



The History of Science

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THERE ARE A VAST NUMBER OF BIBLIOGRAPHIES of interest to the historian of science. It is the purpose of this paper to deal only with those that catalog the historian's own productions: that is, bibliographies of books and articles *on* the history of science. This limitation excludes the great wealth of bibliographic work devoted to the source materials of science: the retrospective bibliographies of astronomy, chemistry, physics, the bibliographies of the works of individual scientists, the published catalogs of scientific libraries. The number of these is so large that an adequate review of them could not be made within the limits of this paper.

The history of science as an academic discipline is essentially a twentieth century development. Fortunately for present-day historians, one of its founders and prime movers, George Sarton, was a man with a deep and lifelong interest in bibliography. It is to him we owe what is today the most important bibliography of current work in the history of science.

As editor of *Isis, an International Review Devoted to the History of Science and its Cultural Influences*, Sarton published in that journal in March 1913 the first of his critical bibliographies of the history of science, a series that was to number seventy-nine under his editorship and continues annually today, with the ninetieth number citing some 2,750 books and articles. In the beginning, when the literature of the field was relatively small, it was possible to include much material in fields of supplemental interest to historians of science. Since 1953, however, the inclusion of marginal material has been restricted to that which relates directly to the history of science. The bibliography's rather complex classification system, the perfecting of which Sarton worked at with great diligence, has undergone a number of revisions, the most recent being in 1953, when the editorship passed to new hands.¹ The present system utilizes a combination subject and

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chronological approach with the following divisions: (A) general references and tools; (B) science and its history from special points of view; (C) histories of special sciences; (D) chronological classifications. Critical reviews, as the title of the bibliography indicates, are often given for both books and articles. If books are not reviewed in the bibliography, the citation is followed by references to other reviews. The bibliography is presently compiled by a committee which systematically searches the literature of the field, including some one hundred and fifty journals that consistently publish history-of-science articles. The committee is also furnished with citations and off-prints by correspondents and authors of books and articles. While the time lag of citations is perhaps greater than that encountered in quarterly bibliographies, the literature of the history of science is covered by this international index more completely than by any other indexing service available today.

The principal defect of the *Isis* bibliographies has been the lack of a cumulative subject index, a lack which has made necessary frequent tedious searches through the many pages of the bibliographies. The History of Science Society is now sponsoring a bibliography project under the editorship of Magda Whitrow (London) to remedy this lack.² Work is in progress on the first volume of the cumulative bibliography, which will consist of the following parts: personalities, in alphabetical order; institutions and societies, in alphabetical order; chronological periods, containing entries dealing with particular periods and references to entries in the first two sections; an alphabetical index of authors; and an alphabetical index to subjects. Future volumes will cover books and articles dealing with the history of science in general. It will undoubtedly be some time before the whole work is published, but when completed it will be without rival as the major key to the literature of the history of science in the twentieth century.

Next to the *Isis* bibliographies, the most important index to current literature is that published by the Centre National de la Recherche Scientifique de France as section twenty-two of its *Bulletin Signalétique*.³ This has been published since 1952. Like its American counterpart, it is international in scope, but the emphasis is on French materials. It indexes both books and articles, with each citation having a critical and descriptive annotation of some forty to sixty words. Publication is quarterly, with a time lag of about six to nine months for articles and one to two years for books. Classification is in broader subject areas than the *Isis* bibliography, and there are no chronologi-

cal divisions. An annual subject-author index is published to cumulate the quarterly issues. The Centre National de la Recherche Scientifique will supply a microfilm of any of the works listed in the bibliography. Editor of the section is François Russo.

While the bibliography in the *Bulletin Signalétique* is currently the most important supplement to the bibliography in *Isis*, until 1942 the *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften und Technik* was the second major indexing tool. Founded in 1902 by Karl Sudhoff in Hamburg, it was really the first journal to be devoted almost exclusively to an extensive, annotated bibliography of all the literature of the history of science, with annual author and subject indexes. To be sure, the largest part of the bibliography was devoted to the history of medicine; the history of science was subordinate. But nevertheless, during its forty years of publication the *Mitteilungen* managed to catalog most of the German and a good share of the foreign books and articles on the history of science.

