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SPECIAL LIBRARIES

FEBRUARY 1962, VOL. 53, NO.

Using a Collator in an Inverted Index . . . A Manual and Machine-Based Index for Reports . . . Textile Literature Review . . . Daily Library Newspaper . . . Washington, D. C. in 1962

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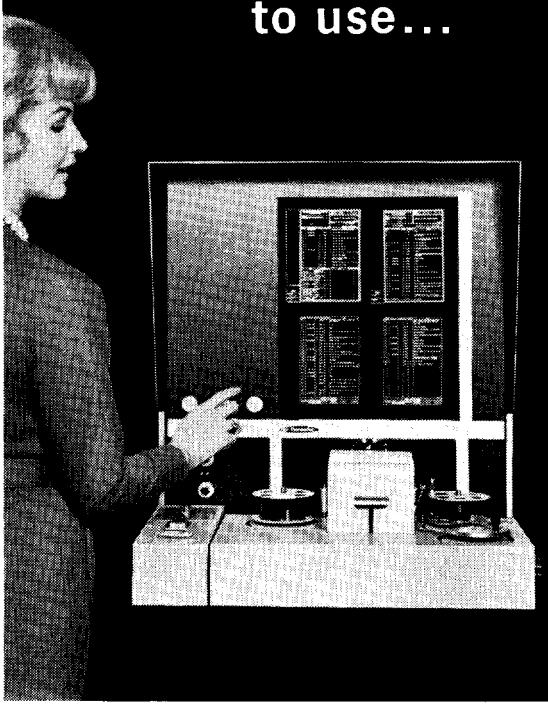

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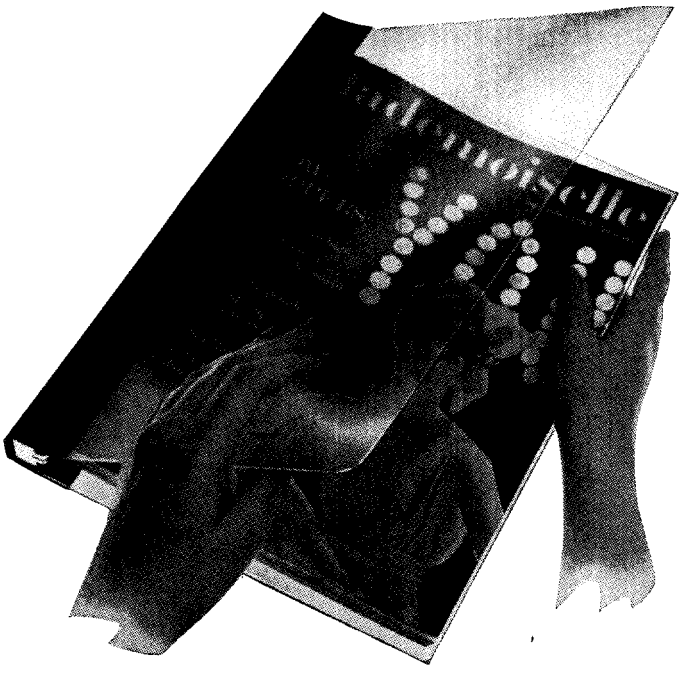

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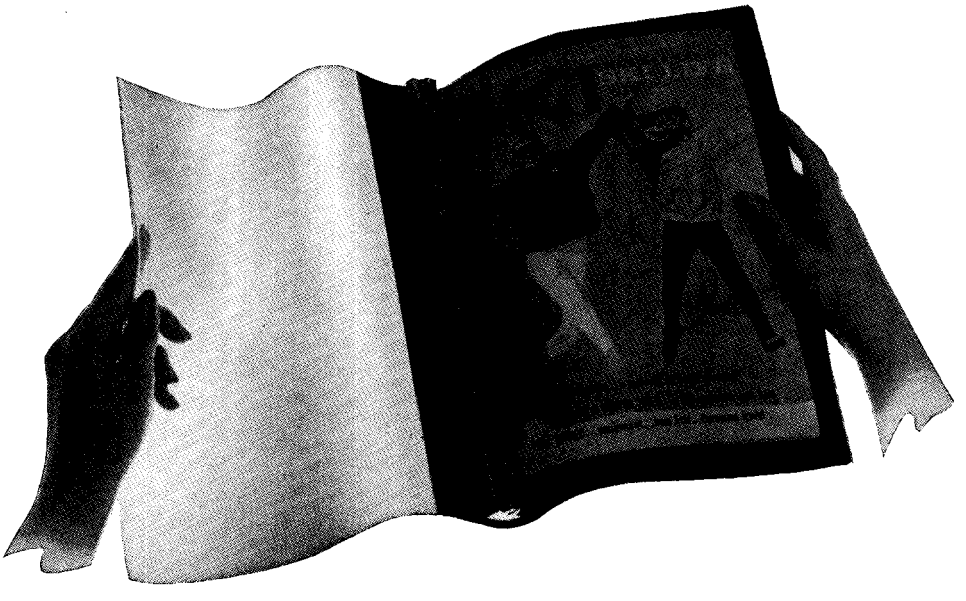

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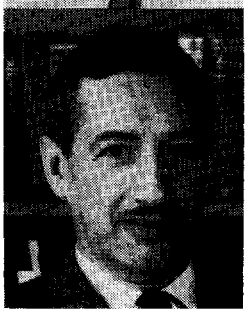
Librarian, ASD and Research Library, IBM Corp., San Jose, Calif.—brings a varied background in college, government and army libraries. She is president of the San Francisco Bay Region Chapter of the Special Libraries Assn.



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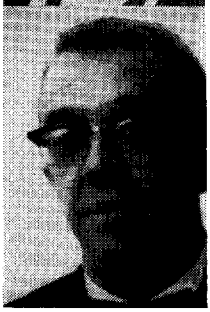
Dean of the School of Library Services, Atlanta University—was a teacher and a catalog librarian before joining the staff at Atlanta. Appointed Dean in 1945, she's also been active in the ALA, serving two terms as a Council Member.

Hannis S. Smith

Director of Libraries, Minnesota State Dept. of Education. He received his library degree in 1949, was Public Library Consultant, Wisconsin Free Library Commission and held several other administrative posts before his present position. He's been editor of *Minnesota Libraries* since 1956.



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SPECIAL LIBRARIES

Official Journal
Special Libraries Association

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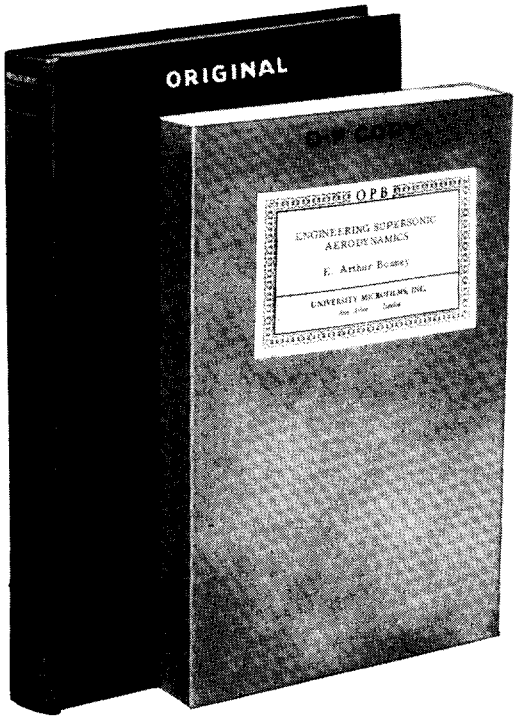

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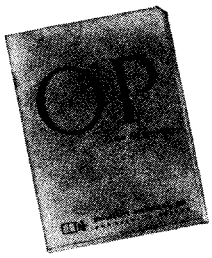

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The Use of a Collator In an Inverted File Index

DR. FRED R. WHALEY, Tonawanda Research Laboratory
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LIBRARIANS ARE QUITE familiar with conventional subject indexes of two types, the printed page index and the card catalog. Given a document file consisting of company reports numbered serially, either type of subject index could have subject headings arranged alphabetically, and each entry would be followed by the identifying number of the document.

Entries like the following could be found in either a printed page index (each entry a line) or a card catalog (each entry a card):

Silica, preparation from silicon tetrachloride	5416
Silica, preparation of silicon tetrachloride from	4729
Silicon tetrachloride, preparation from silica	4729
Silicon tetrachloride, preparation of silica from	5416

The first two entries illustrate opposite concepts using subject headings that contain the same key words, but the contents are distinguished by the judicious use of commas and connectives like "of" and "from." The second two entries are cross references using a different key word as the approach to the concept of each document.

The printed page index is easier to use than a card catalog, but the card catalog can be maintained up to date without frequent reissues and is cumulative. The two types are quite closely related. In fact the unit entries for a printed page index usually consist originally of cards analogous to those in a catalog. The organic growth of the card file is frozen at intervals to print out an index for convenience.

Presented in part before the Documentation and Science-Technology Divisions, May 31, 1961, at the 52nd Annual Convention of Special Libraries Association in San Francisco.

Building an index (conventional or nonconventional) comprises: *1)* analyzing documents in the light of an organization of terminology, subject headings or classification schemes, and recording these observations on a work sheet; and *2)* manipulating the information on the work sheet into an index.

For technical fields the analytical phase requires persons well trained in the subject matter, unless a very shallow index is sufficient. The manipulative phase may require specialized training in machines from typewriters to computers but does not require training in the technical field of the indexed documents.

The use of an index for retrieval is analogous to the building of an index because it requires an analytical and a manipulative phase. The inquiry must be analyzed and formulated in the light of the index language (the organization of terminology). This requires an individual with a knowledge of the subject field, and as the organization of terminology gets more complex, he also needs experience and know-how in building an index in order to use it to the best advantage. A properly formulated inquiry then has to be processed (manipulated). The same individual may carry out both phases of retrieval. However, some or all of the operations required for the manipulative phase may be carried out more economically by machines run by persons having skills different from those required of a document analyst.

Nonconventional Indexes, Analytical Phase

When an index deviates from the techniques and procedures that characterize either the analytical or manipulative phases of the printed page index or the library card catalog, it is by common consent called a non-

conventional index.[1] The most important departure from conventionality in the analytical phase is in the organization of the subject material of the field to be indexed. Instead of either subject headings or elements in a classification scheme, the subject matter is frequently broken down into terms (compositions, properties, processes, etc.). For example, the subject heading, "Silicon tetrachloride, preparation from silica," could be replaced by the terms, silicon tetrachloride, prepare, and silica. In many cases the terms are replaced in the system's memory by codes representing the terms. In these cases a code dictionary or term file is necessary to lead from the alphabetical term listing to the corresponding term code.

The use of the conjunction of terms has led to the expressions, "concept coordination" or "coordinate" index, to distinguish from conventional (subordinate) indexes, where terms are subordinated to other terms in a subject heading or a classification. Since a set of terms can be combined with each other in many ways to characterize different documents, the number of terms required for a given set of documents is less than the number of subject headings (in the conventional sense) required. This is because subject headings are frequently recombinations of terms previously used in parts of other subject headings.

The advantage of conciseness of coordinated terms as opposed to subject headings is partially offset by a loss of discrimination due to losing the connectives in the subject heading. In processing an inquiry on how to prepare silicon tetrachloride from silica, for example, a search for the conjunction of the terms "silicon tetrachloride," "prepare" and "silica" would yield the desired reference, 4729, but would also yield an unwanted reference, 5416, on the preparation of silica from silicon tetrachloride.

This type of "noise" or "cross talk" (extraneous retrieval) can be avoided in a coordinate index by the use of role codes appended to a term or its code. Roles show the context or syntactical relations between terms. For example, the code 5 appended to the term code of silicon tetrachloride could show that it is the object of a preparation.

The principal use of roles, therefore, is to re-establish in the system's memory the syntax that was lost when subordination through connectives was supplanted by concept coordination. One might well ask, why abandon the comfortable, homey connectives of a conventional index for the unfamiliar concept of roles? The answer lies in anticipating the next phase of indexing, the manipulative phase. The present state of the art does not encourage complex subject headings (including connectives) with mechanized storage and retrieval systems for information. In spite of many false starts, mechanized indexing is here to stay. The principle of appending role codes establishes grammatical structure in the memory system of an index, whose storage units are terms (key concepts as fragments of a subject heading) rather than conventional subject headings complete with connectives. A term with a role appended may be called a structerm in accordance with the analogy to grammatical structure. Roles' use is discussed by Perry and Kent,[2] Costello,[3] Whaley[4, 5, 6] and Holm.[14]

Figure 1 shows schematically the association of pertinent terms with appropriate documents. The terminology of the system is organized, and the terms or their codes are entered in order as column headings (schematically represented by capital letters). The target of the indexing act is the document file, and this must be organized into discrete units, that is, document groups, single documents or parts of documents based on subject content (items, links, etc.). Codes for these discrete units in the document file are represented schematically as numbers, which serve as row headings in Figure 1. An entry in the grid at the intersection of a row and column shows that a particular term is associated with a particular item. The grid is open-ended with respect to both terms and documents. New terms (columns) may be added as needed, and there must be capacity for new documents or items (rows). Terms may include role codes, giving structerms, for greater discrimination.

Indexing Depth

Locating a specified piece of information in a file by means of an index may be con-

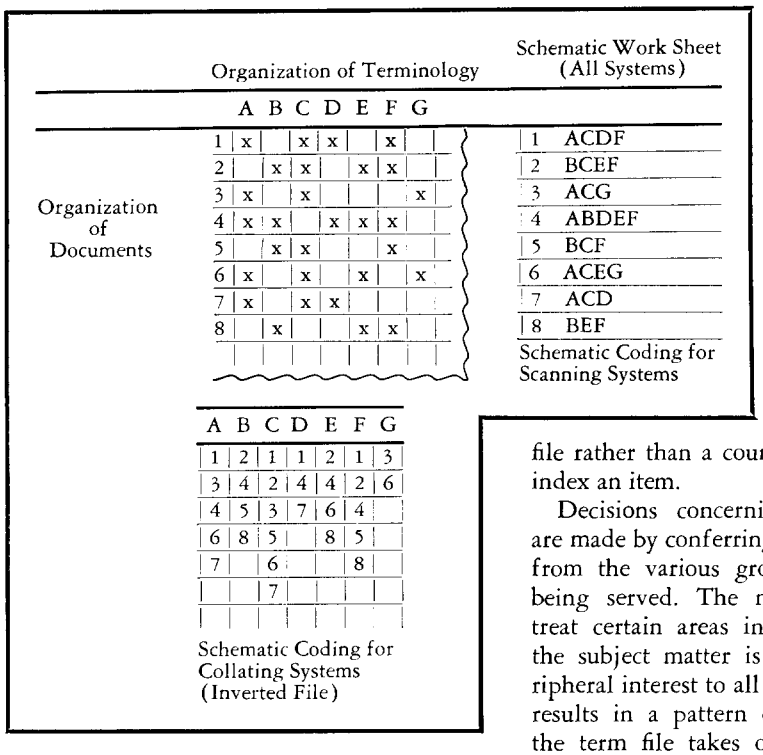

Figure 1: Indexing (Schematic)

sidered somewhat analogous to locating a particular pattern in the field of a microscope. The depth of an index, its resolving power, is increased when a decision is made to split a concept into more specific concepts, each with a separate term number. For example, in addition to a term for hydrogen, terms may be added for deuterium, tritium and the various diatomic combinations of these. Conversely, the depth of an index is decreased when it is decided that certain specific terms can be avoided or eliminated by the use of a single, more generic term. For example, rather than having separate terms for various types of chromatography, one can include them under a single term.

