the social sciences without any foundation or other subsidy. W. Allen Wallis was appointed chairman of the editorial advisory board.

The story of the developments reported thus far has already been described (*5*). I was appointed editor in the fall of 1961, and began full-time work in March 1962; accordingly, it is only from this time forward that I have firsthand knowledge of how the *IESS* was prepared. My purpose here is to review briefly the organizational structure devised for the purpose of editing the *IESS*, to summarize the editorial philosophy and policies developed as a result of collaborative work among the editors, and to describe some of the intellectual and technical problems faced by the editorial staff.

Organizational Structure

The *IESS* had an international editorial advisory board which functioned not as a body but as a group of individual consultants. Its members served without compensation. They were sent two successive versions of the preliminary table of contents and were asked to submit comments and suggestions—many replied with helpful suggestions. Some helped the editors to identify scholars who might contribute articles on specific topics.

Initially, the editorial policies of the *IESS* were reviewed by an executive committee (*6*) (which became inactive when the editorial staff was formed). To ensure strong disciplinary coverage in all the fields of the social sciences, this committee recommended appointment, for each major discipline, of an "associate editor" who would have more duties than an advisory editor

but considerably fewer than a full-time editor. These associate editors, together with five "special editors," carried out their responsibilities largely by correspondence (*7*). The disciplines represented were anthropology, economics, political science, psychology, sociology, and statistics.

This list reveals what we considered to be the core social sciences. Other fields were included to the extent that their substance seemed to warrant it. Linguistics and archeology were included under anthropology; geography was included because its social and cultural branches are closely related to anthropology, economics, and sociology; history is represented by a series of articles on the different fields of history (economic, intellectual, and others) and on varieties of historiography; and law and psychiatry were included to the extent that they embrace the subject matter of the social sciences.

Each of the associate and special editors—who became known as "field editors"—was allocated a quota of words and of articles: approximately 1 million words and 290 articles each to economics, political science, psychology, and sociology; about half of that to anthropology; 250,000 words and 65 articles to statistics; and 1.3 million words and 400 articles to biographies. It soon became evident that such fields as geography and history and many general social science topics did not readily fit into our system of classification; these were picked up by various editors, according to their knowledge and interests. Thus, Edward Shils took responsibility for most of the articles on history and religion, and I took on geography and a series of articles on the production, dissemination, and utilization of social science knowledge.

The field editors used fairly standard procedures for building lists of articles and potential contributors. They all consulted textbooks, abstract journals, and colleagues, to make sure that no important topic was overlooked. The process of pruning and adding to the disciplinary lists was continued until well into 1967 when the production schedule made further changes impossible.

The field editors continued to serve as consultants throughout the preparation period. They read most of the articles and often wrote comments on them; in some instances, they did a considerable share of the technical editing. They nominated new contributors for articles that did not arrive or that had to be rejected. In every sense, they were senior partners in the enterprise, and each had full responsibility for the treatment of his discipline.

The field editors, however, could not take a leading part in the actual editing of the encyclopedia. They were all active professors; six of the 12 were also departmental chairmen or directors of research institutes; three others were editors of scholarly journals. In short, the *IESS* had to compete with many other demands upon their time; in some instances, it competed very successfully, in others, less so. The actual editing was done by me and a staff of full-time editors, recruited for this purpose—nine young social scientists who were willing to interrupt their careers for the period necessary to create an encyclopedia (*8*). Assisting this staff were two assistant editors (*9*), a bibliographical staff, and a staff of copy editors provided by the publishers. On the substantive level the work of this staff involved repeatedly reviewing the table of contents to make sure that no essential topic was overlooked; locating contributors for hundreds of articles when the knowledge of the field editors had been exhausted; evaluating proposals for new articles that were volunteered by outsiders; upholding academic standards in the face of many pressures from a commercial publisher; and mediating between the "hard" science and the "soft" science wings of the social sciences, a task made complicated by the fact that most of the editors were members of the former. On a different, but also important level, we were responsible for extracting articles from intellectually nervous or overcommitted professors; for negotiating with the publisher several times a year on the budget and the production schedule; for acting as gadflies in keeping some of the field editors attentive to the needs of the encyclopedia; for determining rules for stylistic matters and writing a style book with which to enforce them; for making a policy for quotations, citations, and bibliographies and establishing procedures to ensure their accuracy; for devising procedures to verify the many thousand cross references; for writing guides to related articles to place at the head of articles on broad topics; for instructing the printer on how to set complicated mathematical matter in linotype; and for seemingly endless proofreading.