The *Mitteilungen* went out of existence in 1942 because of the war, but resumed publication in 1961. As before, the coverage is predominantly German, but it is not limited to German titles. Arrangement is by subject under three main headings: (A) "Allgemeines"; (B) "Medizin"; (C) "Naturwissenschaften und Technik." The medicine section is divided into broad time periods ("klassisches Altertum," "Mittelalter," etc.) as well as subjects, but this is not true of sections A and C, which are arranged by subjects only. Critical annotations are frequent and are often of considerable length, and there is again an author-subject index. Publication, however, has become very irregular, only two issues having appeared since 1961. This is, of course, a serious fault, and unless the *Mitteilungen* can again resume a regular and at least annual publication schedule its usefulness will be greatly impaired.

To fill the gap caused by the war-time death of the *Mitteilungen*, Walter Artelt began publication in 1953 of the *Index zur Geschichte der Medizin, Naturwissenschaft und Technik*.⁴ This is an international bibliography of the considerable amount of literature published between 1945 and 1948. It is arranged in two main sections, "Medizin-historische Bibliographie," and "Naturwissenschaftsgeschichtliche Bibliographie," the former, which is by far the more extensive, subdivided into (A) "Geschichte der Medizin"; (B) "Geschichte der Zahnheilkunde"; (C) "Geschichte der Pharmazie"; the latter into (A) "Geschichte der exakten Wissenschaften und Technik," and (B) "Geschichte der Biologie." Only the "Geschichte-der-Medizin" section has

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a combination of subject and time-period arrangement; the others are classed by subject only. There are neither annotations nor index. A second volume of this work, covering the period 1949 to 1952, has been prepared, but it has not as yet been published.

A new publication of the National Library of Medicine seems likely to become the most important index to current work on the history of medicine. The *Bibliography of the History of Medicine*⁵ will be published annually, the first issue indexing material published since 1964. Every five years a cumulative bibliography will be issued, a great advantage which most other indexes to current work unfortunately lack. The new annual indexes both books and articles, as well as historical sections in symposia and congresses, and chapters in monographs. It is arranged in three parts: (1) Biographies, including works about the medical history of famous people not necessarily connected with medicine; (2) Subjects, with chronological and/or geographical subdivisions; (3) Authors, listing alphabetically by author those citations appearing in parts one and two. The citations are international in scope, and are based primarily on mechanized searching of the extensive holdings of the National Library of Medicine. This bibliography will undoubtedly become an indispensable tool for the historians of medicine.

Before the appearance of the National Library of Medicine's bibliography, the only extensive guide to the literature on the history of medicine being published independently of a journal was the Wellcome Historical Medical Library's *Current Work in the History of Medicine, an International Bibliography*, edited by F. N. L. Poynter. A quarterly index, it began publication in 1954 from the Wellcome Historical Medical Library in London. Excellent as it is, it will now most likely have to take second place to the National Library of Medicine's work, its only major advantage being that it is published quarterly. By far the largest section of this work is a subject index to periodical articles. This is supplemented by a brief author index to the main subject classification, a list of new books on the history of medicine and allied sciences, and a list of addresses of authors. There are no annotations. The bibliography shares with the *Isis* bibliography the serious lack of cumulative indexes. However, the Wellcome Library itself maintains a cumulative index of historical references which may be consulted by visitors to the Library.

