

# Indexing and Abstracting: Recent Past and Lines of Future Development<sup>1</sup>

*Mr. Clapp is chief assistant librarian, Library of Congress.*

BY THE 1930's, the great push toward comprehensive bibliographical control of periodical and monographic literature, with which the century had commenced, was definitely over, and attention was directed to the basis rather than to the actuality of control. The century had started bravely. There was the *International Catalog of Scientific Literature* which produced 254 volumes in 20 series between 1902 and 1921; the *Concilium Bibliographicum*, perhaps the best known of the card services in science, established in 1890; the publications of the H. W. Wilson Company, 1901+; the *Bibliographie der Deutschen Zeitschriften-Literatur*, 1896+; *Chemical Abstracts*, 1907+; the *Engineering Index*, 1892 and 1907+; the *Universal Catalog* at Brussels, 1895+; etc.

But by the thirties the great push was over. Some of the more monumental attempts had perished; others were struggling for support; still others were flourishing, and even expanding, but there was no longer the same hope or expectation that comprehensive control might shortly be attained. The history of *Biological Abstracts* (1926+) and of *Social Science Abstracts* (1927-1933), as well as the tribulations of the *Index Catalogue of the Surgeon General's Library* and *Index Medicus* would

alone have been sufficient to dampen any ardors in this country. The energies which had previously gone into attempts at comprehensive control were now turned to analysis, to the production of ancillary devices and to "coordination" of existing activities. The end product, the production of bibliographic controls themselves, were left to sporadic initiative, some with support from international organizations, some on a commercial basis, some devised by members of professional associations for their own use, some supplied by institutions with interest or responsibility in a particular subject. There was, however, no attempt at comprehensive organization of bibliographical services; and among the bibliographical services themselves there was no such organization, no interrelation, no coordination, but, on the contrary, duplication, overlapping, gaps, uncontrolled multiplication. In 1931 the second edition of the *Index Bibliographicus* listed 273 current bibliographical services in the field of medicine alone.

The decade before World War II was then a period of exploration of the bases for action, rather than of substantive action itself. On the international plane this preparation is represented by the formation of the International Library Committee in 1927, resulting in the first International Congress on Libraries and Bibliography in Rome in 1929. Almost immediately thereafter (1930) the International Federation of Library Associations was formed, to con-

<sup>1</sup>Paper read at meeting of Serials Round Table, A.L.A. Midwinter Meeting, Chicago, Jan. 27, 1950.

tinue the international congresses at five-year intervals. One other congress met before the war, at Madrid in 1935, and the third is only now being planned. Still on the international plane, the League of Nations responded to requests to establish a center for the coordination of intellectual activities, and the Institute of Intellectual Cooperation was established in Paris in 1926. It had, among other organs, a Library Coordinating Service in its Section of Scientific Relations. This service interested itself in standards of bibliographical work, in the establishment of national information centers; it sponsored the *Index Bibliographicus* of Vorstius and Godet, and issued the *Index Translationum*. Still another international organization girded itself for action. The International Institute of Bibliography which sponsored the Universal Catalog at Brussels in its first meeting in 1895, had become the International Institute of Documentation by 1931. In 1937 it became the International Federation for Documentation, the principal objective of which was to promote, through affiliated national groups, the use of the Universal Decimal Classification.

In England, Samuel C. Bradford, with A. F. C. Pollard, founded the British Society for International Bibliography in 1927. Bradford himself became keeper of the Science Library in South Kensington and promptly installed the U.D.C., creating an immense catalog of scientific periodical articles arranged according to this classification, by clipping author abstracts whenever possible from the journals of original publication.<sup>2</sup> This catalog has recently been described as a "white elephant."<sup>3</sup> Throughout the 30's and until his death in 1948, Bradford was active in analysis and discus-

sion of the bases for comprehensive bibliographical control, with full realization that the unit of scientific communication is, for the most part, the periodical article. His bibliography on bibliographical subjects, recently published by Miss Ditmas,<sup>4</sup> must be used by anyone interested in the subject of bibliographical control. His calculation, obtained with the help of Ernest Lancaster-Jones, of the quantity of scientific publication (estimated at 750,000 articles per annum) and of the amount of this publication covered by abstracting journals (ca. 250,000 articles annually abstracted on the average of three times each, resulting in a total of ca. 750,000 abstracts; meanwhile, ca. 500,000 articles not abstracted at all)<sup>5</sup> is frequently quoted; and his "Law of Scattering" recently reduced to a logarithmic curve, has expressed in mathematical terms a phenomenon of common observation.<sup>6</sup>