Contents: Organization

An alphabetically arranged encyclopedia consists of entries under which articles are placed; in that sense, it differs markedly from such topically arranged social science reference books as the *Handbook of Organizations*, the *Handbook of Social Psychology*, or the *Handbook of Psychiatry*. A reader seeks what he wants to know in these handbooks by consulting the table of contents or the index, whereas the reader of an encyclopedia generally first consults an alphabetically located entry. Two tasks of the editor of an alphabetically arranged reference book are to ensure that articles are placed where readers will look for them and to provide an entry for every topic that a reader might consult. The selection of these alphabetical entries was thus of crucial importance.

It might be assumed that we simply derived our list of entries from the lists of topics drawn up by the field editors, but this is not what happened. Each discipline has certain widely used concepts which obviously called for entries: acculturation, culture, diffusion, and race—in anthropology; capital, cost, interest, and money—in economics; administration, decision making, legislation, and power—in political science; attention, emotion, learning, and personality—in psychology; community, groups, socialization, and stratification—in sociology; and distribution, likelihood, probability, and estimation—in statistics. But we soon learned that lists of topics, useful as they were as starting points, and as a means to ensure complete coverage, could not provide us with a complete list of entries.

We alphabetized the lists of topics provided by the field editors and added a number of topics that are either nondisciplinary (for example, ethical issues in the social sciences; information storage and retrieval), or are from disciplines other than those of the field editors (for example, history; geography). Then each member of the editorial staff went through the master list, to put like titles together, locate gaps, and retitle vaguely worded topics. The first preliminary table of contents was distributed to the field editors in November 1962. A meeting with the field editors was held in late November, when many articles were added and deleted. A second preliminary table of contents was ready in February 1963.

This also was distributed, and the changes incorporated into a third version, which was sent in April both to the field editors and to all members of the editorial advisory board. This process was repeated (through correspondence and staff meetings) approximately every 6 months; in June 1967 the 12th (final) table of contents was included in a printed prospectus.

The changes that took place between the first table of contents and the published work constitute much of the intellectual history of the *IESS*. Many articles were added to the list as new topics came to the attention of the editors, or as articles received were found to neglect some important aspects of a topic. Biographical articles were added for these reasons, as well as when death made someone eligible to be the subject of a biography. Many articles were dropped when a topic was deemed inappropriate or was covered in another article, when a suitable contributor could not be found, or when a contributor failed to submit an article and it was too late to commission another; and many articles were retitled.

The titles of some articles were changed for the mundane reason that they were not received or edited in time to be printed in the original alphabetical position, and the titles of others were changed in order to place them where we believed they would be more likely to be consulted by readers. But far and away the largest number of articles was relocated in order to group two or more articles under one heading. These groupings, which we called composite articles, are one way that we resolved the dilemma of "alphabetization versus systematization"—that is, the question of how the inter-relatedness of topics in the social sciences can be reflected in an alphabetically arranged encyclopedia. Furthermore, they indicate both the degree to which synthesis was achieved by the editors and the degree to which synthesis was impossible. For these reasons, composite articles deserve a brief discussion.

The editors of the old *Encyclopaedia* adopted as one of their major goals the achievement of "a more comprehensive synthesis" of the social sciences—to use the phrase in Seligman's preface. In his 1952 autobiography, *Pioneer's Progress*, Alvin Johnson recalled how it had been hoped that the *Encyclopaedia* would serve as a powerful force for unity in the social sciences. Yet when Sutton talked to social scientists in 1954 and 1955 about the goals of a new encyclopedia, few such hopes were expressed (*4*, p. 30).

The editors of the *IESS* never dreamed of achieving a "comprehensive synthesis": our goals were more modest. We made composites of related articles regardless of their disciplinary origin; we tried to resolve flagrant terminological discrepancies whenever they were found; and we sought to point out substantive connections between articles by developing an extensive system of cross references.