A work more limited in that it is confined to the United States and Canada is the index to current literature that has been appearing annually since 1939 in the *Bulletin of the History of Medicine* (Balti-

more, Johns Hopkins Press). This is arranged by subjects and has an author index. There are no annotations. Genevieve Miller has recently edited *A Bibliography of the History of Medicine of the United States and Canada, 1939-1960*,⁶ which is a reissue in consolidated form of the annual bibliographies in the *Bulletin*. This is an enormously useful work of a type that most of the current indexes to historical literature lack. Judson Gilbert has provided a supplement to the *Bulletin's* bibliographies in his *A Bibliography of Articles on the History of American Medicine Compiled from "Writings on American History" 1902-1937*.⁷ This follows the same arrangement as the bibliography in the *Bulletin* and covers the material published in the years (with the exception of 1938) preceding the first annual bibliography in the *Bulletin*. George Griffenhagen's *Bibliography of Papers Published by the American Pharmaceutical Association That Were Presented Before the Association's Section on Historical Pharmacy, 1904-1957*,⁸ while not designed specifically as a supplement to the *Bulletin* bibliography, contains much on the history of pharmacy not included in Gilbert's work or in the *Bulletin*. It is arranged chronologically and has author and subject indexes.

Another source of information on current literature of interest to historians of pharmacy is the section "Le Mouvement Historique" published in each issue of the *Revue d'Histoire de la Pharmacie* (Paris, 1913-). This gives critical reviews of articles as well as books. While the sections in individual issues are not very extensive, the cumulation of them since the journal's beginning in 1913 provides a rich source for materials in this field. It is understood that a cumulative index to them is being prepared.

There are presently two journals that contain indexes to the current literature of the history of agriculture. The American journal *Agricultural History* has published annually since 1953 a list of "Books on Agricultural History" compiled by E. M. Pittenger. This is an unannotated list of books only, arranged alphabetically by author. While it is not confined to American publications, the emphasis is on books published in the United States. The British Agricultural History Society publishes annually in its journal *Agriculture History Review* a "List of Books and Articles on Agrarian History." This also began publication in 1953. Like its American counterpart, it has no annotations, but it does catalog periodical articles. The emphasis is on the history of British agriculture.

In addition to the above mentioned indexes, the U.S. Department

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of Agriculture maintains an unpublished bibliographic index of work in the history of agriculture. It is available for consultation by scholars. Also, Everett Edwards compiled *A Bibliography of the History of Agriculture in the United States*,⁹ which records the publications prior to 1930. This is an annotated catalog, arranged by subjects, with an author-subject index. Finally, Wayne D. Rasmussen's critical survey of the literature, "The Growth of Agricultural History",¹⁰ should be consulted.

In 1964 the journal *Technology and Culture* began publication of a "Current Bibliography in the History of Technology," compiled by the Bibliography Committee of the Society for the History of Technology. It is a result of the failure of the *Isis* bibliographies ever to adequately cover the history of technology. Planned as an annual publication, each issue will index the literature published within a single year, with a time lapse of about a year; that is, the winter 1964 bibliography lists books and articles published in 1962, the 1965 bibliography those published in 1963. The classification is by subject in some fifteen divisions, including general and collected works, documentation, biography, technical societies, transportation, materials, communications, and so on. There are brief annotations, and often indications where reviews may be found. No index was furnished to the first bibliography, but the second one has a cumulative author index to both. Plans have been made to include a subject index also. In its preface to the first bibliography the Committee says that from time to time items of significant interest published at an earlier date will be incorporated in order to increase the usability and coverage of the bibliography.

There was a valuable earlier index to current work on the history of technology published in the *Transactions* of the Newcomen Society for the Study of the History of Engineering and Technology (London). Its "Analytical Bibliography of the History of Engineering and Technology" was published annually from 1921 to 1947. The arrangement was by subject. No cumulative index was published, but there is a reference list of subject headings provided in Volume 10, which serves as a cumulative subject index to the first nine issues. The first three of these bibliographies (in Volumes 2 through 4) indexed only periodical literature, but from Volume 5 on monographs and treatises on the history of technology were included. The bibliographies are not annotated.