Sometimes it is assumed that depth is solely dependent on the number of terms used to index an item. This is an oversimplification. A report on tritium could be indexed under hydrogen and isotope but would be more deeply indexed under the single term tritium, since this would have higher resolving power than the conjunction of hydrogen and isotope. Thus depth is primarily dependent on the organization of the term file rather than a count of the terms used to index an item.

Decisions concerning the proper depth are made by conferring with advisers selected from the various groups of technical men being served. The natural tendency is to treat certain areas in a shallow manner if the subject matter is of no more than peripheral interest to all groups concerned. This results in a pattern of varying depth, and the term file takes on a depth profile dependent on the areas of work going on. Interest areas of considerable depth have to be organized to handle generic as well as specific questions.

The appending of role codes to term codes is a powerful tool to increase the depth of an index. Although the most important aspect of depth is the resolving power of the term file, there is another important aspect of depth independent of the term file. This is the fineness of division of the report file, the target of the indexing operation. If the term file is highly resolved but the document organization quite coarse, i.e., long reports indexed as a whole, the advent of cross talk is quite high. This is because too many terms are coordinated together during the indexing step.

For example, a report may describe several chemical reactions:

(1) $A + B \longrightarrow C$
(2) $D + E \longrightarrow F + G$
(3) $H \longrightarrow J + K$

If the corresponding term codes are all assigned to the same document code, this refer-

ence will be erroneously retrieved when someone wants the reaction of A with E or preparation of C starting with H. This trouble exists even when roles are used to distinguish reactants from products. To minimize this type of cross talk, the indexable material in the above example is divided into three items or links. This principle is further discussed by Costello[3] and Whaley.[4]

In general the fineness of division of the indexable material has to match the fineness of division of the terms used in characterizing the indexable material. Where indexing by broad generic terms is sufficient, the indexable unit may be the document as a whole, even for long documents. Where a portion of the term file of higher resolving power is necessary for satisfactory distinction between concepts, the indexable unit must be correspondingly smaller, either a very short document or individual items within a document or within parts of a document.

Thus the document analyst, faced with a mass of printed matter, must first recognize the indexable material and the proper terms and roles to best express the concepts involved. He then must decide on the optimum number of items needed to give the surest retrieval while minimizing cross talk.

Nonconventional Indexing, Manipulative Phase

Since items are examined one at a time, the course of indexing occurs across a given row (Figure 1) observing and recording on a work sheet the terms pertinent to the item. This analytical step is repeated item by item (row by row) resulting in work sheets shown schematically at the right, where each item has associated with it all the terms pertinent to it. If these work sheets are kept in order by item number, they give an abbreviated table of contents of the document file. If one knows in advance an item number of interest, he can find immediately from this list which terms were deemed pertinent. Such a list, however useful, is not a subject index, since the inquirer must examine each entry in the list for terms of interest to him. A subject index is generally agreed to be a device that enables an inquirer to avoid looking at every entry in a list for the subject of interest.

One way to transform the observations on the work sheet into an index is to code the information directly from the work sheet onto cards or tape, so that a machine or a needle can scan the card or tape file hunting for the code of a particular term. If it is necessary to have two terms in conjunction (concept coordination), the cards selected on the first pass can be given a second pass for the second required term, or a higher priced machine can select in one pass only the cards with both required terms.

One may pause to reflect on a curious fact here. No one would put the label "index" on a file (not in order by subject) that must be perused from beginning to end by a human being seeking index terms of interest. However, if the file can be treated in some way—marginal punch, internal punch, magnetic spots, photographic spots, and so on—so that needles or machines can recognize the terms of interest, the file is now generally agreed to be an index, even though the machine must look at every unit in the file. Such an index is by general agreement included in the expression, "nonconventional index."

Another way to transform the observations on the work sheet into an index is to have a unit in the memory system for each term and post under it the codes for all items for which this term is pertinent. This is shown schematically at the bottom of Figure 1. Since the work sheet observations cannot be entered directly but must be rearranged under term headings, this is called an inverted file. Since entries in both normal and inverted file are derived from the same column-row intersections in the grid, no indexing power has been lost or gained by the inversion. Each column now represents a unit in the inverted file, and these units can be maintained in order based on the organization of terminology.

Retrieval based on a single term requires no manipulation other than recording the item codes listed under the appropriate term. Up to this point the cards in a conventional library card catalog are a perfect example of an inverted file. Conjunction or logical prod-

uct of two terms such as C and E is obtained by matching (collating) the two columns of item numbers listed under C and E, giving items 2 and 6 as the only item numbers that are in both columns. At this point the library card catalog file may become cumbersome, and devices may be introduced to make such item matching easier. Such devices transform the file into a nonconventional index by common usage of the expression.

Whether the file unit in the system's memory comprises a single card, a deck of cards, a portion of tape, film, drum or disc, as long as the document (or item) numbers associated with a particular term are all kept together in a unit defined by the term and these units maintained in order by term, or its code, the system is a collating or inverted file system. The distinct advantage of such a system is that only a small portion of the system's memory device (for example, a card file) is used on each retrieval question, as opposed to the complete file scan required of a normal file or scanning system.

One important point to note in planning the construction of an index is that the analytical and manipulative phases are relatively independent of each other (within certain limiting conditions). That is, the work sheets resulting from the completion of the analytical phase can be processed into an index by either of the two main types of manipulative systems (normal file or inverted file), which in turn can be implemented in various ways: manual, punched card, tape, film, computer. Conversely, a given manipulative system can accommodate any number of analytical systems (different term organizations from a variety of subject areas or disciplines). The only manipulative variant barred by definition is a manual scanning system. The latter devices are called "tables of contents" rather than indexes. Manual collating and machine variants of both collating and scanning systems are in use in various document centers throughout the United States.[1]

The balance of this report deals with inexpensive variants of collating systems for the manipulative phase of indexing. A review of variants of both scanning and collating systems is covered elsewhere.[6]

Collating Systems, The Ordered File

There are two very popular types of collating systems in which the collating of document numbers may be done manually. One is the Batten "peek-a-boo" type where each document is assigned a particular punch position in the body of each term card.[1 (p. 11, 26), 7, 8] The position assigned to a given document is punched only on the term cards that characterize the document. Conjunction between two terms is obtained by putting the two term cards in register against a contrasting background and observing which document positions were punched in both cards.

The other type involves Taube's Uniterm cards, where a special manner of posting document numbers on the card allows for rapid visual matching of document numbers between cards.[1 (p. 4, 6, 9, 28), 9]

Another collating system was developed by Peakes, the Unit Card system, whereby each time an item is characterized by a term, a separate IBM card is punched to identify both the item and the term.[1 (p. 39), 10] The cards are kept in decks of the same term number, and the decks in order by term number. For conjunction of two terms, the decks for the respective terms are sorted in order together by item number and visually collated to obtain the required conjunction.

The collating systems discussed above are capable of performing conjunction, the operation of logical product or intersection, that is, locating items where terms A and B are both found, expressed as A·B. Many questions, however, do not require all the pertinent terms to be in an item; some may be in the relation of logical alternation. For example, an inquiry on adsorption of any one of the normal hydrocarbons C_2 up to C_7, on any one of three designated adsorbents could be expressed: $(A + B + C + D + E + F)(G + H + J)$.

The first group of terms represents the respective hydrocarbons and the second group the respective adsorbents. Terms connected by plus signs are in an alternate relation to each other; any one or more of them will serve the purpose. With apologies to purists in the field, this relationship is aptly called logical sum. The logical expression above

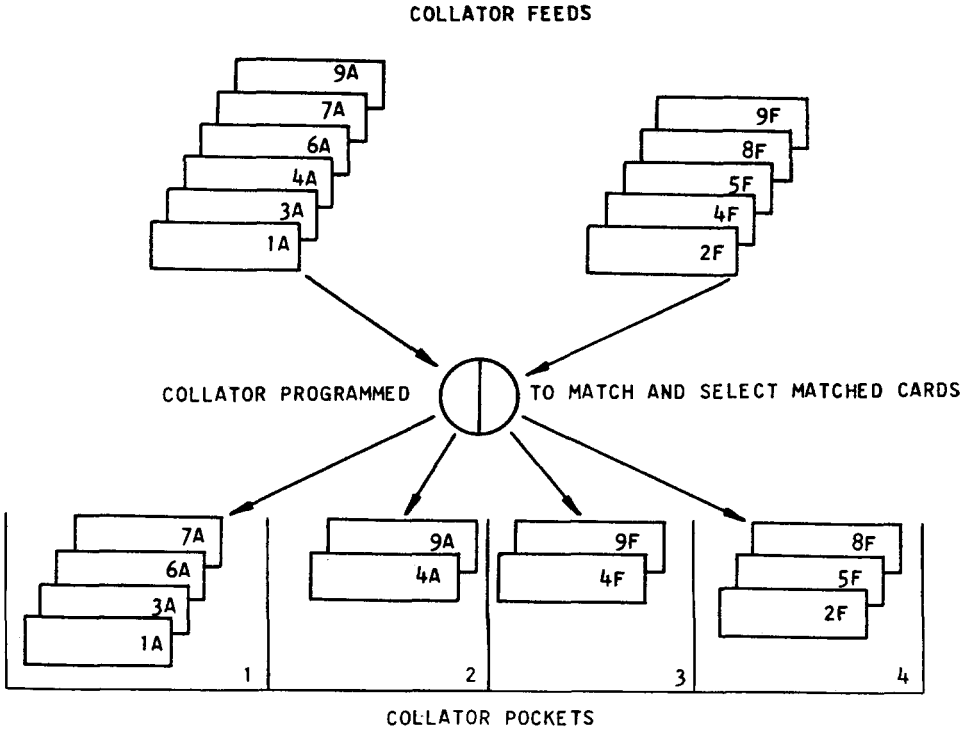

Figure 2: Treatment for Logical Expression, A · F

can also be expressed as the sum of a series of logical products, AG + AH + AJ + BG + BH + . . . etc. (in this example, 18 products). When expressed this way it can be handled by either the Batten, Taube or Peakes system as multiple questions but not as a single matching step as the original logical expression shows. This is because none of the collating systems thus far mentioned allow for the implementation of logical sum.

Linde's system[1 (p. 22), 4, 5] is an extension of the Peakes collating system. The addition of another inexpensive machine, the IBM 077 collator, allows not only greater speed and accuracy in matching numbers but also allows the implementation of both logical product and logical sum in a simple manner.

The use of a collator in retrieval for logical product is shown schematically in Figure 2. Each card has two essential codes (letter representing term, and number representing document). A typical question could be the preparation of chemical A from chemical F. The cards are stored in order by term number, and for the logical product A·F, the A and F decks are removed from the file, and each sorted in order by document number and placed respectively in the two feeds of a collator. If all four collator pockets are used, at the completion of the pass, the outside pockets will contain unmatched cards from each deck, and the inside pockets will contain cards with matched document numbers. Several variations in handling the collator output are possible here, for example, *1)* only one matched group need be separated out, i.e., cards 4A and 9A in pocket 2, letting the other feed deck emerge intact in pocket 4, or *2)* both matched decks may be merged together, giving a temporary output deck of 4A, 4F, 9A and 9F in pocket 2.

A typical question involving logical sum could be: the preparation of A starting with either F or H. For the logical expression A(F + H), the first step is to obtain the logical sum of F + H as shown in Figure 3. Here the two decks are merged into a temporary deck in pocket 2 representing their logical sum. The second step (Figure 4) is

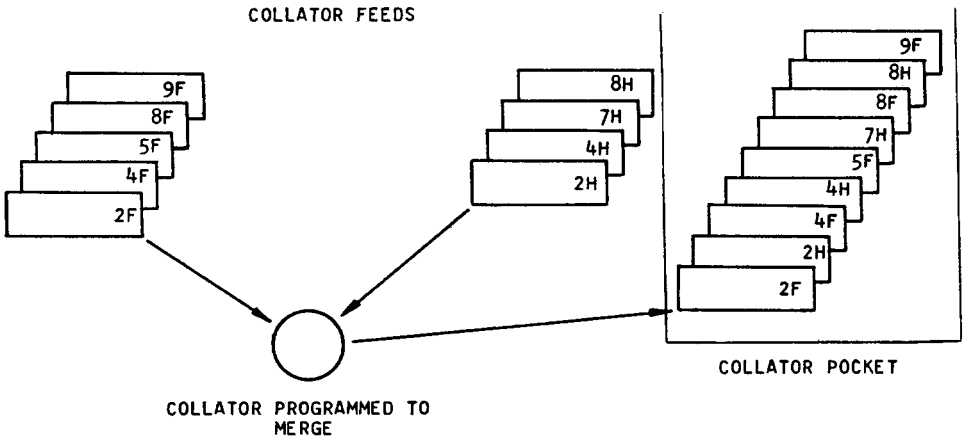

Figure 3: Treatment for Logical Expression, A(F + H), Part I: Logical Sum, (F + H)

the matching of the above temporary deck with deck A, just as in Figure 2. Numerous variations in handling the collator output are again applicable.

If conjunction of more than two decks is required, such as the preparation of A from F, using catalyst H (A·F·H), the matched output from collating any two of them is in turn collated against the third. The same principle applies where some or all of the matched decks are themselves the result of a logical sum step as in Figure 3.