As the result of the preparation of the 12 successive tables of contents, a majority (601 out of 1118) of the topical articles in the *IESS* was placed within 198 composite articles. (The term "topical article" refers to a nonbiographical article. The *IESS* also contains 598 biographical articles describing the contributions of 601 persons; of these, only 12 are placed within composites.) By contrast, the earlier *Encyclopaedia* has fewer than one-fourth (424 out of 1966) of its topical articles within its 102 composites (*10*).

Many of these composites represent various facets of a topic from the point of view of a single discipline; for example, the six articles under the heading "geography" are all by geographers on various fields of geography, and the six articles under the heading "taxation" are all by economists on various types of taxes. But 105 of the composites contain articles from more than one field. For example, the three articles under the heading "diffusion" are by an anthropologist, a geographer, and a sociologist, and the four articles under "conflict" are by a psychologist, a political scientist, a sociologist, and an anthropologist. By the use of these strategies, the editors hoped not so much to create a unity within the social sciences as to reflect as clearly as possible such unity (and diversity) as exists.

Contents: Substance

The discussion thus far has been for the most part focused on the procedures followed in selecting and arranging the contents of the *IESS*, rather than on the content itself. It would of course be possible to tell the story the other way round: to answer the question "What is the encyclopedia about?" and then tell how it was put together. But this would give the impression that the character of the *IESS* was determined in advance, and that the procedures followed in preparing it flowed naturally from a master plan. This is not what happened. Several years before undertaking this assignment I wrote a book in the field of organizational sociology, the major thesis being that organizational procedures (means) have an enormous impact upon organizational goals (ends). On the title page of that book I thought it appropriate to quote these lines by Ferdinand Lassalle (1825–1864):

> Show us not the aim without the way,
> For ends and means on earth are so entangled
> That changing one, you change the other too;
> Each different path brings other ends in view.

Nothing in my experience in editing the *IESS* caused me to think less of the cogency of this observation.

In the first year or two of our work, the editorial staff and I did develop a fairly clear notion of what kind of an encyclopedia it was going to be. When a topic nominated for inclusion was thought inappropriate, or when an article submitted seemed inappropriate (either in its entirety or in part), the judgment we would make to each other was "Wrong encyclopedia!" This means that we had a rather clear conception of what was appropriate, of what we really wanted to include, but we also had to take into account the differences among disciplines, the differences in point of view among the field editors and among the contributors, and the quite different motivations that would ultimately bring readers to the *IESS*. In spite of all these compromises we were able to produce an encyclopedia that conforms, to a large extent, to our conception of what the *IESS* should be; and because of these compromises, the model may well have been modified to its advantage.

This conceptual model was developed in our staff meetings, in our discussions with the field editors, and in our informal conversations. The "style" and "tone" of the encyclopedia that emerged is partly the result of the reconciliation of our individual points of view; partly a consequence of the fact that the editorial staff had all been graduate students in the remarkable decade of the 1950's, when the social sciences acquired much of their contemporary empirical–theoretical character, and partly a reflection of the "behavioral sciences" orientation of the

field editors. But it was also a response to three "outside" influences—the *Encyclopaedia*, the report of the Chicago study group, and the contributors.

It is difficult to assess the influence of the *Encyclopaedia* on our thinking, but in my own case it was an important one. The very fact that an encyclopedia of the social sciences had been produced before made the task seem plausible and feasible. Also, the *Encyclopaedia* gave us a point of reference: we knew that readers and reviewers would inevitably compare the two encyclopedias, and the success of the earlier one meant that there was a standard of excellence that we had to meet. Finally, our awareness of the varying rates of obsolescence of articles in the *Encyclopaedia* perhaps helped us make the *IESS* a little more obsolescence-proof than reference books usually are.

The report of the Chicago study group contained three major "operational" recommendations that gave us a mandate for seeking (and gaining) acceptance for a conception of the *IESS* that we found thoroughly congenial. The first was that the primary stress in articles should be on "theoretical contributions and empirical regularities"; the second was that descriptive material should in general be included "only for illustrative purposes"; and the third was that the number of biographies should be far fewer than the 4000 in the earlier *Encyclopaedia* and should be limited to persons of direct relevance to the social sciences.