The literature of the philosophy of science, like that of the history of technology, has been covered to some extent in the *Isis* bibliography, but the best listing of current materials in this area can be found in *The British Journal for the Philosophy of Science* (Edinburgh and London, 1950-), as its "Recent Publications on the Philosophy of Science." This began as a list of books received for review, but, while it has remained essentially that, it has become quite extensive and includes as well a long list of pertinent articles, arranged in broad subject groups.

The most recent indexing tool of current literature is the bibliography inaugurated in the January 1966 issue of the *Journal of the History of the Behavioral Sciences* (Brandon, Vt., Psychology Press, 1965-). This is an index to current books and articles on the history of anthropology, sociology, psychology, psychiatry, psychoanalysis, philosophy, neurophysiology and related fields. Some of what is recorded here will eventually, I suspect, be duplicated in the *Isis* bibliographies, but the present bibliography will be published twice annually and so will be able to present to its users a more current survey of the literature of interest to them. The bibliography is divided into two parts, articles and books, each arranged alphabetically by author. There is no attempt at subject analysis, nor are there annotations. The first index lists works that appeared in 1964, the second will list 1965 publications, and after that the emphasis will be on current materials. The bibliography is an outgrowth of that which appeared in the *Journal's* predecessor, the *History of the Behavioral Sciences Newsletter*, which was published from July 1960 to December 1964 (New York, Payne Whitney Psychiatric Clinic).

There are a few other more specialized bibliographies that should be mentioned. The journal *Scientiarum Historia* (Antwerp, 1959-) publishes annually a "Bibliografie van de Geschiedenis der Wetenschappen in de Nederlanden," a subject index devoted to materials in various languages that concern the history of science in the Netherlands. The Comité Belge d'Histoire des Sciences (Brussels) began publication in 1946 of its *Notes Bibliographiques*, a bibliography relative to the history of science and technology in Belgium. It is divided into three parts: books, articles, and reviews. *Lychnos* (Stockholm, 1936-), the official journal of the Swedish History of Science Society, includes an annual subject bibliography of books and articles on the history of science in Sweden. In the 1963-1964 issue of *Lychnos*, there is also a valuable subject index to all of the material

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that has appeared in that journal between 1936 and 1962. Finally, the *Notes and Records of the Royal Society of London* (London, 1938-) has published in each issue since 1952 a short bibliography of books and articles dealing with the history of the Royal Society and its Fellows.

An interesting new journal, *History of Science, an Annual Review of Literature, Research and Teaching*, is something of a transitional work between the systematic surveys of current literature described above and the monographic type of bibliography which will be discussed presently. Its first volume was published in 1962 (Cambridge, Eng., W. Heffer). Each issue contains four or five articles which critically survey, with extensive bibliographies and reference citations appended, the recent literature of a limited subject in the history of science, such as Newtonian research, the history of medicine in 1960-1961, histories of scientific societies, new studies on Lavoisier, and so on. There are also extensive essay reviews of recent books, which themselves make considerable reference to current materials.

George Sarton and François Russo, who have been primarily responsible for the two major indexing services of current literature, have also produced the two major guides to the history of science. The best known of these is Sarton's *Horus: A Guide to the History of Science*.¹¹ The bibliographic section, which follows three essays by Sarton on the history science, is by far the largest part of the book. It is divided into four parts: history, which treats books on historical methods, atlases, encyclopedias, biographical collections, etc.; science, which discusses catalogs of scientific literature, general scientific journals, abstracting and review journals, national scientific societies, etc.; history of science, outlined below; and organization of the study and teaching of the history of science, which treats history-of-science organizations, institutes, museums, libraries, international congresses, prizes, etc. The most important section is that on the history of science itself, which is essentially an annotated bibliography of secondary works arranged in three sections: special countries, special cultural groups, and individual sciences. The sections are not mutually exclusive, so that some books are listed in more than one place. Since the work was designed for English students, the great majority of the works cited are in English. English translations of foreign works are indicated where they exist. A long and very useful annotated bibliography of journals and other serials devoted to the history of science is also provided. Like most of Sarton's productions, this work treats also

subjects related to the history of science, such as philosophy, sociology, and psychology. It is, however, weak in the history of technology.