In the United States a similar situation obtained. The Bibliography Committee of the A.L.A. conducted a vigorous existence, under the chairmanship of Ernest Cushing Richardson, into the thirties. But the problems of periodicals required more specific attention than the Bibliography Committee could give, and in 1929 the A.L.A. Council authorized the creation of the Periodicals Section, whose name was changed in 1938 to the Serials Section. In spite of the existence of the section, the Executive Board authorized the creation of a Periodicals Committee in 1936. The work of the Periodicals (later Serials) Section in indexing and abstracting is well known. Its Committee on Indexing and Abstracting published still-valuable surveys in the field;<sup>7</sup>

<sup>4</sup> Ditmas, *op. cit.*, p. 172-174.

<sup>5</sup> Bradford, S. C., "The Extent to Which Scientific and Technical Literature is Covered by Present Abstracting and Indexing Periodicals." In *Report of Proceedings*, (Association of Special Libraries and Information Bureaux), 14:59-71, 1937.

<sup>6</sup> Vickery, B. C., "Bradford's Law of Scattering." *Journal of Documentation*, 4:198-203, 1949.

<sup>7</sup> A.L.A. Serials Section. Committee on Indexes

<sup>2</sup> Ditmas, E. M. R., "Dr. S. C. Bradford." *Journal of Documentation*, 4:169-74, 1948-49.

<sup>3</sup> Urquhart, D. J., (Department of Scientific and Industrial Research, London) L. S. to L. H. Evans, Dec. 19, 1949.

in 1937 it proposed the creation of a joint committee to study the problem; in January 1938 the Executive Board created a Joint Committee on Indexing and Abstracting in the Major Fields of Research "to formulate a plan for the study and solution of the most pressing problems connected with the publication of indexing and abstracting services covering the literature of the several scientific, humanistic, social science, learned, professional, and business fields; and, if financial support can be obtained, to carry out the plan." Nine other associations were invited to participate in the work of the joint committee; it is interesting after the event, to note that neither the American Association for the Advancement of Science, the International Federation of Library Associations, nor the Special Libraries Association ever appointed a member. The joint committee worked for eight years; it would appear that all of its substantive work was done by its A.L.A. representative; though it was never able to secure funds for its support, it produced some still-useful studies;<sup>8</sup> it eventually produced a plan for bibliographical control which was published in its final report.<sup>9</sup>

It was there proposed that the United States Government, acting through learned bodies and libraries, should undertake the preparation of a general indexing and abstracting program which would be financed by groups already operating bibliographical services, by associations benefiting from the use of such services, and by government subsidies. The producing unit should be operated at, but not necessarily by, the Library of Congress. The resultant indexing and

abstracting service would consolidate or supersede all those currently appearing and provide uniform and complete coverage in all subject fields in accordance with a schedule which included indexes to the various classes of publications, special aids such as poetry and play indexes, and abstracting services prepared by discipline. But this proposal was not accompanied by an estimate of cost, and it fell on deaf ears.

Meanwhile, the war had swept away the great German bibliographical services; it had in one way or another added to the burdens of services everywhere; it had increased the amount of publication in the surviving countries; and it had brought to the fore a new form of publication—the research report reproduced by mimeograph or otherwise from typed copy. At the same time it had stimulated research and whetted appetites for information which would not be satisfied with existing mechanisms; and it had made many members of the groups which had not participated in the work of the joint committee keenly aware, at last, of the problems of bibliographical control.