The first commissioned articles began to arrive in the late fall of 1962. By June 1963, 248 articles had been received, and by October the count had reached 899. The effect of this feedback from the contributors upon the editors' conception of what the *IESS* should be like should not be underestimated. Especially in the early years, our practice was to circulate manuscripts widely among the editors, whose reactions to them, positive and negative, affected future editorial decisions. The comments we made to each other went far toward establishing a consensus on the ideal model for the *IESS*.

Contents: Two Encyclopedias Compared

The question "What is the encyclopedia about?" can also be answered by contrasting its articles with those in the earlier *Encyclopaedia*. Simply turning the pages of the two encyclopedias gives the largely correct impression that the earlier one places greater emphasis on economics and less emphasis on psychology and statistics; that it includes hundreds of biographies of historical figures (from Alexander the Great to Theodore Roosevelt); and that it contains hundreds of articles on particular institutions (from Christian Science to the League of Nations) and on particular historical events (from the Black Death to the Russian Revolution). A more systematic way is to compare sample pages from the two encyclopedias. This was done.

Table 1. Major disciplinary relevance of articles on sample pages of two social science encyclopedias.

Discipline	*Encyclopaedia of the Social Sciences**	*International Encyclopaedia of the Social Sciences*†
Anthropology	4	11
Economics	39	14
History	7	1
Information sciences	0	2
Law	2	1
Political science	16	14
Psychology	1	16
Public health	1	0
Sociology	16	18
Statistics	0	2
Totals‡	86	79

* A sample of 100 pages was drawn by the staff of the Chicago study group (*2*; the articles that appear on these pages are listed on appendix pages 150 and 151 of the report). The page numbers were selected by using a series of 100 random numbers chosen from M. G. Kendall and B. B. Smith, *Tables of Random Sampling Numbers* (*11*). † A sample of 100 pages was drawn by me by a procedure identical to that used in selecting the sample of *Encyclopaedia* pages, except that the page numbers were selected by using a series of 100 random numbers chosen from Rand Corporation, *A Million Random Digits* (*12*). D. B. Peizer, statistical consultant at the Center for Advanced Study in the Behavioral Sciences, gave advice on appropriate procedures to follow in drawing the sample. ‡ The totals are less than 100 because pages containing only biographies or bibliographies were excluded from the samples.

It is evident from the articles on the sample pages that the editors of neither encyclopedia were able to establish a standard level of abstraction for use in selecting topics; both samples reflect great diversity in modes of organizing knowledge, and both contain articles on many analytical levels. One striking difference is between the number of articles devoted to the different disciplines. The *Encyclopaedia* is stronger in economics, which is a reflection of the relative importance of economics in the late 1920's and early 1930's and of the fact that both senior editors were economists. The *IESS* has a more even balance between the disciplines, a reflection partly of intellectual developments in the intervening years and partly of policies established by the editors (Table 1).

Table 1 demonstrates the difference between the topical articles in the two encyclopedias as far as disciplinary balance is concerned, but it does not reveal the equally large differences in content. These differences could be demonstrated by means of a content analysis of the sample pages; alternatively, the articles on the sample pages could be classified according to whether or not comparable articles are included in the other encyclopedia and, if not, to try to discover why not. This was done.

The degree of overlap or near overlap between the two encyclopedias as represented by these samples is nearly the same: 32 out of the 86 articles in the *Encyclopaedia* sample have counterparts in the *IESS*; examples are articles on agricultural credit, capitalism, democracy, homicide, liberty, mortality, and social work. Similarly, 38 out of the 79 articles in the *IESS* sample have counterparts in the *Encyclopaedia*; examples are archeology, business cycles, justice, land tenure, literacy, propaganda, and sociology. Of greater interest is the frequency distribution of the reasons for lack of overlap. Of the 54 articles in the *Encyclopaedia* sample that do not have counterparts in the *IESS*, 38 are too specific–descriptive to meet the purposes of the *IESS* (for example, company towns; railroads); 12 are too historical–descriptive (Conciliar movement; Jacobinism); three are not included because the concept is not in current social science use (amateur; decadence; gerontocracy); and one (Islamic law) because a planned article did not materialize. By contrast, of the 41 articles in the *IESS* sample that do not have counterparts in the *Encyclopaedia*, 29 deal with concepts not used at the earlier time (for example, automation, ethology, and game theory) and 12 with concepts outside the announced scope of the *Encyclopaedia* (for example, emotion, psychometrics, and random numbers).