François Russo's *Histoire des Sciences et des Techniques, Bibliographie*¹² in some ways duplicates Sarton's work, with a strong emphasis on French rather than English materials, but there are important areas in which it supplements Sarton. The work is divided into three sections. The first, "Généralités," is a guide to history-of-science societies and institutes, congresses, biographies of historians of science, libraries, museums, periodicals on the history of science, encyclopedias, biographical dictionaries, bibliographies, and general histories. It is in the second section, however, that the work differs fundamentally from Sarton's. This, the longest section of the book, is a bibliography of the major scientific works produced from the beginnings of science to the twentieth century. It is divided into four parts: antiquity; middle ages; sixteenth, seventeenth and eighteenth centuries; and nineteenth and twentieth centuries. Each part contains as its core an alphabetical bibliography of scientists and their major works. Biographies and critical studies are listed after the original works. Russo has also included the history of technology, a field which Sarton left practically untouched. The list is of course highly selective, bibliographical information is scant, and most often, when one is available, a French translation rather than the original edition is listed. The final section of the book is devoted to histories of individual sciences. Most entries throughout the book are given a brief annotation as to their value. A symbol indicating in what French library the item may be located is added to each entry. In 1955, a brief mimeographed supplement was issued.

Another handbook, Walter Artelt's *Einführung in die Medizin-historik*,¹³ is designed as a manual for historians of medicine. The second section of this work is of interest here as it is an annotated guide to the histories, bibliographies, library catalogs, encyclopedias, manuscript sources, and so on, important to the historian of medicine. The bibliography section is especially strong. Emphasis is on German materials.

Louise Malclès' *Les Sources du Travail Bibliographique, Tome III, Bibliographies Spécialisées (Sciences Exactes et Techniques)*,¹⁴ while far from being devoted exclusively to the history of science, nevertheless contains much of interest to the historian of science, in particular in regard to subject bibliographies of the various branches of science. Sarton and Russo catalog perhaps the most important general bibliog-

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raphies, but in their work little attention is paid to the bibliographies of such special subjects as thermodynamics, dyeing, horology, and so on. The first chapter of Malclès' work is concerned with the history of science, but it is very brief and contains little that cannot be found readily in Sarton and Russo. The following chapters, devoted to the individual sciences and their special branches, each begin with a list of the important histories of the subject and end with the bibliographic guides to the subject. In between can be found much information as to the major works in the field, both classic and modern, such as encyclopedias and dictionaries, journals, and current indexing tools. A detailed index to subjects and authors is provided.

Two other interesting and useful handbooks should be mentioned: John Thornton's and R. I. J. Tully's *Scientific Books, Libraries, and Collectors*¹⁵ and John Thornton's *Medical Books, Libraries, and Collectors*.¹⁶ Their chapters on the literature of science and medicine from before the invention of printing to the close of the nineteenth century describe bibliographically the publication of the most important scientific works and are rich with references to the modern biographical, bibliographical and historical studies of them. There are also exceptionally interesting chapters on the historical bibliographies of medicine and science. These are not mere lists, but discussions that indicate the extent of coverage of each work.

Thornton and Tully's chapters on bibliography are of course highly selective. The most important source for information on the retrospective bibliographies of science is Theodore Besterman's monumental *World Bibliography of Bibliographies*.¹⁷ This is arranged by subject. To find all of the bibliographies available on physics, for example, the user must refer not only to physics but also to the special sub-divisions of the science, such as heat, sound, and so on. A note is added as to the number of items each bibliography indexes. The work is limited to separately published bibliographies; nothing published in periodicals is listed.