The noises of war had hardly died away when the cries for improved bibliographical control began to arise. Mrs. Cowles' report for the joint committee, though in a sense completing the work of the thirties, was actually made after the end of hostilities. At just about the same time Dr. Vannevar Bush's well known report, *Science, the Endless Frontier*, made proposals very similar to those of Mrs. Cowles.<sup>10</sup> These, however, were stimulated by the recent experience of the war, as, too, were the proposals made to Unesco at its preliminary conferences in London in 1945 and 1946<sup>11</sup> when the representatives

and Abstracting Services. "Tabular Analyses of 550 Titles in the Field of Periodicals Indexing and Abstracting." *Library Journal*, 64:354-57, 1939.

"Preliminary Survey of Indexes and Abstracting Services, with Special Emphasis on the Fields of Industrial Arts and Chemistry." *Library Journal*, 63:265-71, 1938.

<sup>8</sup> Produced in the form of mimeographed circular letters: No. 1, Feb. 21, 1942; No. 2, May 1, 1943.

<sup>9</sup> *A.L.A. Bulletin*, 39:370-71, 426-27, Oct. 15, 1945.

<sup>10</sup> U. S. Office of Scientific Research and Development, *Science, the Endless Frontier. A Report to the President by Vannevar Bush, Director*. Washington, Government Printing Office, 1945, p. 120.

<sup>11</sup> Preparatory Commission for Unesco (Fifth Session, London, 1946). *Progress Report on the Programme of the United Nations Educational, Scientific and Cultural*

of many disciplines made almost unanimous demands for services which would enable them to ascertain what was going on in their fields of activity, by means of bibliographies, indexes and abstracts.

Here in the United States we have seen since the war the development of much activity in or relating to this field. One of the earliest acts of President Truman was to provide for the establishment of the Publication Board which, through the Office of Technical Services in the Department of Commerce, has abstracted and indexed a great mass of the research reports in separate form which resulted from wartime inquiry, both domestic and foreign.<sup>12</sup> Among other bibliographical devices for the control of the newborn separate research report may be mentioned the bibliographical services of the Central Air Documents Office at Wright Field, the *Technical Information Pilot* produced for the Office of Naval Research by the Library of Congress, and *Nuclear Physics Abstracts* issued by the Atomic Energy Commission. Nor have services of the more usual types been wanting, though their production has in more than one instance been made possible by the application of new techniques (a point I want to emphasize)—the *Bibliography of Agriculture*, the *Monthly List of Russian Accessions*, the *Current List of Medical Literature*, the *Bibliography of Periodical Literature on the Near and Middle East*—representing attempts by individual institutions to meet currently some of the most pressing indexing problems which come to their attention. All these are additional instances of multiplication of bibliographical services, and made no contribution to coordination or integration.

There have, however, been activities at

Organization. Unesco/Prep. Com./51, London, July 3, 1946).

<sup>12</sup> U. S. Publication Board. *Bibliography of Scientific and Industrial Reports*. Washington, U. S. Department of Commerce, Jan. 11, 1946+. Weekly, later monthly.

the planning level—attempts to analyze and if possible to rationalize the situation with a view to closing the gaps once and for all and for bringing order among the existing services.

The problems of subject bibliography, including indexing and abstracting, were, for example, considered at the Princeton Conference on International Educational, Cultural and Scientific Exchanges in the fall of 1946. This conference was called to consider library programs which might be recommended to Unesco, as well as U.S. action in relation to such programs, and the preliminary memoranda, prepared by Edwin E. Williams and Ruth V. Noble, which have since been published, remain excellent summaries of previous action and proposals in these fields. In bibliographic matters the Conference made a number of specific recommendations to various bodies, chiefly dealing with the completion of the U.S. and other national bibliographies, but in the field of indexing and abstracting the Conference merely called attention to the need for "greater international cooperation."<sup>13</sup>

An outstanding example of the continuing focusing of interest upon problems of documentation is provided by the American Chemical Society in which a special Division of Chemical Literature has been formed to provide a forum for those interested in the problems relating to the publication, translation, classification, coding and machine handling of scientific information.