Where the number of cards involved are few (as in the schematic examples), the matching can be done visually giving available answers in less than a minute. The collator is actually needed only when a large number of cards require manipulation, but even then it is faster than a complete search through an entire file. The final matched

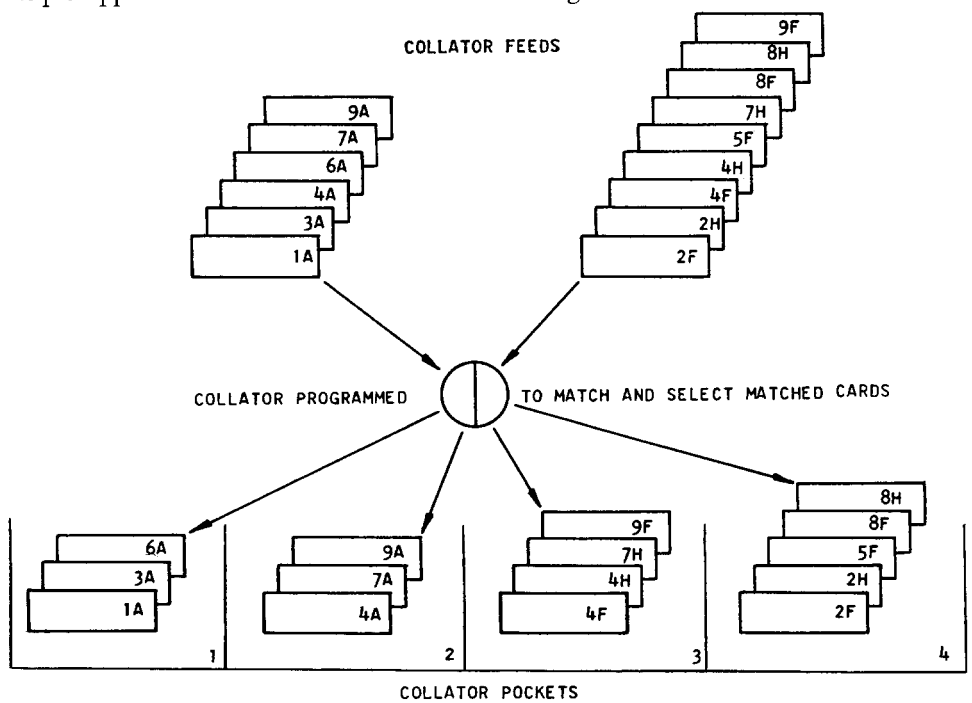

Figure 4: Treatment for Logical Expression, A(F + H), Part II: Logical Product, A × (F + H)

cards from the last collator step show the documents that comprise the answer to the inquiry. Linde's system contains one further step (not discussed here), which eliminates matches at the document level that do not also match at the item level and which shows the part of a document that contains the answer.[4, 5]

To process by Linde's system the inquiry concerning any of six hydrocarbons adsorbed on any of three adsorbents, the respective term decks are removed from the file. The six terms for the hydrocarbons are all combined and merged together by document number, and the same is done to the three terms for adsorbents, thus implementing the two logical sum steps and generating a single deck representing the generic class of chemicals, Q, and another representing the class of adsorbents, R, both determined by the inquiry. The inquiry now reduces to the logical product, Q·R, which is matched as usual. Note that both Q and R are temporary class terms generated by the inquiry. It is impossible to have built into the system all such class terms that might be generated by inquiries. Some inquiries generate temporary class terms comprising hundreds of chemicals. Without a system capable of handling logical sum easily, such questions cannot be answered and hence never get asked.

Even if certain classes are used enough to warrant permanent inclusion in the file, we find it less cumbersome to direct the retriever to the proper specific terms through the term organization than to enter all possible generic levels on the work sheet, especially since a given term may be part of many different generic classes. Hence, there is no ready substitute for easy implementing of logical sum, except to index more shallowly. In the example there could be a term for hydrocarbons, X, and one for adsorbents, Y, leaving only the logical product step, X·Y, but it would contain considerable material retrieved on chemicals or adsorbents outside the interest of the inquirer.

Some machine collating systems involve more sophisticated machines than the IBM collator. For example, the IBM 9900, Special Index Analyzer,[1 (p. 14)] punches paper tape from the cards fed in and matches and merges the tape to give logical product and logical sum as desired, except that logical sum is obtained in a rather cumbersome fashion. The IBM Ramac is being used for internal storage of units for a collating system.[11, 12, 13]

Summary

A subject index to a document file is defined as a device that enables an inquirer to avoid perusing every item in the file, or a listing of such items, in search of documentary sources dealing with a particular subject.

Building and maintaining a subject index requires an analytical phase and a manipulative phase. The analytical phase involves organizing the terminology of the subject field into a vocabulary of terms, which may be considered the building blocks of subject headings, or of a classification scheme, and analyzing documents in the light of this organization. The manipulative phase transforms the observations of the analysts into an index. Similarly, retrieval requires an analysis and formulation of the inquiry according to the index vocabulary, or terminology of the subject field, followed by a manipulative step to identify the documents bearing on the inquiry.

The analytical phase of nonconventional indexes generally show a trend away from complex subject headings or rigid classification schemes and toward more flexible terms used in conjunction. For greater depth and discrimination, two analytical devices are employed: *1)* roles to show terms in context, and *2)* finer subdivision of the document into items or links dependent on subject content.

The manipulative phase usually takes one of two directions with numerous possible variants in each case. Where the terms associated with each given document are stored together in a unit for each respective document (whether or not these units are kept in order by document identification), the system is a scanning or normal file system. Where the documents associated with each given term are stored together in a unit for each respective term and these term units kept in order by term (or its code), the

system is a collating or inverted file system.

All conventional indexes are of the inverted file type, and nonconventional indexes are of both types. The use of a collator in an inverted file index is about the least expensive machine variant of either type for deep indexing.

Although examples from the field of chemistry have been given, the collator method of implementing an inverted file system is applicable to any discipline or field of interest. When a combination of depth requirements and file size make a manual system unwieldy, slow and unreliable, a collator system is economically advantageous. The required machines rent for around $300 per month, and one and one-half clerical personnel can process the output of five document analysts, according to the experience at Linde Company.

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Library of the Future Takes Shape

Plans are progressing for an automated Library of the Future at the Century 21 World's Fair in Seattle. Library 21 will show the potential for the future of electronics and information technology on methods of storing, retrieving and communicating knowledge. The exhibit will feature a prototype of a core library.

Dr. Irving Lieberman, Chairman of ALA's Advisory Committee of the Library of the Future, announced a $82,593 contract from the United States Office of Education to the University of Washington's School of Librarianship for a special training program for outstanding professional librarians of the United States to staff the exhibit. There will be six one-week courses for 72 librarians from public, academic, school and special libraries, who will serve in groups of 12 each month for the six months of the Fair. The first course will start about April 16, 1962.

The training will cover advanced library techniques, the structure of the library exhibit and the philosophy and fundamentals associated with the newer educational media, printed materials and the equipment that will be featured at the Fair. The courses will be directed by Robert Hayes, Advanced Systems Information Company, Los Angeles. Professional librarians interested in applying should write immediately to the Local Program Director, Gordon P. Martin, Library 21 Exhibit, Seattle Public Library, Seattle 3.

The Development of a Combination Manual and Machine-Based Index to Research and Engineering Reports

DR. GERALD JAHODA, Technical Information Division
Esso Research and Engineering Company, Linden, New Jersey

THE FUNCTIONS of Esso Research and Engineering Company's Reports Group, one of the units of the company's Technical Information Division, are to collect, provide an index to, conduct or assist in conducting searches of the internal reports literature and provide copies of internal reports. About 1,600 reports written by scientists and engineers of the Esso Research and Engineering Company and other affiliated companies of Standard Oil Company (N. J.) are added to the reports collection each year.

Types and Uses of Indexes

The types of requests received by the Reports Group are given below, along with the types of indexes that appear most suitable to answer these requests.

TYPES OF REQUESTS	TYPES OF INDEXES
Report by code	Collection arranged by code—no index required
Report by author	Author index
Report by title	Index to titles, shallow subject index, permuted title index
General background information for company work on subject	Shallow subject index
Information *in* report on:	
Specific subject, i.e., additive in product	Alphabetic subject index
Generic subject, i.e., use of a group of catalysts	Classed index
"Coordinate" subject, i.e., effect of part of chemical such as functional group on its properties	Coordinate index

Paper presented before the Documentation and Science-Technology Division, May 31, 1961, at the 52nd Annual Special Libraries Association Convention in San Francisco.

At the time the Reports Group's operations were studied, reports were filed by code, and a printed alphabetico-classed subject index with an author index was issued yearly. Thus, requests by code, author or titles and requests for general background on a subject presented no problem with the existing index and arrangement of reports. However, the alphabetico-classed index, a hybrid between an alphabetic subject index and a classed index, was difficult to use for some types of questions. Cases in point were specific questions that required access points more specific than the headings used. Difficulties were also encountered by the technical men in following the hierarchy established by the indexer. A coordinate type of question, namely a question which required as its access point the combined or coordinate use of two or more parts of existing index headings, was also difficult to answer with the alphabetico-classed index.

This theoretical argument was borne out in practice: the alphabetico-classed index was not used very much by the final users of the information, the individual research men. If all questions were to be handled through the Reports Group, this would not be a disadvantage. It was our opinion, however, that a subject index to company reports should be readily available to the technical man—at his desk, if possible, and easy to use. The technical man's personal contact with the index should be encouraged as one way to stimulate

more extensive use of the internal reports literature.

The search for a new index, or a combination of indexes as it turned out to be, was on. It was begun with an analysis of 281 subject requests that had actually been posed to the Reports Group. About two-thirds of these questions could be answered with a relatively shallow index, namely, an index to titles and to major parts of reports. One-third of the questions required an index of greater depth, a sufficiently large portion to warrant construction of a deep index.

About three-fourths of all the questions were specific; that is, specific terms or concepts were required as access points to the index. About half the remaining questions could best be answered with a classified index, the other half with a coordinate index. A decision was made to develop a coordinate index and to supplement it with an alphabetic subject index. The reasons were *1)* it was thought easier to build a coordinate index to answer questions intended for a classified index than vice versa; *2)* the publication of a simple alphabetic subject index intended only for answering specific questions was made practical by backing up this index with a coordinate index; and *3)* it was anticipated that the percentage of questions that would be answered with the coordinate index would greatly increase when users become acquainted with its possibilities.

Development of Coordinate Index

A number of questions have to be answered before a coordinate index for a particular subject area can be developed. These questions can be answered from a review of the literature on the subject, from an analysis of the organization's information needs, from small-scale experiments and, last but not least, a number of educated guesses. When this project was started in late 1957, we were influenced by Mooers' work on coordinate indexing, particularly his use of a small number (about 300) of arbitrarily defined generic indexing terms called descriptors, which were grouped into a small number of subject categories.[1] The IBM 101 Electronic Statistical Sorter was selected as the machine to be used because of its flexibility, its relatively low cost, its use in other indexing installations and again, last but not least, its availability to us for test purposes.

In order to test the adequacy of this type of index and its cost of preparation, a small-scale experiment was set up. The published rather than the internal reports literature was selected for this first experiment because a similar problem of difficult access existed and because the availability of abstracts of published documents made this a simpler experiment to design and execute. The published literature on lubricants was selected, and the users' needs for information on this subject were determined by reviewing literature searches on lubricants conducted by the staff of the Technical Information Division and by discussing present and anticipated needs with the company's lubricant experts.

A list of descriptors (indexing terms) was compiled from existing conventional indexes, reference books and from suggestions by the company's subject experts. This was broken down into a small number of subject categories. Abstracts of the journal articles or patents were used to represent the documents in this experiment.

Rules for indexing consisted of instructions on what and how to index. Indexable information included: *1)* composition of lubricant and lubricant additives; *2)* use of lubricant and lubricant additive in equipment, machine or engine; and *3)* process of making lubricant and lubricant additive. Indexers were instructed to: *1)* index as specifically as the subject permitted; *2)* characterize indexable information by combination of existing descriptors whenever possible; and *3)* record each indexing decision.

Indexing decisions included altering the defined meaning of a descriptor, cross-references and use of combination of descriptors to characterize a concept. One IBM card per document, with some exceptions, and one punch per descriptor were used for this experiment.

The original sample consisted of one year's lubricants literature, about 1,000 documents. The list of descriptors was reviewed after indexing 500 documents, because it was felt that some descriptors were being used

too frequently to have adequate discriminating power. The frequency of use of each descriptor was determined at this point, and descriptors used in more than five per cent of the documents were reviewed.

Each use of these descriptors was examined to determine whether the descriptor could be split into less generic ones. An example of this was the division of the organic hydroxyl group descriptor into two descriptors—organic monohydroxyl group and organic hydroxyl groups other than monohydroxyl group. When a descriptor was so subdivided, the new descriptors were defined and assigned to indexed documents whenever pertinent, The indexing of the 1,000 document sample was then completed.

Testing the Experiment

The sample was tested with 44 questions. These questions included previously conducted literature searches on lubricants as well as searches which reflected current need for information. Six of the machine searches were checked by reviewing each of the 1,000 abstracts for pertinence. The results of the tests are summarized below:

ANALYSIS OF 44 MACHINE SEARCHES

Total number of documents selected	402
Total number of references found pertinent upon inspection (hits)	200
Total number of references found to be non-pertinent upon inspection but falling within scope of search heading (noise)	183
Total number of references which turned out to be non-pertinent upon inspection and which did not fall within scope of the search heading (false drops)	19
Percentage of false drops	8%
Percentage of non-pertinent references	50%

COMPARISON OF MACHINE VS. MANUAL SEARCH

Number of references selected by machine	14
Number of references selected manually	24
Number of references missed by the machine	13
Number of references missed manually	3

These test results were satisfactory in terms of keeping false drops and noise to an acceptable maximum. The results were unquestionably unsatisfactory in terms of pertinent documents missed in the machine-based searches. Further studies yielded the following reasons for missing pertinent documents:

REASONS FOR NONSELECTION OF REFERENCES IN MACHINE SEARCH

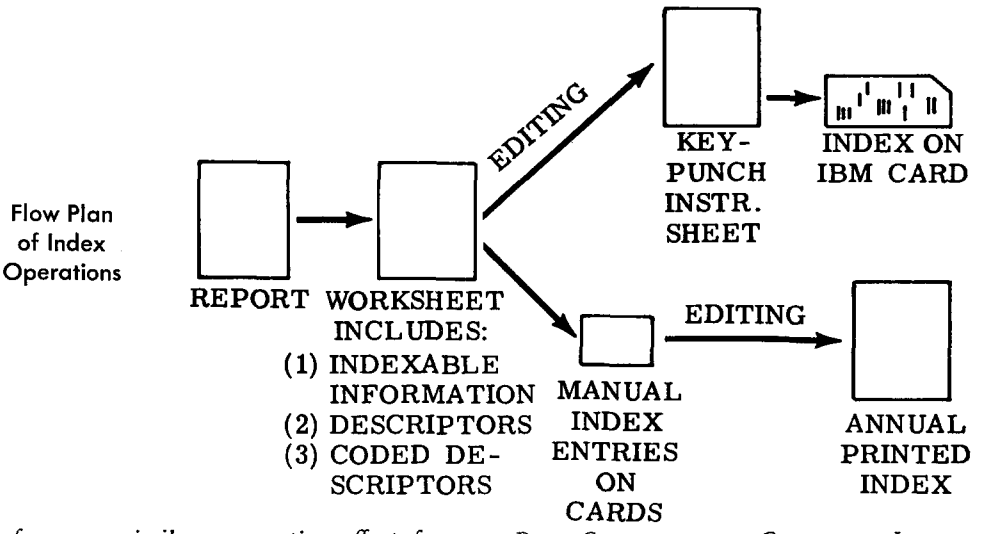
Clerical Errors	
A descriptor was omitted in code translation, transcription or keypunching operations	6
Indexing Errors	
The wrong descriptor was used in indexing	3
The subject was indexed broadly instead of specifically	2
The abstract was incompletely indexed	1
Searching Errors	
Too many descriptors were combined in the search	1

Momentary inattention, probably caused by fatigue, resulted in the omission of three references in the manual search. It may be interesting to note that the six machine-based searches were carried out in about one and one-half hours (machine wiring and searching plus subsequent manual operations), while the manual searches required about eight and one-half hours. Since the omission of references in the machine-based searches was largely the result of inexperience with this new tool rather than intrinsic problems of the system, we assumed that steps could be taken to reduce the nonretrieval of pertinent documents to an acceptable minimum.