These comparisons are suggestive of the kind of systematic analysis of the two encyclopedias that might profitably be extended. Such an analysis would demonstrate the extent to which and the ways in which the definition of social science knowledge has changed since the late 1920's and early 1930's.

Purpose

We did not of course plan the *IESS* so that it could be used by future sociologists of science; we had much more mundane uses in mind. The question "What is an encyclopedia for?" was constantly before us. We were aware of the doubts about the need for a new encyclopedia that the Chicago study group had encountered in the 1950's, and we were almost daily made aware that the need for a new encyclopedia did not have a high priority among social scientists of the 1960's. Although the rate of acceptance among invited contributors was very high, partly, we thought, because of the prestige of the earlier *Encyclopaedia* and partly because of the reputations of the field editors, many declined because they saw no need for an encyclopedia, and many others undoubtedly accepted the invitation only to show faith and goodwill.

Apathy toward a new encyclopedia was by no means universal. The older generation of social scientists was enthusiastic, and 60 contributors to the earlier *Encyclopaedia* contributed to this one. Such important older social scientists as Edwin G. Boring, Crane Brinton, Carl J. Friedrich, Otto Klineberg, Hans Kohn, Harold D. Lasswell, Margaret Mead, Oskar Morgenstern, Talcott Parsons, Joseph J. Spengler, and Jacob Viner were willing contributors. Among economists of all ages the prestige of the *Encyclopaedia* was high, and their cooperation was generally the easiest to obtain.

A major reason for the general lack of interest in a new encyclopedia was surely the lowered prestige of encyclopedias generally; it seems that a generation ago scholars consulted the *Encyclopedia Britannica* more frequently than they do now, and that for many scholars today an encyclopedia is an expensive set of books containing third-hand material that a salesman tries to persuade them that they must buy if they have the best interests of their children at heart. Moreover, in this age of the computer-generated abstract service, how can an encyclopedia be anything but an outmoded form of publication?

Although these arguments surely have some merit, it is my hope that the *IESS* will partly refute them. The *IESS* will have to speak for itself; all that I can do here is to try to describe the ways in which we tried to make it as widely useful as possible.

Our awareness that the encyclopedia would have to create its own demand led to a number of editorial decisions. An early concern was to try to gauge the audience. Little is known about who uses what kinds of encyclopedias for what purpose. Our typical users, we guessed half jokingly, would be "the American graduate student and the assistant professor at the University of Bombay"—the first because of his need to pass his subject matter doctoral examination and the second because of his limited access to current American and European books and journals. We also guessed that some undergraduates would use the encyclopedia, and that mature scholars would use it to explore alien disciplines. Given the range of potential users, we thought it best not to insist that our contributors aim at a particular intellectual level—we let them suit themselves and the subject, and trusted that the result would in turn suit some segment of the audience.

A related decision was that of having the *IESS* consist entirely of articles written expressly for it. Accordingly, in spite of many pressures upon us to include previously published material, nothing in the *IESS* is reprinted from the earlier *Encyclopaedia* or from any other publication.

We insisted that every article be accompanied by a bibliography, and in some cases we enlarged the bibliographies supplied by the contributors. We also developed an extensive system of cross references to guide readers to related articles.

In the course of editing the *IESS* we used the earlier *Encyclopaedia* extensively as a source of "facts"—dates, the spelling of names, the names of political parties and other organizations, the titles or dates of publication of books—and we inferred that the *IESS* would probably be used for the same purpose. We took some pains, therefore, to verify the facts it contained. And since we thought (and rather hoped) that the *IESS* might be referred to for its use of technical terminology, mathematical symbols, tables, figures, and matters of style generally, we tried to make it a model to be followed in preparing material for publication.