A very precise inquiry has been the one conducted by the American Institute of Physics under a contract with the Office of Naval Research into requirements of indexing and abstracting services by American physicists, and the adequacy of the services

<sup>13</sup> *Conference on International Cultural, Educational, and Scientific Exchanges* (Princeton, Nov. 25-26, 1946). Preliminary Memoranda by Edwin E. Williams [and] Ruth V. Noble. Recommendations Adopted, Summary of Discussion. Chicago, American Library Association, 1947, p. xvi.

now available to them.<sup>14</sup> This study began in the early fall of 1948 and its final report is now being written. It has made some pertinent findings, which must be taken into consideration in any planning of indexing and abstracting services. It was found, among other things, that American physicists rate wide coverage and promptness as more important than the preparation of abstracts by experts and the issuance of extensive indexes; that about 900 journals carry material of interest to physicists; that in the principal physics abstracting journal the abstracts follow original publication with an average lag of four months unless it exceeds a year; that 47 per cent of the articles abstracted in *Physics Abstracts* during the first six months of 1948 were also abstracted in *Chemical Abstracts*.<sup>15</sup>

More recently, the Graduate Library School and the Division of the Social Sciences of the University of Chicago have undertaken a study to ascertain the possible bases for bibliographic services in the field of the social sciences. The final report of the survey has recently been published. It recommends increased collaboration and integration of existing services now serving the social sciences and the creation of two new services in the social sciences field—one of bibliographical reviews and one of selective abstracts.<sup>16</sup>

During this same period the Army Medical Library has been re-examining its bibliographical procedures. One immediate result has been the construction of the new medical book classification Class "W". One of the library's principal problems, however, has

been to make a decision regarding the *Index Catalogue of the Surgeon General's Library*, commenced in 1880, now in its 59th volume, but with a backlog of a million and a half entries and ever-increasing arrearages. Although coordination between the *Quarterly Cumulative Index Medicus* and the *Index Catalogue* was attempted back in the thirties, this coordination did not work out, and the two publications have each since pursued its way, the one covering the literature currently, the other providing more nearly comprehensive coverage, but at an interval. The Army Medical Library also publishes, however, for the current literature, the *Current List of Medical Literature*, which is essentially a transcript of the tables of contents of some 1800 journals. To advise the library with respect to these indexing problems the Surgeon General of the Army appointed in 1948 a Consultative Committee on the Medical Indexes published by the Army Medical Library. In response to the committee's desire for an agency to dig out facts, to experiment with methods and to investigate particular problems, the Surgeon General has also contracted with the Johns Hopkins University for the conduct of a research project in the subject of medical indexing. This project, under the direction of the librarian of the Welch Medical Library, Dr. Sanford V. Larkey, has made inquiries into the use of medical indexes and abstracting services by medical scientists, it has commenced studies of medical subject headings and of scope and coverage of various indexing and abstracting services, and it has some experiments with punched cards well under way.

Certain other useful experimentation in procedures in connection with indexing and abstracting media have been performed by the Department of Agriculture Library, the Central Air Documents Center at Wright Field and the Library of Congress.

<sup>14</sup> Bray, R. S. "The Physics Abstracting Study of the American Institute of Physics." *Special Libraries*, 40:248-50, 1949.

<sup>15</sup> American Institute of Physics. "Physics Abstracting Study." Mimeographed reports and memoranda. AIP/45: PR-13, Appendix, Oct. 1, 1949; AIP/45: M-9, Jan. 11, 1949; AIP/45: M-16, Oct. 27, 1949.

<sup>16</sup> Bibliographical Services in the Social Sciences; a Report to the Carnegie Corporation by the Graduate Library School and the Division of the Social Sciences at the University of Chicago, September 1949. (Mimeographed).