An analysis of the economics of the system, i.e., the cost of preparing a coordinate index balanced against search time saved with this index, turned out to be unfavorable for the published literature. This was largely because the coordinate index would have to be supplemented with a conventional index so that the common types of questions could be answered efficiently.

Application to Internal Reports

At this point, we turned to a study of the internal reports literature. The economics were more favorable in this instance since we were dealing with a smaller collection, growing at the rate of 1,600 documents per year versus 30,000 published documents of primary company interest. Moreover, internal reports warranted a greater indexing investment per document than published documents in view of their value to the company. Finally, while we expect a coordinate index to the published literature to be prepared on a cooperative, industry-wide basis, we did



not foresee a similar cooperative effort for the internal reports literature.

The coordinate index developed for the published literature was then tested on the internal reports literature. It was soon realized that a more sophisticated system was required for this application. While an average of less than 10 descriptors was used per published document, an average of 20 descriptors was selected for internal documents. Despite the lower rate of growth of this collection, a larger index vocabulary and a way to relate or link pertinent descriptors in a document were required.

As a result of further experiments similar to those described in the development of a machine-based index to the published literature, a coordinate index to internal reports evolved. This index was described in a recent paper[2] and will not be discussed in detail here. The machine-based index is backed up with a conventional alphabetic subject index, designed to answer the large number of questions which are better handled with a conventional, book-form, use-it-yourself type of index. By assigning the answering of coordinate and generic types of questions to the machine-based index, the complementary alphabetic subject index becomes a single purpose tool that is relatively easy to prepare and use.

The basic ingredients of the coordinate index and a flow plan of indexing operations are given below.

BASIC COMPONENTS OF COORDINATE INDEX

Indexing Terms—Major descriptors (generic) and minor descriptors (specific) used in combination to characterize indexable concepts.

Role Indicators—to modify meaning of major descriptors

Links—to relate major descriptors in a document

Subject Authority List—to control vocabulary of indexing terms

Rules for Indexing—to achieve consistency of indexing

Future Plans

The combination coordinate index-alphabetic subject index to internal reports was installed on an experimental basis about a year ago, and although over 1,500 reports are now in the system, it is still considered experimental. Areas for improvement are already under study. One change has already been put into effect, namely a shift from the IBM 101 Electronic Statistical Sorter to the IBM 108 Card Proving Machine. The new machine is more than twice as fast (1,000 cards versus 450 cards per minute) without decrease in searching flexibility or corresponding increase in rental cost.

Although the alphabetic subject index is largely prepared from the coordinate index worksheet, about one-half a professional man is still required for preparing and editing the index entries. We are convinced that a manual index is necessary at this point to supplement the coordinate index, but we are no longer certain that it must be an alpha-

betic subject index. A key-word-in-context index as described by Luhn[3] is one possible substitute. A printed index of the key descriptors as used in the cumulative indexes to the ASTIA's *Technical Abstract Bulletin*[4] is another possibility under consideration.

The mechanics of coding and key-punching the descriptors can and will be improved. Recopying of codes from the worksheet onto keypunch instruction sheets is necessary with the present procedure, because codes have to be arranged in ascending order of column numbers. This is a time-consuming procedure and, because of the recopying of the codes, a source of errors. The possibility of translating indexable information into codes by computer is also being considered.

The revision of the subject authority list is another essential but time-consuming step. The preparation of copies of the subject-authority list from punched cards is under consideration to speed up this operation.

Conclusion

I have attempted to describe some of the steps in the development of an indexing system. The emphasis should be placed on "some of the steps," since I did not wish to test your patience by chronicling all the details of the operation. I have strongly implied that the development and operation of an indexing system are very expensive, something that is probably not news to librarians. All this underlies the points that the area of application of a coordinate index should be carefully selected and that a coordinate index should be prepared on a cooperative basis whenever possible.

We now have tools at our disposal which open up exciting possibilities for organizing information and providing service on a more sophisticated level. We also have the record of about a dozen years' experience in this field, which can be used to help us decide what to do as well as what not to do.

No doubt you are thinking to yourself, "All this is very interesting but what can *I* do with it?" This I cannot answer. But I would like to leave with one thought—the time has come to take a careful look at the new indexing techniques and the machines used to implement them. Though these techniques may look rather crude now, you should remember that the first printed book was a poor imitation of the painstakingly handcopied manuscript. History has shown us that the printed book built on and soon superseded the manuscript. Perhaps there is an analogy here.

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AAAS Forms New Section

The Council of the American Association for the Advancement of Science at its annual meeting in Denver (Dec. 26-30) approved the establishment of the Section on Information and Communication. To be known as Section T, the new section stems from the Conference on Scientific Communication which has been a recurrent part of the annual meeting of the AAAS since 1952. The original purpose of the Conference was to bring before the Association some of the important problems that confront those who prepare scientific manuscripts. Subsequently, the scope was expanded to provide a forum where members of organizations concerned with all media for communicating scientific knowledge could meet to discuss mutual problems and to interchange ideas.

Thus, the Special Libraries Association, as one of some 250 affiliated societies of AAAS, has moved from a general category classification to a new and more fitting location as a charter member of the 19th section of the AAAS. A full section program will be planned for the next (129th) meeting of the AAAS, Philadelphia, December 26-31, 1962.

An Approach to the Library of the Future

H. THAYNE JOHNSON, Head, Library Services and Documentation Research
Hughes Aircraft Company, Culver City, California

IMAGINE walking into a library sometime in the future. There instead of card catalogs and check-out desks, there are several small desks on which rest only two items, a microphone and a screen not unlike a small television screen of today. Sitting down at one of these desks, you insert a library card in a slot and soon a message appears on the screen telling you to proceed with your request. In a few words you express what you want, and the automated library swings into action. Following the instructions appearing on the screen, you speak several commands and are soon given the choice between several books as the titles with abstracts appear. Asking for those you wish to examine, they are soon delivered into a drawer at your side. From a closer examination you pick those you wish to check out and return the rest to the drawer. Then, retrieving your card from the slot, you pick up your books and walk out. The books are already checked out to you.

Preposterous? Perhaps it might be for the average library, but automation must also come to many libraries to keep them from sinking into a morass of the very thing they deal in—information.

Numerous engineering and library groups in the past few years have tried to solve many aspects of automatic information storage and retrieval. The problems of machine indexing and abstracting are under close scrutiny. New classification systems are being devised. New machines are being invented. Adaptability of information to machine is being discussed. But few suggestions are being made for a single unified approach to bind together as many library facets as possible. Yet it would seem that such direction is overdue. The question of a single goal is too infrequently raised, but one needs to be considered to solidify the haphazard and often unrelated efforts presently being made.

AUTHOR'S NOTE: The visual displays presented were adapted from the slide presentation "Automated Library Search," copyrighted by Thompson Ramo Wooldridge.

Approach Requirements

Can a single unified approach be defined at this time? The purpose of this article is to suggest one—not a panacea for all the ills besetting information retrieval but a suggested approach to the future library that might provide a common direction. What should the ideal approach do?

First, it should be as useful as possible as soon as possible.

Second, it should be compatible with, and preferably incorporate, the useful features in the present body of library knowledge while removing dangers experienced in the past.

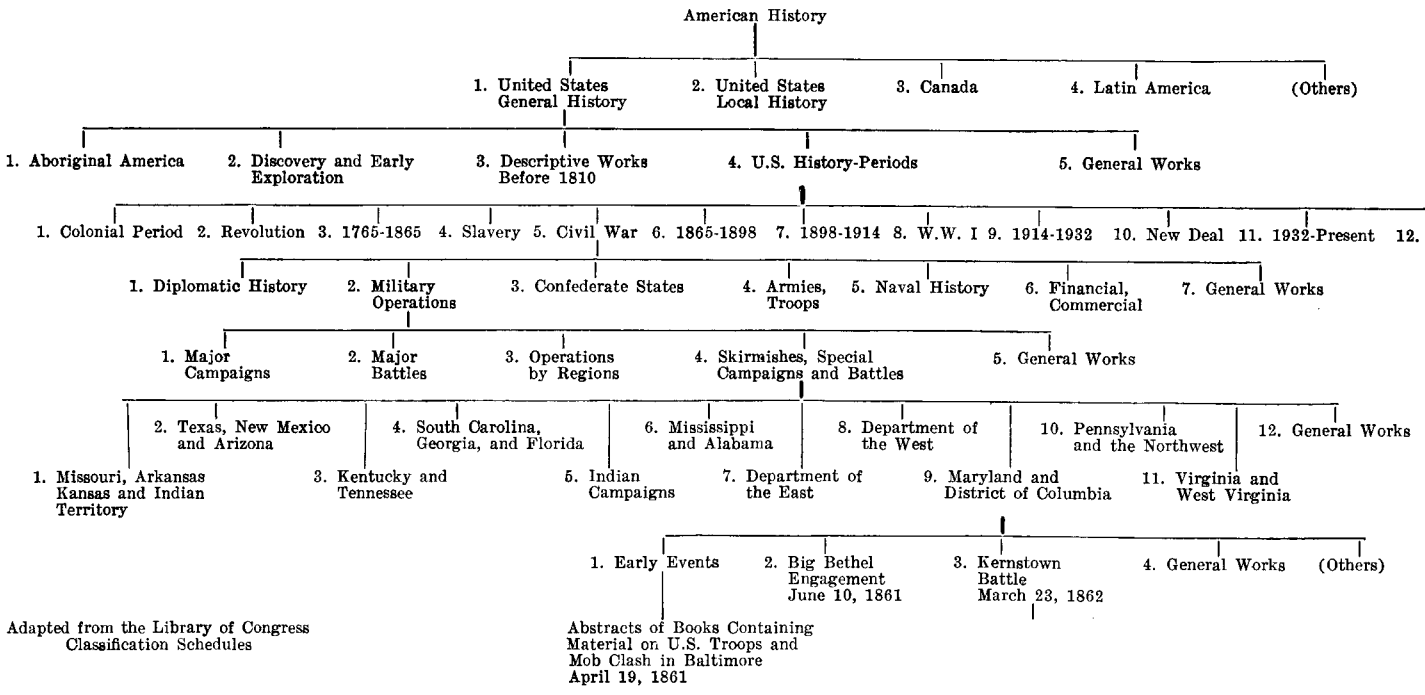
Third, it should be a general approach, capable of handling libraries of all sizes and kinds—the public as well as the technical library, reports as well as books, the million volume as well as the ten thousand volume library. And it should do this with a consistency of operation and retrieval that will enable both the user and the librarian to feel equally at home.

Fourth, it should retrieve, or have the future capability of retrieving, a greater proportion of the meaningful information in the stored materials than is now possible.

Fifth, it should retrieve in a single series of operations many kinds of materials—books, reports, maps and magazine articles.

Sixth, it should have at least limited adaptability to the present state of automation and also be adaptable to future technological advances as they are made.

Figure 1: Section of the American History Hierarchy



Adapted from the Library of Congress Classification Schedules

Seventh, it should be flexible enough to expand and even vary as future knowledge grows and changes. All librarians are familiar with the growing pains of the major classification schedules and subject headings lists. These troubles should not be duplicated. A good approach must be as flexible as knowledge itself can be, expanding and changing to meet future requirements.

Eighth, any system devised must be quick, simple and easy to use. To complicate or lengthen the storage methods beyond those now used might make the costs prohibitive, while to complicate or lengthen the retrieval process would tend to nullify any gains and might even result in less use of the library.

These constitute the requirements for an ideal approach to the library of the future. They are stringent and precise. Some, such as the ability to retrieve 100 per cent of the meaningful information in a library, come close to the impossible, as there will never be agreement on what is meaningful; yet to go beyond a useful point would impose heavy requirements on the system and the machine.

The following suggested approach meets the above criteria to a large extent. It is based upon a pyramid of human knowledge and the assigning of terms needed to cover all knowledge in their proper positions in the pyramid. Major categories, similar to the ten in the Dewey Decimal system, would be established. These in turn would be subdivided again and again until each includes a hierarchy of descriptive terms, each of which, in turn, is representative of the categories of knowledge beneath it.

Such an arrangement is not new to librarians. They have been doing just this for years in their major classification schedules, although not for the purpose, per se, of forming a hierarchy of human knowledge. For instance, one branch of the E and F categories of the Library of Congress Schedules can be partially broken down as in Figure 1 (historians will recognize it as being far from complete). Other fields could be stacked the same way.

Machine Application

Assuming a machine application, what advantages would such a hierarchy have over the random application of conventional subject headings? First, when using the hierarchy the user would mentally define any term in relation to its place in the hierarchy. In actuality, each term becomes a compound subject heading through the knowledge the user has of the terms above. For example, the term "major battles" does not stand alone but would be recognized as "major battles—military operations—Civil War."

Second, all knowledge is categorized. Each step downward in the hierarchy eliminates hundreds or even thousands of terms from a search.

Third, instead of the three or four subject headings now assigned to a library item, numerous more could be used. An interesting philosophy would develop, for instead of assigning subject headings to a library item, the item itself would be assigned to proper terms in the system and fall under as many terms as necessary to assure meaningful use.

With present computer technology machine application of the system now becomes relatively easy. In its simplest application, the user could pick the appropriate major category and in several steps work downward through the terms to the subject desired. Physically he would operate a simple console on which would be located a few operation buttons and a visual output, preferably a viewing screen. Pushing the start button would present a visual display of instructions and the major categories numbered from 1 on. The number of major categories could be larger than those used in the Dewey or L.C. schedules, being limited only by the size of the viewing screen and the ability of the user to quickly choose the appropriate category. After choosing, the user would push the numbered button associated with his choice and the display would move one step down the hierarchy. Again he would choose, and so on down through the terms until the desired subject was reached. The visual display or a typewriter output would acquaint him with the published material on the subject and the call number or other means of retrieving it.