For bibliographies on the history of science published in periodicals, as well as separately, the *Bibliographic Index*¹⁸ is most helpful. This covers the literature published since 1937. Within the section devoted to a particular branch of science, a subdivision "history" will record bibliographies that catalog works on the history of that science.

There were a number of attempts early in the twentieth century to compile general bibliographies of the history of science but these are all now out of date. The most extensive list was the John Crerar Li-

brary's *List of Books on the History of Science*,¹⁹ with its various supplements. Being a library catalog, it was of course incomplete, but it is still useful today, in spite of Sarton and Russo's handbooks, because it catalogs many minor works, off-prints, speeches, etc., ignored by the more modern works. John Crerar Library also published *A List of Books on the History of Industry and Industrial Arts*,²⁰ and three mimeographed reference lists entitled *Subject Bibliography to Histories of Scientific and Technical Subjects*.²¹ G. K. Hall and Company of Boston has announced the forthcoming publication of the John Crerar Library's card catalog, both subject and author files. This will undoubtedly be a most important work for historians of science, not only for histories and secondary works, but also for source materials in science.

One other older bibliography that should be mentioned is that contained in the "Bibliotheca Historica," "Bibliotheca Biographica," and "Bibliotheca Bibliographica" sections of the catalog of the famous collection of Sir William Osler, *Bibliotheca Osleriana, a Catalogue of Books Illustrating the History of Medicine and Science*.²² This is an annotated list, largely devoted to medicine.

The monumental work of George Sarton, *Introduction to the History of Science*,²³ while intended primarily as a guide to source materials in science through the fourteenth century, contains at the end of the discussions of individual scientists a section of criticism which records a vast amount of historical material, both books and articles. Likewise, Josef Mayerhöfer's *Lexikon der Geschichte der Naturwissenschaften: Biographien, Sachwörter und Bibliographien*,²⁴ an alphabetical encyclopedia of men and subjects important in the history of science, includes at the end of each article a useful bibliography of secondary works on the man or subject treated. This work is still in process of publication.

George Sarton produced, in 1936, *The Study of the History of Mathematics*,²⁵ which, after an introductory essay, is devoted to an excellent bibliographic guide to the subject, with critical chapters on general treatises, handbooks, bibliography, journals, centers of research, and an appendix containing references to biographical material on modern mathematicians. A similar work is Gino Loria's *Guida allo Studio della Storia delle Matematiche*.²⁶ This is an excellent critical discussion and has the advantage of being published ten years after Sarton's work. Lastly, a survey of recent periodical literature was published by Cecil Read in "Articles on the History of Mathematics:

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a Bibliography of Articles Appearing in Six Periodicals.”²⁷ This is a simple listing, with no annotations. The journals indexed are *American Mathematical Monthly*, *Mathematical Gazette*, *Mathematics Teacher*, *National Mathematics Magazine*, *Scripta Mathematica*, and *School Science and Mathematics*.

Robert Forbes has compiled a useful bibliography of the literature on ancient science and technology in his *Bibliographia Antiqua, Philosophia Naturalis*.²⁸ The main volume of the work was published in ten subject parts that listed materials published before 1939. The author has since added two supplements covering books and articles published within the last forty years. There are neither annotations nor author indexes, but it is nevertheless an excellent place to turn for a convenient list of materials on special subjects in the history of technology. Another most interesting guide is currently being published in parts in the journal *Technology and Culture*: Eugene S. Ferguson’s “Contributions to Bibliography in the History of Technology.”²⁹ This is a critical discussion of bibliographies, encyclopedias and handbooks, biographical works, directories, periodicals, guides to government records, early source books, manuscripts, etc. It should be of great help to students and scholars. It is to be hoped that the author will publish it in a more convenient book form.