The technique of photolithography from printed cards or slips, first used extensively by the Edwards Brothers for the 163-volume *Catalog of Library of Congress Printed Cards* has since been adopted by the *Library of Congress Cumulative Catalog*, the *Monthly List of Russian Accessions*, the *Technical Information Pilot*, the *Bibliography of Agriculture, Biological Abstracts*, etc. Photographic improvements of this technique, which make the mounting of the cards or slips unnecessary, have been perfected at Edwards Brothers. At the Library of Congress, also, printer's copy for a subject heading list has been prepared on electric typewriters controlled by a set of punched cards which could be mechanically sorted and interfiled for new editions;<sup>17</sup> and the use of this technique for future editions of the *Union List of Serials* is currently being considered.<sup>18</sup> At the Central Air Documents Office abstracts have been issued on transparent sheets which permit the recipient to make his own cards photographically.<sup>19</sup>

Abroad, the most significant action on the indexing and abstracting problem has been taken in Great Britain by the Royal Society, which has taken leadership in the matters of bibliographic control of scientific literature ever since 1867 when (at the suggestion of Joseph Henry, the first secretary of the Smithsonian Institution) it commenced publication of its *Catalogue of Scientific Papers*. In the summer of 1948 the society convened an empire-wide Conference of Scientific Information at which American observers were invited to be present and which discussed the whole range of scientific communication from the problems of initial publication to

those of documentation services.<sup>20</sup> For this conference much useful information was gathered, and the recommendations of the conference were passed on to constituent groups. For example, the (British) Library Association has since been working, as the result of one set of these recommendations, on a plan for the division of subject responsibility among libraries with a view, similar to that of the Farmington Plan, of making Britain self-contained in the matter of research literature.<sup>21</sup> At this conference, also, was presented Professor Bernal's plan for central coordinated publication of scientific papers in the form of separates, a plan which, if adopted, would undoubtedly greatly influence the form and organization of indexing and abstracting services and which has recently been echoed in Bruce L. Smith's report on the possibilities of a social science abstracting service.<sup>22</sup>

The work of the Royal Society Conference has been continued by the society's Committee on Scientific Information which has in turn sponsored a Committee on Abstracting Services. The main committee has considered the problems of a universal classification (with the tentative conclusion that none such is possible);<sup>23</sup> it has recommended, in order to promote and reduce the costs of the abstracting process, the use of "synopses" (these are abstracts, possibly prepared by the author of the articles abstracted, but in any case subjected to the same editorial scrutiny as the article itself

<sup>20</sup> The Royal Society Scientific Information Conference, June 21-July 2, 1948. *Reports and Papers Submitted*. London, The Society, 1948.

<sup>21</sup> Library Association. Library Research Committee. Working Party on Library and Information Services (Royal Society Scientific Information Conference Recommendations). "Report on the Co-operative Provision of Books, Periodicals and Related Material in Libraries." *Library of Congress Information Bulletin*, Nov. 8-14, 1949, Appendix.

<sup>22</sup> Bernal, J. D. "Provisional Scheme for Central Distribution of Scientific Publications." *Royal Society (op. cit., note 19)* p. 253-58. Cf. Smith, B. L., "Proposals for Unified Bibliographic and Reporting Systems for the Social Sciences." [Chicago, 1949.] Mimeographed p. 22-25.

<sup>23</sup> The Royal Society (London). Information Services Committee. Classification Panel: Interim Report (IS/82 (49)) [1949].

<sup>17</sup> [U.S.] Library of Congress. Science and Technology Project. "List of Subject Headings," Washington, 1949. Reproduced from typed copy. For method of preparation of copy see p. xv.

<sup>18</sup> Keller, A. H. "A Plan for the Development of a Union Catalog of Serials by Punched Card Methods," Washington, Library of Congress, 1950. Reproduced from typed copy.

<sup>19</sup> The Air Technical Index issued by C.A.D.O. consists of translucent sheets each containing six 3 x 5 inch forms filled in with bibliographic data, abstract, etc., describing a research report.

and published with it);<sup>24</sup> and it has also made recommendations regarding copyright in scientific journals in order to facilitate copying.<sup>25</sup> Besides this, the committee has stimulated the formation of an Abstracting Services Committee, one of whose first jobs has been to compile a list of the 127 science abstracting services currently published in Great Britain.<sup>26</sup>

At the international level, the problems of indexing and abstracting have had fairly continuous attention since the war. The recommendations made to Unesco by representatives of its member states in 1945 and 1946 have already been mentioned. When, in the autumn of 1946, it was learned that two rival medical abstracting services (*World Abstracts of Medicine* in England, and *Excerpta Medica* in the Netherlands) were preparing to enter the same field, Unesco called a meeting which resulted in the formation of the Coordinating Committee on Medical and Biological Abstracting. This committee has interested itself in reduction of duplication and increase of cooperation between services, and in the creation of basic tools, such as lists of periodicals and of abstracting services, which would contribute to the efficiency of all medical and biological indexing and abstracting media.<sup>27</sup>