Such an application has distinct advantages over conventional means in many situations. All kinds of materials—books, periodical

articles, technical reports, specifications and so on—could be retrieved in one simple series of operations, limited only by the extent of the hierarchy breakdown and the capacity of the processing machinery. Furthermore, the patron would find it unnecessary to consult any card catalog, list of descriptors, indexes or books of reviews or abstracts.

To help acquaint the user with the information in each individual item under his desired subject term, a full list of terms under which the item is stored could be furnished with the bibliographic data. Even better, an abstract might be added. With a greater number of discriptive terms and abstracts, material could merely be accessioned and retrieved by accession number, although, if stack browsing is desired, material could still be shelved in a classified manner.

As future knowledge advances and changes, no alteration of the item itself will be necessary, nor will costly and time-consuming changes in a card catalog be necessary. If required, whole bodies of knowledge and material could be shifted from one place in the hierarchy to another. Even individual terms could be quickly changed to synonyms of the future without affecting the operation. The hierarchy could be easily expanded as areas became overcrowded with material. Each one of these changes could be accomplished in a machine by changing the programing, not the book or card catalog.

Foreseeable technological advances could be incorporated without changing the basic system, even to the extent of installing larger and more complex computers by simply shifting the program and information to a new machine. As machine indexing, abstracting and similar advances became practical, they also could be incorporated. The hierarchy could be expanded, and a greater number of meaningful terms could be assigned to each item, assuming a greater per cent of meaningful retrieval. A bibliography of all material in the library covered by any one term could be automatically obtained by adding a typewritten output. A relevancy scale could be added to arrange the items under any term in order of relevancy to that term. These and numerous other features could be incorporated as the desirability for them made the cost worthwhile.

However, there might also be several disadvantages. Too much fine judgment might be placed on the patron as he tries to go down through terms. Mistakes could be made, necessitating a retrace of steps or a complete new start. Experienced users who know what they want would still have to start at the beginning and go through the terms to the area they desired.

However, these disadvantages might be overcome by a refinement of both the system and the technology involved. A definition for each term defined in the light of the terms under it would allow a user to determine his direction easily at any time. Allowing a user to place himself in the hierarchy at any point would solve the problem for the experienced user. This might require something like a thesaurus of synonyms to interpret a request and transfer it into terms the machine would understand.

Hypothetical Operation

Let's set up a man-machine situation and take the example compiled from the L.C. American history schedules given in Figure 1. The social sciences has been chosen because of its generally generic terms.

The machine will consist of an operation console connected to the necessary computer equipment. On the console will appear a cathode ray tube used as a visual display, an alphanumeric keyboard, data process keys and other miscellaneous controls necessary to the operation of the computer, as shown in Figures 2 and 3.

The data process keys will include:

DEFINE TERM—to receive on the screen a definition of any term descriptive of the terms under it.
BIBLIOGRAPHY—to request bibliographic data and accompanying abstracts on items under any term.
REPEAT DISPLAY SEQUENCE—to repeat entire display sequence from the time the user began the operation of the console.
DISPLAY SUBTERMS—to display the next lower level of terms under any term.
REPEAT LAST DISPLAY—to repeat the previous display.
INPUT—AUTHOR, —TITLE, —SUBJECT—to distinguish between inputs to the machine when first typed.

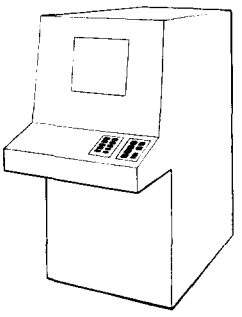


Figure 2: Operational Console

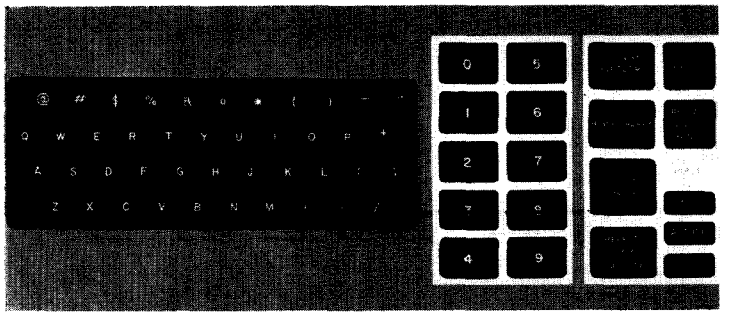


Figure 3: Close-up of the alphanumeric keyboard and data process buttons

ERASE—to erase the visual display if a mistake is made.

Imagine that an inexperienced patron comes into the library looking for material on the clash of United States troops and a mob at Baltimore during the Civil War. Knowing nothing else he sits at the console, turns it on and types out on the alphanumeric keyboard, "U.S. troops and mob at Baltimore during the Civil War." As he types, the letters appear on the screen in front of him, and he can check his request for spelling and meaning.

Satisfied, he pushes the SUBJECT button under INPUT. The machine evaluates and replies with display of "Choose BALTIMORE or CIVIL WAR." He can now enter the system through either term. Being more interested in the relationship of the clash to the Civil War, he chooses that term and enters the system there. He now types out "Civil War" and pushes the DISPLAY SUBTERMS button. The visual display replies with:

Civil War
1. Diplomatic history
2. Military operations
3. Confederate states
4. Armies, troops
5. Naval history
6. Financial, commercial
7. General works

He arbitrarily chooses "Armies, troops" and simultaneously presses the button DEFINE TERM and button 4 on the alphanumeric keyboard. The definition appears:

Armies, troops—Individual military groups, muster lists, death lists, replacements of the USA and CSA.

Realizing this is the wrong term he pushes the button REPEAT LAST DISPLAY and receives a return. The only other logical choice is "Military Operations," so he presses DISPLAY SUBTERMS and button 2 of the alphanumeric keyboard and sees:

Military operations
1. Major campaigns
2. Major battles
3. Operations by regions
4. Skirmishes, special campaigns and battles

He presses DEFINE TERM and button 4 of the alphanumeric keyboard simultaneously and receives:

Skirmishes, Special campaigns and battles—Minor skirmishes, small and minor campaigns and battles involving U.S. troops, C.S. troops, Indians or civilians.

The patron now knows he is on the right track and pushes BIBLIOGRAPHY.

The console replies with:

511 books under this term. Do you wish subterms?

He pushes DISPLAY SUBTERMS and gets:

Skirmishes, Special Campaigns and Battles
1. Missouri, Arkansas, Kansas, and Indian territory
2. Texas, New Mexico and Arizona
3. Kentucky and Tennessee
4. South Carolina, Georgia and Florida
5. Indian Campaigns
6. Mississippi and Alabama
7. Department of the East
8. Department of the West
9. Maryland and District of Columbia
10. Pennsylvania and the Northwest
11. Virginia and West Virginia
12. General Works

He pushes DISPLAY SUBTERMS and button

9 of the alphanumeric keyboard and gets:

Maryland and the District of Columbia
1. Early events to May 1861
2. Big Bethel Engagement, June 10, 1861
3. Kernstown Battle, March 23, 1862
4. General Works

He now pushes button 1 of the keyboard and DISPLAY SUBTERMS and gets:

Early Events
21 books. Request bibliography.

Now aware of the number of books under the term, the man can push BIBLIOGRAPHY and have displays of all 21 books. Each display will show complete bibliographic data plus an abstract. From the abstracts the patron can choose those items he wants to examine, and he can note the call number, accession number or other means of retrieval.

Using a refined system such as this, the patron can enter at any point. It combines good features from both classification schedules and subject headings. The patron has the understanding of where he is in the field of knowledge that only subject headings can give him. On the other hand, he can browse through the library materials through use of the visual display and the abstracts furnished. If he wants to browse further, he can start at the beginning of any field of learning and go through the entire field. As many consoles as necessary might be tied into the system with many miscellaneous advantages that anyone who has stumbled over other card catalog users can appreciate.

Several means of retrieval might be used. The consoles might just replace the card catalog with the materials classified in any one of the several systems now used, or a simple accession number might be assigned, or the retrieval might be completely automatic. The extent to which any library might be automated will depend upon technological advances and the wish of the library to be automated.

Visualize the closed stack library of tomorrow. As a new item leaves the order department, it goes into the programing (catalog) department where it is given an accession number. It is then handed to the programer (cataloger) sitting at a console not unlike those described above. He opens it to the proper page (perhaps the last), where there is a list of suggested terms that can be applied to the book, a suggested collation and an abstract. He types this information plus the author and title onto the screen of the console, checks it and then pushes the proper buttons to incorporate it into the system. The item is then put in its proper place on a shelf and is immediately available for use and retrieval by the outside consoles.

Or go beyond this and visualize a worldwide retrieval library to which is sent, not the published item, but simply the author, title, imprint, collation, a list of suggested terms and an abstract. Scholars from all over the world could use the system to find desired information. It wouldn't even be necessary for them to come to the library, for tie lines could connect the system into consoles in all major cities.

Technical Problems

Computer problems for such a system are large but not insurmountable. Although it will take time to work out an adequate system of terms, this is probably possible. The major obstacle is the tremendous amount of material that will have to be stored. The L.C. subject heading list contains about 50,000 subject headings, excluding *see* and *see also* references. Assuming the number of terms would be about the same (a poor assumption), there are, to begin with, 50,000 terms and an equal number of definitions to be stored in the basic programing, without storing any information. Taking a large library of 1,000,000 books, 20,000 pamphlets, 50,000 bound periodicals, 5,000 maps and 10,000 assorted other items to be included, there would be 1,035,000 items plus 5,000,000 magazine articles (average of 100 articles per year) to be included. The total would be 6,035,000. Now there are 6,035,000 entries along with 6,035,000 abstracts to be stored under 50,000 terms with 50,000 definitions. Even a cursory glance at these figures indicates that such a library presents extremely complicated problems.

On the other hand examine the more pressing problem of technical literature. The highly specialized literature of the highly

specialized library would considerably reduce the requirements. In electronics, the special library of 10,000 books, 5,000 bound periodicals, 20,000 technical reports and 1,000 miscellaneous items could probably be stored under just a few thousand terms, and the total effort would reduce to 531,000 items and 531,000 abstracts under a few thousand terms and definitions. Even the definitions might be eliminated in a highly specialized situation where the terminology is consistent and mutually understood. If periodicals are removed from this last list, it would reduce to only 31,000 items and 31,000 abstracts under a few thousand terms. To further reduce the storage problem of the computer, the abstracts might be stored on punched cards or simply numbered cards. In a small library where the item might be readily available, the abstracts might even be eliminated.

In addition to the very immensity of information, other problems can be seen. For example, it may never be practical to add authors and titles to the system, since to add them would require an exact knowledge on the part of the patron. If he knew the exact title and the exact author, including spelling in each case, retrieval could be accomplished through the alphanumeric keyboard. But too often this isn't the case. Only an approximate title or only the last name is known. Browsing through the card catalog will often quickly supply the missing information, but it's difficult to imagine a machine quickly supplying it. In the long run, authors and titles may have to remain on cards, and the console replace only the subject catalog.

Basic Studies Needed and Underway

One study that should precede any great amount of experimentation should be the determination of what percentage of meaningful information is now retrievable from libraries using conventional methods. At the present time we can only guess. It can easily be assumed that applying eight or ten terms to a book instead of the average three or four subject headings now used will make more information retrievable, but the question of how much more and how meaningful in the light of total retrievable information must be evaluated in terms of cost. It's possible that machine indexing might soon be accomplished, a technological advance that would conceivably permit placing an average library item under hundreds of terms. But at some point the mere addition of terms will cease to be practical. This point must be determined, and preceding it must be studies of present day methods.

A second study would be the first step in developing the hierarchical system described, a study to determine how effectively knowledge can be stacked for machine application. It must be determined if a rational, consistent approach for all types of libraries and to all kinds of materials can be made. If it can be, a universal compilation can be started to replace the haphazard use of subject headings, descriptors and uniterms, in use or being compiled.

To partially answer these questions two preliminary studies are being evaluated for the technical library at Hughes Aircraft in Culver City, California. Using subject specialists as much as possible, the first will attempt to determine the per cent of meaningful information retrievable from a select group of technical books cataloged with Library of Congress cards. The second study will attempt to determine the feasibility of stacking terms in a highly technical field for machine application.

During a third phase, these two studies will be joined. Various numbers of terms will be chosen from the hierarchy, assigned to the same group of technical books and the per cent of meaningful information determined. A workable machine situation will then be accomplished for later evaluation.

It may be many years before one can walk into a library and obtain desired material by microphone and television screen, but it may be upon the horizon. What is needed is an approach that will weld together all of the diverse elements and haphazard efforts underway at the present time. This article has outlined one possible approach. It may not be the best one, but if it focuses attention upon the necessity for more general studies in library retrieval, it will have performed a worthy purpose.

Textile Literature: A Selected Bibliography for 1961

MARY E. EMERSON, Librarian and Editor, Textile Technology Digest
Institute of Textile Technology, Charlottesville, Virginia

THIS SELECTED LIST includes the outstanding books on textile technology published during 1961 (some items listed were published earlier) as well as examples of various types of publications chosen for their usefulness to the librarian in locating answers to a wide variety of textile information questions.

HANDBOOKS, ENCYCLOPEDIAS, DICTIONARIES The *Encyclopedia of Textiles* (9) published by *American Fabrics* magazine was the only general handbook to come out during 1961. Its usefulness to the textile technologist is limited; emphasis is chiefly on design, history and art. *A Short History of Technology* (38) includes chapters on the history of textile technology from earliest times to 1900. The *Man-Made Textile Encyclopedia* (80) is the most recent of the comprehensive fiber-processing handbooks. The cotton and wool handbooks are now very much out-of-date, but new editions of both are in preparation (67, 124) as is a new engineering manual for the textile industry (40). The first volume of a new series *Advances in Textile Processing* (65) appeared at the end of 1961. This series provides critical reviews of selected subjects by recognized authorities.

A German dictionary of textile finishing (43) supplies a large amount of encyclopedic information (including literature references) and may be used quite easily even by readers with limited German. A British dyeing and printing dictionary (17) includes chemical compositions and process drawings. A polyglot detergents glossary (24) gives terms in 19 languages. The textile industry now has several general dictionaries, but librarians still feel a real need for an up-to-date dictionary with less emphasis on fabric design and more on machinery, instruments and new technical processing terms.

DIRECTORIES, BUYERS' GUIDES, TRADE LITERATURE Quite a few directories and buyers' guides appear annually (1, 7, 12, 36, 87, 102, 103, 106, 110). The librarian should study each carefully for unusual and unexpected information and arrangement. The International Textile Service of Zurich, Switzerland (53) is providing a useful new service in a series of free bulletins, in English, on new textile machinery and auxiliaries. Three separate editions are published: spinning, weaving and dyeing-finishing. Separate articles on technical subjects are listed and are available on request.