Thomas J. Higgins’ “A Classified Bibliography of Publications on the History and Development of Electrical Engineering and Electrophysics”³⁰ was also published in parts in a journal. While not annotated, this work brings together a vast number of citations and remains a valuable guide to the literature of a special field. Higgins recently supplemented this work with a bibliography³¹ of the biographical material on electrical engineers and electrophysicists, which is only the most recent in a remarkable series of bibliographies he has published cataloging biographical information on mathematicians;³² chemists;³³ physicists and astronomers;³⁴ engineers, metallurgists and industrialists.³⁵

Finally in the history of technology, the Cooper Union Library’s publication, *A Guide to the Literature on the History of Engineering Available in the Cooper Union Library*,³⁶ should be mentioned. This lists some 665 titles, including a few articles.

The American Institute of the History of Pharmacy has published two guides to the literature of the history of pharmacy. Glenn Sonnedeker’s and Alex Berman’s *Some Bibliographic Aids for Historical Writers in Pharmacy*³⁷ is an annotated list, while *Some Pharmaco-*

*Historical Guidelines to the Literature*³⁸ contains three bibliographic essays: Glenn Sonnedecker's on pharmacy, J. Hampton Hoch's on pharmacognosy, and Wolfgang Schneider's on pharmaceutical chemistry, all of which give critical discussions of the material.

Guides to the literature of the various branches of science, such as those of Ferguson, Higgins and Sonnedecker mentioned above, are really very useful and it is to be hoped there will be more of them. Francis Johnson and Sanford Larkey published an interesting critical essay³⁹ on the literature of the history of Renaissance science in the *Modern Language Quarterly* in 1941. Not as extensive but still useful are George W. White's "Reference Books for History of Geology,"⁴⁰ and Eduard Farber's short critical survey of the various histories of chemistry in his recent article "Historiography of Chemistry,"⁴¹ Claude C. Albritton's "Philosophy of Geology: a Selected Bibliography and Index"⁴² and its two supplements⁴³ contain references to many books and articles of interest to the historian of geology, with emphasis on materials published since 1949. This is an annotated author bibliography, with a detailed subject index. A more specialized bibliography is that of Harry Skallerup, "Bibliography of the Histories of American Academies of Science."⁴⁴

A number of brief lists of the literature of the history of science have been published: Marie Boas Hall's *History of Science*,⁴⁵ Samuel Geiser's *A Brief Short-Title List of Published Works on the History of Science*,⁴⁶ Jean Lindsay's *The Early History of Science, a Short Handlist*,⁴⁷ and R. J. Forbes's *Geschiedenis van Natuurwetenschap en Techniek*⁴⁸ for example. But these are designed essentially as beginning lists for students and are not of great use beyond that.

In summary then, the main indexes to the current literature are the *Isis* bibliographies, the bibliography in the *Bulletin Signalétique*, the new *Bibliography of the History of Medicine*, and the bibliography in the *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*. The first and last of these have been published simultaneously for the greater part of their existence, so in spite of varying emphasis on English, French and German materials there has been and continues to be considerable duplication of effort. Sarton has argued⁴⁹ that this is good, because different annotations give different evaluations. He condemned those who advocate a single international bibliography made as complete as possible because he believed that the effort to be complete is infantile and harmful. It results in the inclusion of much useless material, making that which is of value more dif-

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ficult to find. However, with the rapid proliferation of the literature, it seems inevitable that some such international bibliography, published independently of a journal and probably with the aid of computers, will have to emerge. It would seem logical that the *Isis* bibliography would be the natural parent of such a project. It has certainly become extensive enough and important enough to warrant being published as an independent journal with its own editorial staff. If it were expanded to adequately cover material now being indexed by such bibliographies as those in *Technology and Culture*, *The Journal of the Behavioral Sciences*, and *The British Journal for the Philosophy of Science*, if it were to give over altogether its coverage of medical history to the new *Bibliography of the History of Medicine*, if it were to follow up at regular intervals the enormously important fifty-year cumulation now being prepared, the *Isis* "Critical Bibliography" would soon become the single strong bibliographic guide to current literature (exclusive of medicine) that historians of science definitely need.

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