Our expectations of potential uses went even beyond these. One further use was as a readily available compilation of new articles by people on topics that the authors themselves had either created or with which they had become closely identified. Examples are: in anthropology, Ray L. Birdwhistell on kinesics; in economics, Wassily Leontief on input–output analysis; in political science, Harold D. Lasswell on the policy sciences; in psychology, Joseph Wolpe on behavior therapy; in sociology, Robert F. Bales on interaction process analysis; in statistics, Herman Chernoff on decision theory; and, in other fields, Anatol Rapoport on general systems theory, and Thomas S. Kuhn on the history of science.

Finally, we envisioned the *IESS* as being more than a traditional reference book in the sense that it would contain articles on topics that most readers would neither look for nor expect to find in an encyclopedia until word of their existence had been disseminated, articles, that is, on topics which would not appear on a standard list. Examples of articles of this kind are James A. Davis and Ann M. Jacobs on tabular presentation, Erik H. Erikson on psychosocial identity, Lloyd A. Fallers on societal analysis, I. J. Good on statistical fallacies, Nicholas Hobbs on ethical issues in the social sciences, Frederick Mosteller on nonsampling errors, and B. F. Skinner on the design of experimental communities.

Conclusion

Since encyclopedias are potentially useful sources of data for both sociologists of knowledge and historians of science, the basic biases underlying the *IESS* will eventually be revealed. The most that can be said now is that the editors attempted to be eclectic in their choice of topics and contributors. An effort was made to have as many non-American contributors as possible: 32 countries are represented. The majority of the 1505 contributors, however, are from the United States, the British Commonwealth, and 17 European countries.

Although we attempted to be eclectic, such influences as refusals, propinquity, friendship, ignorance, and intellectual prejudice undoubtedly influenced the selection of topics and contributors. A methodological task of the future sociologist of knowledge will be to sort these capricious influences from the more systematic ones that will reveal more clearly the contemporary state of the social sciences.

In the meantime, the editors of the *IESS* have considerable grounds for

satisfaction. In spite of its many shortcomings, the *IESS* represents and summarizes much of the best of the social sciences of the 1960's. The initial doubts were overcome, and editors and contributors were drawn from the group of leaders in the field who had had the greatest hesitation. If we were to do it again we would do many things differently, but we hope that the fact that it was done at all will demonstrate that a scientific encyclopedia can be a relevant publication in the 1960's.

References and Notes

1. J. Watson, *The Double Helix* (Atheneum, New York, 1968).
2. The other members of the Chicago study group were Kingsley Davis (sociology), University of California, Berkeley; Clyde Kluckhohn (anthropology), Harvard University; Lyle H. Lanier (psychology), University of Illinois; Charles McKinley (political science), Reed College; Frederick Mosteller (statistics), Harvard University; Arthur M. Schlesinger, Sr. (history), Harvard University; and Jacob Viner (economics), Princeton University.
3. University of Chicago, *A Study of the Need for a New Cyclopedic Treatment of the Social Sciences* (mimeographed, 25 August 1955).
4. F. X. Sutton, *Amer. Behav. Sci.* **6**, 29 (1962).
5. No full-scale history or analysis of either encyclopedia has yet appeared. The Chicago study group report (*3*) is the most comprehensive single source. Brief accounts are given in Alvin Johnson's autobiography [*Pioneer's Progress* (Viking, New York, 1952)]; by F. X. Sutton (*4*); by D. L. Sills, *Amer. Behav. Sci.* **6**, 31 (1962); and in the "Foreword," "Preface," and "Introduction" to the *IESS*.
6. The executive committee for the *IESS* consisted of Edward Shils, Jeremiah Kaplan, Morris Janowitz, and W. Allen Wallis, chairman.
7. The associate editors for the *IESS* were: Heinz Eulau (political science); Lloyd A. Fallers (anthropology); William H. Kruskal (statistics); Gardner Lindzey (psychology); Albert Rees (economics); Albert J. Reiss, Jr. (sociology); and Edward Shils (social thought). The special editors were: Elinor G. Barber [(biographies) the only special editor who worked in New York as a member of the editorial staff]; John G. Darley (applied psychology); Bert F. Hoselitz (economic development); Clifford T. Morgan (experimental psychology); and Robert H. Strotz (econometrics).
8. The full-time editors for the *IESS* were: Elinor G. Barber (biographies); Marjorie A. Bassett (economics); P. G. Bock (political science); Robert M. Coen (econometrics); J. M. B. Edwards (sociology); David S. Gochman (psychology); George Lowy (bibliographies); J. M. Tanur (statistics); and Judith Treistman (anthropology).
9. The assistant editors for the *IESS* were Donna M. Smith and Barbara J. Westergaard.
10. The totals given are subject to slight recount variability, since there are a few articles that can be counted as either biographical or topical (for example, Fourier and Fourierism).
11. M. G. Kendall and B. B. Smith, *Tables of Random Sampling Numbers* (Cambridge Univ. Press, Cambridge, England, 1939).
12. Rand Corporation, *A Million Random Digits* (Free Press, Glencoe, Ill., 1955).