TEXTILE TECHNOLOGY Few new books were published on yarn processing. Modern yarn production methods for manmade fiber-textured yarns are described in 130. The Ontario Research Foundation published a three-part survey on short- and long-term unevenness of yarns spun on the cotton system (20).

Several new books appeared on fiber technology (25, 26, 34, 95). Fiber information from Wright Air Development Division technical reports is summarized and consolidated in 69. Fiber data charts are published from time to time by *America's Textile Reporter, Modern Textiles Magazine, Textile World* and *Textile Industries*. A useful example is 13. The *Textile World* fiber-blend chart (111) tabulates blends, blend applications and production procedures. An outstanding book on cotton fiber technology (62) was published by the Textile Institute as volume two, part one of its *Manual of Cotton Spinning* series. The United States Department of Agriculture compiled a brief handbook on the cotton plant (112). The Asbestos Institute issued a second edition of its handbook of asbestos textiles (14).

Fabric engineering is becoming an increas-

ingly important aspect of textile technology. No new books on this subject have appeared this year, but the Textile Institute is reported to be working on the publication of books on fabric geometry, and a new edition of Ernest Kaswell's *Textile Fibers, Yarns, and Fabrics* (60) is in preparation. Fabric Research Laboratories recently reprinted a limited number of copies of the first edition. Examples of various types of reports involving fabric engineering are 85, 92, 93, 94, 113.

A comprehensive handbook on apparel manufacture (89) appeared, as well as several works on the laundering (32, 41, 78) and cleaning (70, 79) of textiles.

Several books on textile chemistry were published this year, including a much-needed, though not completely satisfactory, book on the dyeing of cellulose fibers (31). Azo and diazo chemistry (131) and surface activity and detergency (39) were also represented. The McCutcheon list of detergents and emulsifiers (66) was brought up-to-date. There seems to be no end to new books and journals on polymer science and technology (22, 42, 99, 126). Librarians can look forward to a much-needed Textile Institute publication on wool finishing.

Three outstanding volumes on textile testing and measurement include *Principles of [Physical] Textile Testing* (19), *Handbook of Textile Testing and Quality Control* (49) and *Statistical Methods for Textile Technologists* (71). Government cotton testing results are summarized in the annual cotton quality survey (115). Two useful experiment station publications show how cotton fiber tests are used in cotton marketing (81, 125). Fiber microscopy is discussed on pages 343-63 in the *Encyclopedia of Microscopy* (30). New and old standards and specifications are included in new editions of the ASTM standards (11), the Worth Street rules (16) and the IWTO specifications (54).

TEXTILE RESEARCH Specific information on textile research projects in British universities may be found in 47, in British industrial associations in 46, in the Wool Industries Research Association in 127. Japanese textile research is surveyed in 76. Information on United States textile research appears in 45, 72, 96 and 119.

TEXTILE ECONOMICS Textile industry economic problems have been the subject of several government reports: textile cycles (64 and 68), comparative fabric production costs of the United States and four other countries (120) and the outlook for the 1960's (121). A new Bureau of the Census periodical, *Business Cycle Developments* (23), is of particular importance to the textile industry.

TEXTILE STATISTICS Librarians are besieged with requests for statistical information and really need a comprehensive handbook compiling and indexing sources of such information. No such handbook has yet been issued, but the *Textile Organon* has published a most helpful list of primary statistical data reports on the textile industry (107). The *Textile Organon* has also made a fiber end use survey (108) and a world manmade fiber survey (109). Cotton statistics are compiled in 116, cotton end uses in 73 and 74, wool statistics in 117, carpet figures in 3 and industrial fibers in 33.

FOREIGN DEVELOPMENTS Keeping up with foreign textile developments is an ever-growing problem as the volume of foreign literature grows and language problems become more perplexing. The manmade fiber situation in Europe is surveyed in 28 and 51, in the USSR in 21 and in Japan in 55. European textile machinery and chemicals are reported in 53, Japanese textile machinery and chemicals in 56, Japanese research in 76, and labor in the Japanese cotton industry in 86. The *Journal of the Textile Machinery Society of Japan* has recently made the welcome announcement that its English edition will be published quarterly instead of biannually. A cover-to-cover translation would be even more welcome news to textile librarians.

TRANSLATIONS The problem of translations has been getting out of control. If foreign language journals would translate titles into English and give brief but adequate abstracts, at least the selection problem would be partially solved. More English language editions and more translated articles in these editions are urgently needed. The Textile Institute is currently publishing a translated edition of *Technology of the Textile Industry USSR* (101). Translations of the 1960 issues are

now appearing. The Office of Technical Services is doing its best to publicize available translations from many sources in its semimonthly *Technical Translations* (100). Copies of the translations are usually available at low prices, and quite a few textile items are listed. The comprehensiveness of this list depends on the active cooperation of all librarians in listing their translations. A commercial translation of Soviet papers on the swelling of cellulosic materials (91) should also be mentioned.

CONFERENCES AND EXHIBITIONS Numerous conferences and exhibitions were held during the year. Innumerable reports have been published of the Knitting Arts Exhibition in the United States and the International Knitting Machinery Exhibition in England. Most conference papers eventually are published in journals. An outstanding example of journal publication is the papers of the Second Quinquennial Wool Textile Research Conference, which were published as the December 1960 issue of the *Transactions of the Journal of the Textile Institute* (129). Many conference papers are published separately (6, 10, 90, 104, 105).

LITERATURE AIDS New literature aids keep appearing to help control the almost overwhelming volume of publications. The *Subject Guide to Books in Print* (98) has many textile library uses; other guides include subject collections (97), indexing and abstracting services (122), Japanese journals (18) and science information services (75). The American Economic Association has published an *Index to Economic Journals,* covering 1886-1949 (8).

Lists of theses and dissertations are sources of information often difficult to locate through abstract journals (15, 44, 63, 77, 118). The *Textile Technology Digest* is planning to list more theses and dissertations.

A new journal reproduces the contents pages of hundreds of space and physical sciences journals (35). An excellent tear sheet service is also offered. This service does not include textile journals but does include the chemistry, physics, statistics, standards, engineering and other such journals of related interest. For keeping up with the very latest chemical articles, the American Chemical Society is publishing a new, speedy journal *Current Titles* (29) with titles machine-indexed under every significant word. *Reports on the Progress of Applied Chemistry* (88), *Bibliography of Chemical Reviews* (4), the annual bibliography in the AATCC manual (1) and a new edition of *Searching the Chemical Literature* (5) are other useful library tools.

Textile bibliographies include the Textile Institute's annual *Review of Textile Progress* (82), a classified book list (61), a source list for manmade fibers (37) and a list of Quartermaster textile series reports (123). The Southern Regional Research Laboratory has published several subject bibliographies of its own research (57, 58, 59). Fiber developments for 1960-61 are reviewed in one of the I/EC Materials of Construction series (48).

No particularly new changes have taken place in the textile abstracting and indexing journals. The *British Cotton Industry Research Association Summary of Current Literature* is now the *Shirley Institute Summary of Current Literature.* The 1959 indexes to the *Journal of the Textile Institute Abstracts* appeared in October 1961, almost two years late. The only current indexes are those of the *Textile Technology Digest,* which appear in the December issue, and the cumulative indexes of the *Applied Science and Technology Index,* which indexes many major English language textile periodicals. The *Textile Technology Digest* has started to list and index news items from the *Daily News Record,* because there is such a need for this current information and no other way to locate it. The *Textile Technology Digest* is also the only current source for the abstracting and indexing of nonchemical United States textile patents (of course *Chemical Abstracts* abstracts and indexes textile chemical patents).

JOURNAL ARTICLES In the thousands of articles published during the past year, the following subjects seemed particularly significant, popular or new: stretch fabrics, foam laminates, wash and wear, chemical modification of cotton and wool, automation of textile machinery, textured yarns, new

knitting developments, shuttleless looms, Duocard carding, nonwovens, graft polymerization, reactive dyes. Quite a few review articles offered helpful bibliographies: reactive dyes (132), cotton carding (52), chlorine retention by resin-treated cottons (2), crease-resistant cotton literature from 1949-60 (114), detergent literature (84), effect of light on cotton (83), textile wastes (50), shrink-proofing wool (128) wash and wear wool treatment (27) and thermosetting resin chemistry and textile applications (87A).

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Special Issue on Professionalism

The October 1961 issue of *The Library Quarterly* contains a collection of papers and discussions originally presented before the Twenty-Sixth Annual Graduate Library School Conference and deals with "Seven Questions About the Profession of Librarianship." Aspects of librarianship covered are the delineation of profession from other occupations, the history of librarianship, professional education, ports of entry into librarianship, the librarian's concern with status, specialization and organization. SLA members Ralph E. Ellsworth, University of Colorado Library, Herman H. Henkle, John Crerar Library, Harold Lancour, University of Pittsburgh School of Library Science, and Agnes Reagan, Emory University, were contributing authors.

Disseminating Current Information

MRS. SANDRA HOCKEN, Research Library
IBM Advanced Systems Development, San Jose, California

MUCH OF THE responsibility for disseminating current scientific literature falls on special librarians. No scientist or engineer can be expected to read all the periodicals that might contain information in this field. Yet new information must reach the right people if its value is to be realized; and, to avoid wasteful duplication of work, it must reach them with speed. Through the cooperation of the library and its users, an effective method of sifting useful information from the mass of incoming material can be devised.

Such a system has been evolved at the IBM Advanced Systems Development and Research Library in San Jose. The present system is a development of several past procedures, which were tried and discarded or adapted with improvements. Among the earlier attempts were: *1)* a weekly listing of abstracted articles, which was rejected because of its forbidding length; *2)* a listing of the tables of contents of current periodicals, which was unsatisfactory because the titles were not explicit enough; *3)* ordering periodicals for individual departments, which caused a duplication of material, lack of library control over magazines and a large bill; and *4)* routing all incoming journals to everyone who might be interested, which required time-consuming clerical labor both in routing and in replacing lost issues of periodicals—if available—and placed the burden of reviewing all incoming literature on the individual scientist.

The shortcomings of these past methods of disseminating information have been alleviated by the initiation five years ago of the *IBM San Jose Technical Library Daily News.* A single 8½ x 11-inch sheet, multilithed on both sides, the *Daily News* carries announcement of scientific meetings, abstracts of articles from current periodicals of interest to laboratory projects and a listing of new materials in the library. Readers who find items of interest in the paper may request copies by calling the automatic recording telephone in the library—a futuristic way of ordering new material. The *News* itself can then be discarded as the library maintains a record of requests. The color code of the paper has meaning for readers because each day of the week is assigned a special color—yellow, blue, orange, green and brown. A request for an item in a "yellow paper during the last month" simplifies what could be a lengthy search.

Each edition of the paper lists on the front page: *1)* scientific or laboratory seminars; *2)* library notes, such as announcements of new abstract material or an occasional missing book; and *3)* articles chosen by the scanners, followed by a two- or three-line abstract if the article is not clearly explained by its title. A thought-provoking quotation, now and then contributed by laboratory personnel, marks the bottom of the front page. Sometimes this becomes a riddle and is answered the next day; it can make fun of science and technology or applaud the inventions of modern times.

The back page of the paper continues with current periodical literature and announces new books, pamphlets, IBM reports, university reports, society papers and the arrival of technical periodicals whose articles were not mentioned.

The IBM stock quote, typed just before the paper is printed so that it will be as current as possible, traditionally marks the end of the paper; it was placed there to entice readers to turn over the page!

In this daily announcement medium the number of items to be read is small. Long weekly or bi-weekly lists are often set aside because their use is so time-consuming, and the value of currency in the list is lost.

Cooperative Compilation Methods

The *Daily News* is unique in that it is the end result of the cooperative effort of many people in the laboratory. The preparation of abstracts starts with a review of all new technical periodicals that come into the library. When the system began, lists of periodicals were passed among scientists, engineers and technicians, who were requested to sign their names beside the periodicals they would be willing to scan. When a new journal is checked in, one of these volunteers is telephoned and asked to come into the library during the next day or two to scan the journal for articles of interest to the laboratory. He knows where to find the journal and that he needs to spend only a few minutes choosing material for the *Daily News*. He lists page numbers or checks the table of contents. He may underline a passage he feels should be quoted; it is not necessary for him to write an abstract. Those who scan journals written in a language other than English are asked to translate the titles of articles they choose. Envelopes and post cards to request reprints from authors are handy on a nearby "scanners' table."

The reviewing system is flexible; some scanners appreciate seeing every issue of a few journals, others prefer variety. In one department, each week one member has the responsibility of scanning all journals in that field received in the library. The library staff reviews less technical periodicals. The scanning procedure has the cooperation of management; engineers scan during working hours as a recognized contribution to the laboratory. Most laboratory members are willing to help, whether they feel it a privilege or a duty to select articles for the paper.

Providing Copies of Items Listed

As circulation increased to a total of 1,300 and requests grew in number, management and the library recognized the need for a more efficient and rapid system of copying articles than was provided by standard office duplicating machines. It was decided to microfilm articles to achieve the goal of furnishing hard copy to requesters now and later with little delay.

After purchasing a microfilm camera, the publishers of all periodicals received by the library were written and asked permission to microfilm selected articles. Most publishers were cooperative; the few that were not were deleted from the experiment.

As the editor includes an article in the *News,* she assigns it a number in ascending order and indexes it according to subject. Later author and subject cards are punched on an IBM Keypunch so that the article can be included in the IBM 7090 Information Retrieval Bibliography. The articles are microfilmed the same day, and the film is sent out to be processed and made into reproducible copies or vellums, which are returned within a few days.

Most requests for copies of items are received in writing or over the automatic telephone within three days after they are announced. Copies are made from the vellums by a diazo process, and in most cases they are larger than the original journal and are very clear. The vellums are kept for six weeks to satisfy additional requests and are then thrown away to make space for the new vellums that come in daily. When a copy of the microfilm is returned, each article is cut from the roll, placed in a pretyped envelope and filed according to its preassigned number. This has proved to be the most efficient way to file, since both the subject and author entry in the catalogs refer to this number. Should a copy be requested later, the film can be manually pulled from the file, and a copy made on the 3M microfilm reader-printer.

Few complaints have been received since this system has settled into a routine. Microfilm prints and diazo copies can be made quickly, and since laboratory members know that they will receive requested copies in a reasonable length of time, there are fewer "rush" requests.

The advantages of having a microfilm file are many:

1. Circulation is decreased, because copies of articles can be run from the film with little delay; the need for overdue notices, circulation card filing and reserve lists is avoided in many cases.

2. Library storage is decreased.
3. Engineers can build up permanent files of their own, yet there is still a reproducible copy in the library.
4. In addition, some interlibrary loans may be copied on film and thus are readily accessible in the future.