Unesco's next step was in the direction of science indexing and abstracting, generally. A proposal, initially made by a group of experts convened to advise on the program for an international meeting, that a new international body should be formed called ICOSA or International Coordinating Office for Science Abstracts, was laid before

an International Conference on Science Abstracting and Indexing in Paris last June.<sup>28</sup> Prior to this conference the National Research Council of the U.S. called a meeting to discuss the subject, and the proposed ICOSA was unanimously rejected on grounds of being quite without prospect of the necessary financial support, and on the further grounds that the first thing for the United States to do was to put its own bibliographical house in order.<sup>29</sup> However, at the conference itself it was found that the other principal countries were of the same mind with the National Research Council, and the creation of ICOSA never really received serious consideration. Instead, the formation of national committees was recommended, each to seek order within its own jurisdiction in cooperation with other national committees, with the international scientific unions and with Unesco.<sup>30</sup> (The National Research Council now has before it a proposal for the formation of just such a committee.) The International Conference, which had before it a report from the International Federation for Documentation listing over 1000 existing indexing and abstracting services,<sup>31</sup> also recommended some basic palliative measures—the use of “synopses,” the development of union catalogs and union lists, the issuance of lists of periodicals and of the indexing and abstracting services which cover them, the study of classification, coding, terminology and translating, the development of cooperative arrangements between services, the study of a unified physics abstracting service, and the like.

Concurrently, Unesco has been conducting an inquiry into the possibilities of im-

<sup>24</sup> ———, Guide for the Preparation of Synopses (IS/42/SEC, 12 April 1949).

<sup>25</sup> The Royal Society (London). *Declaration of Fair Dealing in Regard to Copying from Scientific Periodicals*. London, The Society, 1949.

<sup>26</sup> The Royal Society (London) Abstracting Services Committee. *A List of Periodicals and Bulletins Containing Abstracts Published in Great Britain*. London, The Society, 1949.

<sup>27</sup> Unesco. Interim Coordinating Committee on Medical and Biological Abstracting (Second Session, Paris, 1949). Resolutions Adopted (NS/SAMB/5, Annex 1, Paris, May 26, 1949).

<sup>28</sup> Grivet, T. “Present State of Science Abstracting and Possible Improvements.” (Unesco/NS/SAC/1, Paris, April 15, 1949), p. 70-74.

<sup>29</sup> International Conference on Science Abstracting (Paris, June 20-25, 1949). U. S. Delegation, Report. Washington, 1949, p. 5.

<sup>30</sup> ———, “Final Act.” (Unesco/NS/SAC/27, Paris, Aug. 1, 1949, Res. 7-9.

<sup>31</sup> International Federation for Documentation (The Hague). *List of Current Abstracting and Indexing Services*. The Hague, The Federation, 1949.

proved documentation in the social sciences, has commissioned a number of reports on this subject, and has convened a meeting of experts. It has recently, also, convoked a meeting of users of abstracts of physics and a study group on engineering documentation.<sup>32</sup>

Unesco's next major step, however, has been and still is in the field of bibliographic control generally. For two years it has had a contract with the Library of Congress. The first year's work was spent in a study in a particular field of Unesco's interest, namely fundamental education, which resulted in Mrs. Murra's report on the sources of bibliographical information in this field.<sup>33</sup> The result of the second year's work is a study of the present state of bibliographic services and of the possibilities for their improvement.<sup>34</sup> This is shortly to be published and is expected by Unesco to be used immediately as a working paper for the Third International Congress on Libraries and Bibliography which is being planned by the International Federation of Library Associations and the International Federation for Documentation.