13. This paper is based upon work performed at Crowell Collier Macmillan, Inc., New York, and was written while I was a 1967–68 fellow at the Center for Advanced Study in the Behavioral Sciences, Stanford, California. I thank the center and staff for the time, perspective, and facilities provided me. Helpful comments on an earlier draft were furnished by B. Barber, E. Barber, B. Berelson, P. G. Bock, H. J. Jerison, W. H. Kruskal, D. G. MacRae, F. Mosteller, E. A. Rubinstein, J. M. Tanur, and W. A. Wallis.

NEWS AND COMMENT

M.I.T.'s March 4: Scientists Discuss Renouncing Military Research

Cambridge, Massachusetts. "March Fourth is a Movement, Not a Day" buttons here proclaim. At many universities, the day of March Fourth was devoted to discussing how the misuse of scientific knowledge endangered man; the "movement" is an attempt to turn researchers away from military work toward socially constructive activities.

M.I.T. is the "mother" of the March 4 activities which spread to approximately 30 universities around the country. The idea was generated at a November conversation between three physics graduate students—Joel Feigenbaum, Alan Chodos, and Ira Rubenzahl—all of whom later played a major role in organizing the March 4 activities at M.I.T. The idea spread from the physics department to graduate students in biology and then began to attract substantial support from faculty members in theoretical physics and other disciplines.

The M.I.T. plan was not publicly revealed until late January (*Science*, 24 January), and professors and students elsewhere had only a few weeks to organize. At the University of Pennsylvania, Provost David Goddard responded to a faculty petition and called off all classes on March 4, to hold discussions. Programs were reported at Cornell, Rockefeller, Columbia, Yale, Stanford, Carnegie-Mellon, Rutgers, Northwestern, Maryland, Minnesota, Colorado, and the University of California at Irvine and Berkeley, among other universities. The M.I.T. organizers tried to get other universities to schedule March 4 activities, but it was necessarily a rather chaotic organizing attempt. "If our embryonic, naive, kooky proposal could generate such a movement, arousing so many important people, just think what a better planned effort might do!" exclaimed one M.I.T. organizer on the afternoon of March 4. However "naive" in origin, March 4 is likely to be one of the best-remembered events concerned with the politics of science and the universities in recent years.

The original statement in support of the March 4 research halt at M.I.T. was signed by 47 senior faculty members. The statement said that the war in Vietnam had shaken the signers' confidence in the ability of the U.S. Government to make wise decisions; that the response of the scientific community to these events had been "hopelessly fragmented"; that the "concerned majority has been on the sidelines and ineffective"; and that "we feel that it is no longer possible to remain uninvolved."

One of the themes developed at the March 4 discussions at M.I.T. was the need for scientists and engineers to concern themselves more with the uses to which their research and knowledge were put. Howard Zinn of Boston University commented that, while professors might take disinterested attitudes toward their work, the outside world was very much interested in what uses it could make of their research. "When you have a disinterested academy in a very interested world, you have disaster," Zinn said.

One of the original faculty backers of March 4, Victor F. Weisskopf, head of M.I.T.'s physics department, quoted a statement of Winston Churchill's: "the Stone Age may return on the gleaming wings of Science." Weisskopf said there was a feeling that scientists don't do enough and are not concerned enough about the effects of science and technology on the physical and social environment. Weisskopf argued that scientists had a responsibility to see that science is used better and to find out "how and why technology went wrong."

Other speakers criticized the ethical neutrality of scientists and engineers. One of the main faculty organizers of