Browsing and Circulation

Requests for books and reports are also taken over the automatic telephone. The requester mentions only the call number, which is underlined in the *News.* Laboratory personnel may also come into the library to browse through the reviewed or announced periodicals. All journals mentioned in the *Daily News* are kept in the library for three days after listing, giving everyone a chance to see all information and thus, perhaps, decreasing the number of requests for copies. The material can be seen immediately, and although it cannot leave the library, browsers may decide that one look at the article cancels the need for a permanent copy.

After citing the disadvantages of routing, it is only fair to say that the San Jose library does route periodicals. The principal reason is that engineers and scientists still want to skim through the main journals in their fields, even if a particular issue contains no material relating to their own work. Once the journal has been scanned for articles relevant to laboratory projects and articles copied for those interested, routing no longer delays getting information to the potential user. Besides, the announcement system is not foolproof—occasionally someone will bring in a magazine and ask if a particular article was included in the *Daily News;* if not, it is listed. A reader may add to the routing list names of persons he thinks would be interested in a particular issue. It is also necessary to route journals we are not allowed to copy. Our routing slips are machine processed and involve little clerical work. There is an extra "copy to remain in the library" of basic, frequently used journals; the less technical periodicals are not routed.

With its attractive format, the *Daily News* serves an incidental purpose which special librarians recognize as important—it draws attention to the library. But, most important, the *Daily News* helps the library staff fulfill its daily purpose—to sift all incoming information and send it quickly to the right people. Periodicals can be reviewed the day they come into the library and appear in the paper two days later—a time lapse of only three days. The periodicals are scanned by people who know what is important. The specially selected information is offered in brief, readable form to everyone who receives the *News*—not just to those who others think may be interested. Most of all, it is *used,* partly because its brevity makes it so easy to scan, but chiefly because people have confidence in the system to which they contribute.

ASA Expansion

The American Standards Association has announced the addition of 18 new members to its board of directors and the election of two new vice-presidents as part of an extensive organizational change designed to give industry a more direct voice in the administration of the agency.

The long-range impact of these changes will enable ASA to respond to industry's demands for increased service and standards-developing machinery. The present ASA membership roster includes 2,172 companies and 127 technical and professional societies and trade associations.

Micro-Opaque Standards

The American Standards Association has developed American Standard Specifications for Micro-Opaques, PH5.5-1961, which prescribes the sizes and number of images on micro-opaque cards and tape as well as margins for library identification. Common uses of micro-opaque cards and tape include reproduction, use, preservation and storage of data contained on library cards and in books and historical documents. Four types of micro-opaque cards are specified in the Standard, ranging in totals of micro-images from 48 to 200. SLA was among the organizations participating in the research. Copies of the Standard are available at $1 each from ASA, Department P269, 10 East 40th Street, New York 16.

Library Space and Steel Shelving

GORDON E. RANDALL, Manager, Library
Thomas J. Watson Research Center, Yorktown, New York

LIBRARIES MUST be a real problem to management, or at least to that portion responsible for the assignment of office space. A well-planned cafeteria never outgrows its area. If a warehouse becomes cramped, the inventory control system can be modified. The personnel department may be increased in size but somehow with the shifting of a couple of desks, the original square footage is still adequate. But this isn't true of the library. It is possible to place an irremovable ceiling on the size of the library staff, keep its budget pared to the proverbial bone and exercise any other growth factor controls known to management, yet an originally ample area will, in a short time, be hopelessly crowded.

Solutions to Problem

There are three or four ways of dealing with this problem of space for the library. A librarian might buy, for example, only those books a requester would agree to retain in his office until some one else wished to borrow them. This poses a few problems. When a second party is found who wishes a book, the original requester has held it so long he has either lost the record of its whereabouts or considers it so necessary to his job performance that he cannot work without it. In either case, the library must buy a second copy, which further compounds the situation.

A second solution might be an active discarding program. Under this system, a librarian would buy a title only if he were willing to discard one, or preferably two, already in the collection. This system, too, has its dangers. Discard a book, and even if it hasn't been out of the library for five years, guess who will send his secretary to the library for it the next day—the vice-president.

A third solution is rearranging the library area so the librarian can make more effective use of the space available to him. If aisle space is already narrower than 30 inches and books are stored on top of the stacks, in the workroom and in the warehouse three miles away, it is probable that simple rearrangement of the space is not the answer.

It may be necessary, in this case, to ask for additional space, which is the fourth method of solving the problem. However, in some library situations, one or more of the facetiously suggested solutions may help and should be considered seriously by the librarian before the fourth, drastic, step is proposed.

Shelving Space Requirements—Hypothetical and Theoretical

Just how many volumes can a library of given size accommodate? The authorities, as quoted by Louis Kaplan in *Shelving* (volume 3, part 2, "The State of the Library Art," edited by Ralph Shaw. New Brunswick: Rutgers Graduate School of Library Service, 1960), don't agree. He credits Melvil Dewey as assuming ten volumes to the linear foot, F. J. Burgoyne suggested 8.5 volumes and K. D. Metcalfe 6.1 volumes. Of course these estimates ranged in time from 1887 to 1947, and one might assume that in recent years authors have become wordier, or at least their books thicker.

But then modern manufacturers of shelving don't agree, either. Remington Rand suggests reference books be estimated at six per foot, while Globe-Wernicke and Hamilton hold out for seven; still, they are a little closer to agreement than the three librarians. The following tables and estimates are concerned with

Paper presented before the Advertising, Newspaper and Publishing Divisions, May 31, 1961, at the 52nd SLA Convention in San Francisco, California.

maximum capacity, and the librarian who uses them should come to his own decision as to how full he wishes to stack his shelves and for how much future growth he wishes to plan.

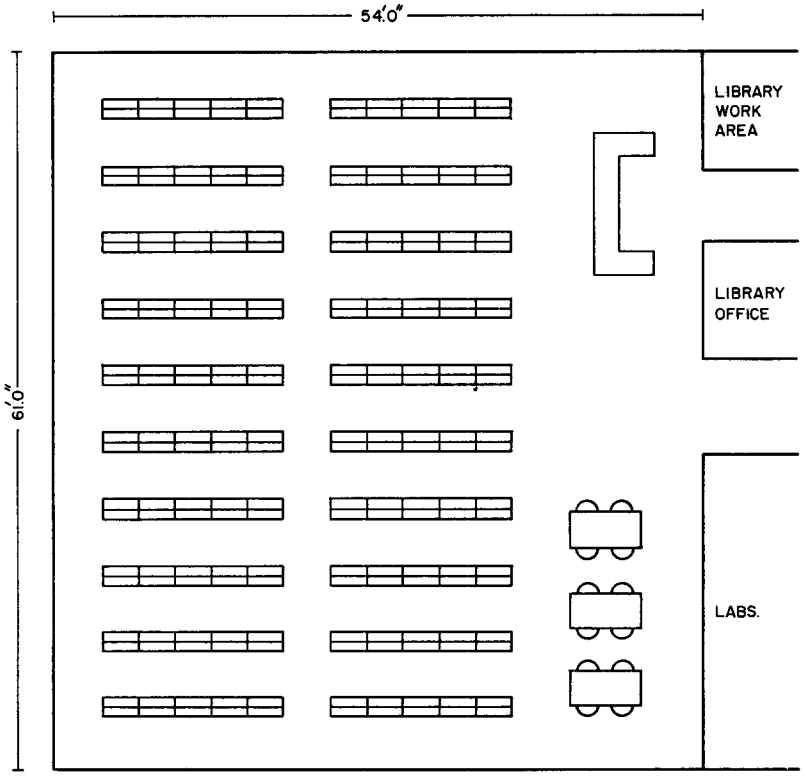
The charts suggest that six scientific and technical books can be stored per linear foot. That means 18 per shelf and, with seven shelves per section, 126 volumes in each single-faced section. A simple bit of long division proves 80 sections are needed for books. A similar exercise indicates a requirement for 77 sections for bound journals. A thinking librarian will also realize he must store the current issues of his journal subscriptions. By storing them flat, he realizes he can handle three titles per shelf, which will require a total of 167 shelves. If only seven shelves

Shelf Requirements

	Globe-Wernicke		Remington Rand		Hamilton	
Type	*Vol/ ft.*	*Vol/ section*	*Vol/ ft.*	*Vol/ section*	*Vol/ ft.*	*Vol/ section*
Economics	8	168	7	147	8	168
Reference	7	147	6	126	7	147
Technical and Scientific	6	126	6	126	6	126
Law	4	84	5	105	4	84
Bound Volumes	5	105	5	105	5	105

Let us take a look at a hypothetical library whose librarian feels the need of additional space and hypothesize about how many stacks and how much space is actually needed. Let us assume that the library records disclose the following facts:

1. Books—10,000
2. Bound journals—8,000
3. Journal subscriptions—500



Hypothetical library with 200 shelf sections

are considered per section this will mean an additional 24 sections of shelving. If, however, he spaces his shelves on 6-inch intervals, which he can do if he uses shelves that fit into slots, he can manage with only 12 additional sections.

So far this hypothetical library needs 169 sections of shelving. The authorities seem to agree that ranges of shelving should be on 4-foot 6-inch centers, that the ranges may be any multiple of 3 feet in length and that perimeter aisles should be 3 feet wide. This application of the rules would indicate that the collection, as described, could be housed in 1296 square feet (24 x 54 feet), which would accommodate two single-faced ranges and 11 double-faced ranges of seven sections each, with a 3-foot aisle along the end of the ranges.

	Hypothetical Library	Formula Requirements
Book stacks	50	80
Bound journal stacks	139	77
Current issues	11	12
Total	200	169
Square feet	3294	1296

So the hypothetical librarian pulls out his yardstick and abacus and takes stock of what he has, with the fervent hope of justifying a request to management to double his library area. His findings are recorded below:

His books require only 60 per cent of the sections indicated by the formula, and his bound journals require about twice as many. His total library area was over twice the amount specified in the table. His first inclination was to check the records again to verify that his collection contained as many volumes as they indicated. But the inventory taken recently had verified the figures he used. His second inclination was to toss out the formula and rules. Regardless of the guides, he was crowded. He knew it, and it was obviously so to anyone who visited the library.

He then took a cooler look at his situation in an effort to bring theory and experience into alinement. His circulation records indicated he had over 4,000 books on loan. While he had 10,000 books in the collection, only 6,000 were on the shelves. That did make a difference.

He then walked through the journal collection, abacus in hand. Instead of seven shelves per section, the size of many of the journals required that, in a number of sections, only six could be used. So that he could shift journals as new titles were purchased or binding shipments came in, he had made six shelves standard throughout the periodical area. That required a total of 106 sections for his bound journals instead of the recommended 77. In addition, he had a total of approximately 200 shelves that held unbound issues or had been left for expansion. This accounted for an additional 33 sections. At this point he began to have a better appreciation for the validity of the formulae.

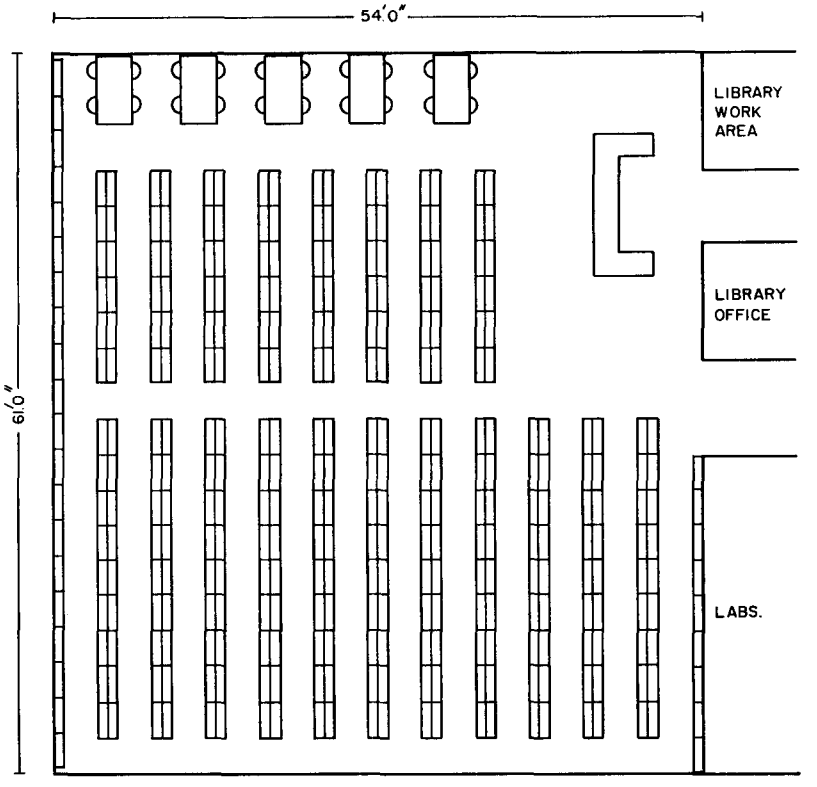
His yardstick showed that instead of 4-foot 6-inch centers for his stacks, he had somewhat over 4-foot aisles between ranges, a perimeter 4-foot aisle around the area and a center aisle through the stacks so that none of the ranges were longer than 15 feet.

His solution to his shelving requirements resulted in a careful review of his journal practices. He initiated a discarding policy for journals he didn't bind and a regular binding policy for those which were retained.

He also replanned his stack area to learn what his ultimate storage capacity really was. Using the recommended centering for ranges and the 3-foot aisle space, he found he could increase his shelving from 200 sections to over 300 sections.

Steel Shelving Qualities

Let us leave our hypothesizing, hypothetical librarian and look at another thing that caught his attention—steel



Revised hypothetical library with 323 shelf sections

shelving. For a competitive product, steel shelving has a surprising degree of standardization among the various manufacturers. Size is standard—sections are 3 feet wide and 7 feet 6 inches high, and all sections can at least be placed back to back to form double ranges.

There appear to be two basic patterns: *1)* shelving suspended from a pair of uprights by brackets that hook into holes in the uprights, and *2)* shelving that slides into slots in the end panels. Most manufacturers offer both types. In either case, individual shelves are readily adjustable on 1-inch centers, and for some of the slotted end-panel sections, on ½-inch centers.