Having participated in the preparation of the last-named report, I can affirm that it makes no startling discoveries. I trust that it will be found to have the merit of providing, in a form suitable for discussion, an outline which embraces most if not all of the points which inevitably arise in the circular discussions which ordinarily revolve about bibliographical problems. But this is

<sup>32</sup> Unesco, Committee of Experts on Documentation in the Social Sciences. "[Reports and Documents]" Unesco/SS/AB/[various numbers], Paris, 1949.  
"Meeting of Users of Abstracts of Physics." (Dec. 19-20, 1949): [Reports and Documents] Unesco/NS/SL/Conf. 4/[various numbers], Paris, 1949-50.

"Study Group on Engineering Documentation." (Dec. 15-16, 1949): [Reports and Documents] Unesco/NS/SA/[various numbers], Paris, 1949-50.

<sup>33</sup> Murra, K. O. "Sources of Information for Fundamental Education with Special Reference to Education for Literacy: a Preliminary Report." Washington: Library of Congress, 1948. Mimeographed.

<sup>34</sup> Unesco/LC Bibliographical Survey. *Bibliographical Services: Their Present State and Possibilities of Improvement*. Washington: Library of Congress, in press.

the most that can be claimed for it. Its finding can be briefly compressed; I shall say nothing of its recommendations here.

The first point I would make is that librarians, though their profession is with books and with the making and using of bibliographies, are fundamentally ignorant of the nature of bibliography. What precise standards do we have, for example, for adequacy in bibliography? Can we, on demand, supply specifications of the best arrangements for particular purposes? Can we tell when to use a classified, when a dictionary arrangement, or when another form? Can we say what the relation of these forms is to cost or preparation, to efficiency of use, to coordination between bibliographies, to the control of materials in different fields of study, to studies of varying degrees of specialization, or to further bibliographical work which may in turn be dependent upon bibliographies? Can a bibliography at the same time attempt to be "comprehensive" and yet serve the purposes of "selectivity" to those who require the latter, or must there be separate "comprehensive" and "selective" bibliographies? When is the establishment of a separate bibliographic service for a subdivision of a field justified? What constitutes justifiable duplication and overlapping? How should a comprehensive bibliographical service be organized ideally—by subject, by discipline, by language? Is a universal classification applicable to a division of fields between bibliographical services? What is the rôle of subject headings in bibliographical analysis? Is a terminology interchangeable between disciplines possible? What constitutes adequate national bibliographical service? Must everything be indexed? What may or should be omitted? What should be the priorities in bibliographical work? Where should one begin in a scheme of rationalization? Specifically, in the field of periodical indexing, is it true (as



Bradford held) that "periodical literature must be abstracted by source, and not by subject, as hitherto"?<sup>35</sup> I submit that, in common with the rest of the world who make and use bibliographies, librarians can at best give no more than illumined opinions in response to any of these questions.

In the second place, I believe it is to be worth noticing that all bibliographical activities, even more than the original publications which they describe, depend upon mechanical devices. This is for the simple reason that *arrangement* is essential and for arrangement devices are required. A disordered list of bibliographical notes could hardly be called a bibliography; it is necessary that the notes be put into a systematic order, and that requires that the author use slips of paper, or cards, or some other device. The various devices which have been used can be classified in accordance as they serve to provide the initial record of bibliographical information, an intermediate record, or the final record; but the same device may, under varying circumstances, serve in all three capacities. Thus, a catalog card may provide the initial record, while a catalog of such cards may serve either as the final record or merely as the intermediary arrangement preliminary to reproduction in book form. Among the devices which have been put to the uses of bibliography in these capacities are:

Slips of paper or other writing materials (stelae, glyphs, shards, cuneiform tablets, papyri, parchments, etc.).

Books, including their various forms (scrolls, codexes, pamphlets, periodicals, broadsides, etc.).

Catalog cards.

Pages printed on one side, suitable for clipping and filing.

Pages printed in card form, perforated for separation and filing.

Microcards, containing not only the bibliographic description of a publication, but also

<sup>35</sup> Bradford, S. C. "Sources of Information on Specific Subjects." *Engineering*, 137:85-86, 1934.

its text.

Stereotype plates, mats or flongs.

Addressograph plates and stencils.

Linotype slugs.

Reproduction proofs.

Photographic transparencies, individually, in groups, or in sequences adaptable to selection and reproduction by photoelectric servomechanisms.

Punched cards and tapes; magnetic tapes, wires and drums—similarly designed for treatment (sorting, interfiling, selection, enumeration, reproduction, etc.) by servomechanisms.

It is probable that every one of these devices with the exception of stereotype plates, has current use in bibliographical work, and some with very remarkable effect. The use of linotype slugs by the H. W. Wilson Company is an example. The card catalog, made possible by the catalog card, still provides advantages not superseded by more recent devices such as punched card and film selectors—it is indefinitely expandable while still making possible the almost instantaneous narrowing down of a search to a preselected group of items without the necessity for first examining every card in the catalog.

The truth is, however, that in view of the task to be done, all of these devices as now developed are quite inadequate. The book catalog with its pasted slip inserts which was used through the nineteenth century (and even into the twentieth by some libraries) could hardly cope with the flood of information even in book form. C. C. Jewett's suggestion, just 100 years ago, for a union catalog of stereotype plates, from which individual library catalogs might be published, might have worked if the plates hadn't warped. The printed catalog card from a source of central cataloging information has come nearer to solving the bibliographic problem than anything else—but its success has been more signal in the field of books than of periodical articles. The latter, the typical form of communication of the nineteenth and twentieth centuries, are

actually at the heart of the bibliographical problem today, and purely library techniques have contributed little to its solution. If any one of our great libraries made a complete card catalog of all the periodical articles in its collection it would require a catalog building instead of a catalog room. The remark is obvious, then, that we need a new mechanical device for bibliographic work—a device more flexible, more capacious, more speedy, more accurate and cheaper to operate, than anything we have as yet. To feed such a mechanism we need standardization of terminology and subject headings, of form of entry, of classification perhaps, and cooperative indexing and abstracting way beyond anything we now know, which would make it possible for us all to throw the results of our bibliographic work into one pool from which we all could fish. The question of translation also enters here. We cannot remain dependent upon slow human translation involving constant recourse to dictionaries. Dictionaries can be coded into computing machines and translation will, I am confident, become in large part if not wholly mechanized.

Nor have we, as librarians, as bibliographers, succeeded in rationalizing, even for the purposes of a work-day philosophy, the function of bibliography itself. What we call bibliography consists essentially of lists of works, though in these lists we permit analysis and annotation. We refuse the name bibliography, however, to the index of a book, though it analyzes the book. But we all know that it is the proper names, the actual words of a title, the terms, the formulas, the musical themes, the concepts, which are the *terminus ad quem* to which bibliographic analysis is a very rough approximation. Why then, refuse the name or the procedures of bibliography to the analytic index? Suppose our new mechanical device—it isn't invented yet, so we

may as well draft its specifications—suppose our device were to be so flexible and capacious that it would hold the entire indexes of books as well as the two or three subject headings under which we ordinarily analyze these books? And supposing the whole mass of information were so organized that the inquirer could find a series of volumes when he wanted that, or a periodical article when he wanted that, or a page in a book if all he wanted was the source of a particular minute piece of information. We would then almost have H. G. Wells' world dictionary. The feeding of such a machine would be an activity in which every bibliographer in the world would participate; the service from the machine would be a matter of drawing off information for particular purposes at particular intervals in accordance with prescribed methods.

All this may be a fantastic dream. But certainly nothing could be more fantastic than our present situation; a situation in which thousands of catalogers, indexers and abstracters in every library, newspaper office, documentation center, abstracting and indexing service and book publisher's office all over the world contribute to disorganized, heterogeneous, unrationalized, duplicating, unduly expensive, gapping, and inefficient complex of services (remember the 273 services in the field of medicine alone in 1931) which hasn't caught up with the nineteenth century let alone reached the twentieth. As librarians, we must discover that our trade is bibliography, and take responsibility accordingly. In this discipline we must employ not only our own talents, but all the talents, inventions and technical knowledge of the age. Either that, or the job of bibliography will go to others and may—possibly—get done worse there. Or else (my final alternative) we and the rapidly accelerating age will stay, bibliographically, a century or even more behind.