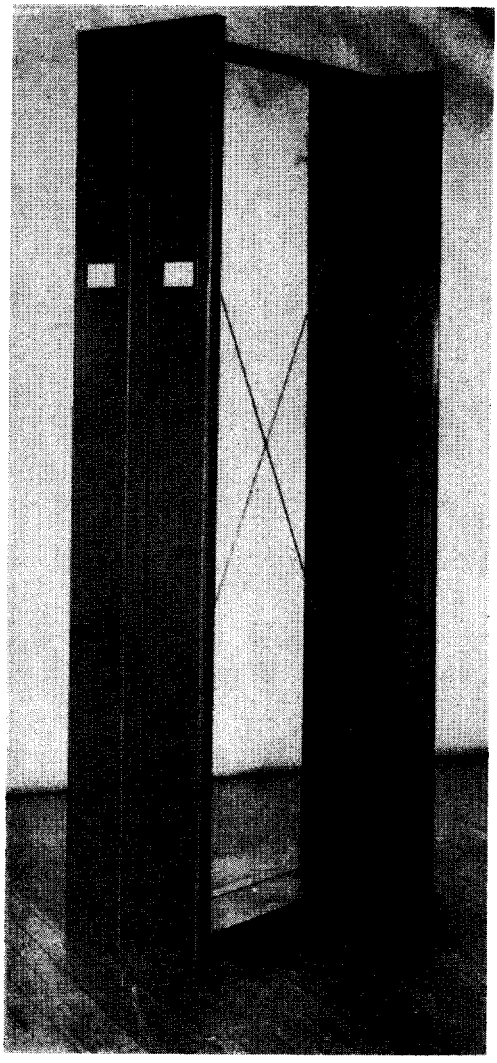
There are, of course, minor differences between the products of the various manufacturers. The basic pattern for bracket-type shelving is to have two or three engaging lugs at the top and at least one at the bottom. These lugs are curved so the shelf must be lifted slightly in order to remove it. Most manufacturers make a right-hand and a left-hand bracket, but one thoughtful manufacturer makes a reversible one that fits at either end of the shelf.

The uprights into which the shelf brackets are hooked are basically similar. These are made of 16-gauge steel and usually made with eight right angles. The holes in which the lugs of the shelf bracket fit are different, or additional small location holes are drilled at regular intervals so that it is easy to place the shelves level and at regular intervals.

Slotted shelves are also built on a comparable pattern. Some offer shelves that can be adjusted on ½-inch intervals, but the standard pattern is for adjustments at 1-inch intervals. Some shelves engage in a slot that extends the depth of the end or side panel, while others engage in a slot at the front and back of the panel. Because of the nature of the construction, the end panels are of lighter gauge steel than are the upright columns for the bracket-type of shelving.

The question of whether to buy the

bracket-type or the slotted-type of shelving is, with a couple of exceptions, resolved by personal preference. If one desires to store current journals on shelves at 3-inch intervals, he had better content himself with the slotted variety of shelving, for with the bracket-type of shelving, the controlling factor is the height of the bracket. On the other hand, if he wishes or has to use two different depths of shelving—say the 8-inch and the 10-inch—in the same section, he can do so by using the bracket type. The decision as to type may also be made on the kind of accessories required, discussed later.



A sample free-standing double-faced, slotted-type shelving.

Shelving Specifications and Considerations

How careful should the librarian be in preparing specifications for his shelving? The answer to this depends upon the librarian, the purchasing department and the auditors. It may also depend upon how the librarian plans to use the shelving.

If the maintenance crew is apt to use the shelving as a base for scaffolding to do repair work on the ceiling or if there is a short, athletic variety of librarian who uses the shelving as a ladder to reach the top shelf, some rather rigorous specifications may be required and the plant engineer should be called in to help write them. But if one plans to store regular library books and journals on the shelves and to use them in a normal fashion, the product of any of the regular manufacturers of library shelving will be adequate.

Ray Dickison, librarian of the Oak Ridge National Laboratory, has written me that he has procured his steel shelving from six different manufacturers and has found that requiring "standard steel library shelving" yields satisfactory results.

Just as is true of wooden shelving, there are some inherent problems with steel shelving, many of which are not the exclusive fault of the manufacturers. Shelves should be easily removed and replaced to obtain different spacing between shelves. If the shelving is not properly erected, this may prove difficult. Improper alinement of a range may result in the binding of a shelf so that it can neither be removed nor replaced easily. I have experienced this difficulty with both the bracket and the slotted type of shelves. It is also possible for the erection crew to fail to engage the shelf in the bracket or in the slot in the end panels. I have not yet seen steel shelving that could not be scratched.

Free-standing shelves are offered by several of the manufacturers. Regardless of the design and techniques of manufacture, if the floor on which the shelving is placed is uneven or if the shelving is not properly installed, it may require addi-

tional bracing. After it is erected and filled with books, lean on it. If you can sway it, call in your safety engineer or ask the maintenance men to tie the ranges together with angle iron.

Occasionally it may be necessary to order additional shelving. Remember that although shelving is quite similar, it isn't interchangeable, so be sure to order the additional shelving from the manufacturer of the ranges in which you wish to use it. Also remember that the 8, 10 and 12-inch deep shelving are nominal depths and *not the actual depth* of the shelves. The nominal depth is figured from the center of the range to the edge of the shelf. A nominal 8-inch-deep shelf from Remington Rand actually has a depth of 7 inches.

Shelving Accessories

While all libraries are faced with the problem of book and journal storage, most libraries have other storage requirements they hope shelving manufacturers will solve for them. If the problem is not absolutely unique, the manufacturers can help them.

Many libraries store reports, pamphlets or folders of materials. While filing cabinets are frequently used to house this type of material, librarians will find that steel shelving offers more economic utilization of the available floor space. This material can be stored in pamphlet boxes and put on standard shelving, or divider shelves may be used. A divider shelf has slots at one-inch intervals in the shelf itself and in the back support of the shelf. The manufacturers supply five dividers per shelf so that rigid support for curl-inclined type of material can be provided at 6-inch intervals.

It is frequently helpful if material can be inspected at the shelf location. For this purpose, manufacturers offer "reference" shelves. These are attached to the shelf holding the books and may be pulled out to hold a book to be examined or to hold material to be filed. The reference shelf can be installed only in double-faced sections, which have no backs or sway braces, because the reference shelf, to be supported, must be approximately twice as deep as the shelf to which it is attached. In some models, it can be pulled out and used on either side of the range.

Periodical shelving for back issues with sliding slanting shelf for current issues. Note bracket-type shelving on the upper right.

There are a variety of book ends. The simplest pattern is a sheet of metal with a U-cut made in it. It is then bent so that the U-tongue fits under the books and the bottom of the sheet supports the device. These can be obtained with felt or a plastic on the base to prevent slipping and to protect the shelf from being scratched. It is very easy to lose such a support between books or to "spear" a book with a book end when the book is placed on a shelf. However, by putting a flange on either the side or the top, both the potential for becoming lost and book spearing is overcome.

A wire book end, which is inserted in the overhead shelf, is offered by several manufacturers. While their literature says these can be inserted and adjusted easily by a slight squeeze, there must be enough tension to keep the support from slipping, and one of my correspondents reported she had considerable difficulty in inserting and adjusting these supports.

Globe-Wernicke, in its "Trac-shelf" line offers a book end that can be used either from the shelf above or in the regular position. This device requires a shelf that has an interior, longitudinal slot.

It is sometimes desirable to have lockable compartments in the stacks in which rare books, manuscripts or other items can be protected. These are offered by at least

three manufacturers: Remington Rand, Hamilton and Globe-Wernicke. The ones offered by Remington Rand are 16 inches high and 11 inches deep. These may be inserted in any stack section when they are needed.

Librarians like to display the current issues of their journals. The manufacturers offer slanted shelves with a flange on the bottom. These can be interspersed with regular flat shelves to store the preceding issues. It is also possible to purchase combination display and storage shelves. This combination offers a slanted shelf that may be lifted and slid back into the unit to display the stored journals.

Martha Bailey, librarian of the Linde Company, had her maintenance people build slanted shelves for her journals. These shelves were hinged to a stationary flat shelf but could not be slid into the stack. She found it desirable to have little aluminum batons made with rubber tips on either end to prop open the shelves so that she could get at the stored back issues with both hands.

Newspapers also offer a challenge to the librarian. All manufacturers offer display racks as part of their regular shelving. These are angled supports fastened either to the end panels or to the uprights on which 6 to 11 newspaper rods can be stored. The catalogs of Globe-Wernicke and Hamilton also offer extra-deep shelves (18 and 22 inches) to hold back issues.

Carrels for use in stack areas are a common product. These are standard units, which can be attached to stack unit by brackets or can be obtained with legs and used as free-standing units.

Not all of the accessories of each manufacturer were shown in the catalogs sent me. I would suggest that unique requirements be discussed with the representatives of possible suppliers to determine what they have available or can make.

Plea for Information

As a Special Library Association representative on the ASA Z-85 Committee, I have been appointed to the Steel Shelving Subcommittee. Honesty compels me to admit that, during the year I have been a member of the Committee, it has not met; I am, however, optimistic in assuming that a meeting will be held in the near future. If I am to serve as the Association's representative, I can do so effectively only as members advise me of the problems they experience with steel shelving.

AUTHOR'S NOTE: I would like to acknowledge the assistance I have received in the preparation of this paper:

Martha J. Bailey, Linde Company, Indianapolis, Indiana
Mollie Seibert, General Electric, Waterford, New York
R. R. Dickison, Oak Ridge National Laboratory, Oak Ridge, Tennessee
Leslie Poland, Ethyl Corporation, Detroit, Michigan

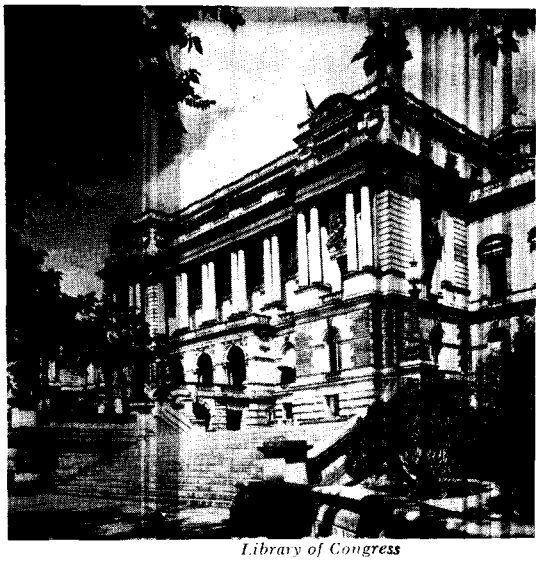
Burroughs Manufacturing Company
Deluxe Metal Products Company
The Globe-Wernicke Company
Hamilton Manufacturing Company
Penco Division of Alan Wood Steel Company
Remington Rand

Funds for Business History Study

The Harvard Graduate School of Business Administration announces the availability of funds to aid archivists, librarians and researchers interested in investigating topics in economic and business history or in studying the acquisition and handling of archival material, manuscripts and books in this field. The School's unique resources in these areas will be available to such persons during the summer of 1962. Members of the Business History Group and the staff of Baker Library will be available for consultation and guidance, but applicants who receive assistance will be free to pursue their projects as they think best. The criterion for awarding financial aid will be primarily the extent to which the use of the School's resources can be expected to advance proposed projects. This decision will be made by a committee of faculty members at the Harvard Business School. The amount of aid will be adjusted to the requirements of the individuals who are selected. Inquiries may be addressed to Professor Ralph W. Hidy, Morgan 304, Harvard Graduate School of Business Administration, Soldiers Field, Boston 63.

Washington in 1962

DR. KARL A. BAER, Chief Librarian
National Housing Center Library
Washington, D. C.



Library of Congress

BLAME IT ON L'ENFANT! The city planner of Washington, who designed a plan characterized by the criss-crossing of numerous avenues, by unexpected tangents and by numberless odd junctions and breaks, may well be responsible for your getting lost during a walk in the Nation's Capital. But, think nothing of it—wherever you may find yourself, you are bound to be near some interesting sight: an imposing government building, an embassy built in a strange foreign style, an art gallery, a museum, even a mosque, or—perish forbid—a library, which may just happen to be "special."

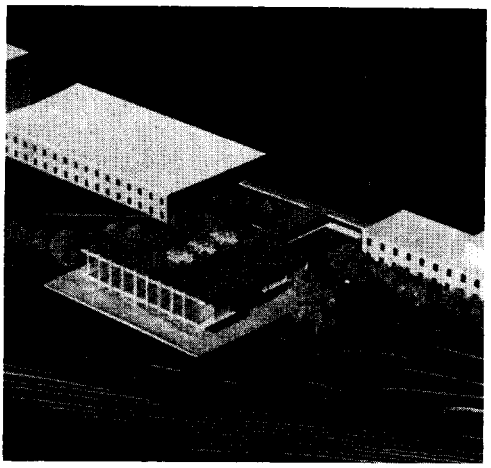
If you are completely uncertain where you are and how to get to that workshop (or cocktail party) in time, one of the more than 10,000 inexpensive cabs is sure to come along and take you to your destination. You will also find that even areas designated by such names as Foggy Bottom and Swampoodle are perfectly safe and acceptable. The slums that disgraced the environs of the Capitol have given way to remodeled "status" townhouses and to new developments. A walk in that part of town will also give you a good opportunity to form your own opinion on the pros and cons of the "federal style" in architecture.

But enough said about local sightseeing—you, being a librarian, will read much about the attractions of our city before you come; for those not familiar with the literature, a few books and guides are listed at the end of this article. There is too much to be seen even to summarize in an entire issue of *Special Libraries*—and I have only a few pages! Let me therefore devote my remaining remarks to our principal interest—special libraries.

The Library of Congress has very often been referred to as an accumulation of many special libraries under *one* administration. There could be no more apt characterization of the place where subject specialists and librarians cooperate in making available holdings that outstrip—particularly in English and Russian—the holdings of practically any special library of the world, in any field, except medicine and agriculture. In these fields two other government libraries—special and national at the same time—have assumed the duty and privilege of acquiring "everything."

The Library of the Department of Agriculture (including, for you honey-lovers, an apiculture unit at suburban Beltsville) not only prides itself on possessing the largest collection of agricultural material in the world but also is associated with the work of many land-grant colleges and experiment stations throughout the United States. As far as the National Library of Medicine is concerned, you will find it most worthwhile to take the pleasant ride out to Bethesda in order to see the attractive ultra-modern building that was dedicated in December 1961 and into which the collections are scheduled to be moved in April 1962.

Other federal libraries are largely so-called "agency libraries" designed to serve as information centers for, and in the subject



Model of Johns Hopkins University, Applied Physics Laboratory Library, To Be Ready Fall 1962.

field of, the government agencies of which they are a part. On the basis of their special subject coverage and their service to a special limited clientele, they are doubly deserving of the designation "special library." To list them would mean listing all the departments of federal government. Mention must be made, however, of the important libraries of the Defense Department. There is the Army Library, rather general, which actually is the Pentagon Library and serves all branches of the Defense Department. The Army Map Service Map Library is the center of topographic maps for the entire Defense Department. The Air Force maintains technical libraries at Andrews Air Force Base and the libraries of the Air Force Office of Scientific Research, which is concerned with basic physical sciences, and the Office of Aerospace Research. The Navy's libraries are far-flung and numerous. The Naval Observatory Library was recently described in *Special Libraries* (February 1961, p. 78-81). The Naval Research Laboratory maintains a vast scientific and technical collection, while the Navy Department Library itself emphasizes naval history and science as well as the law of the sea and international law.

Other important federal organizations, which are not libraries as such but offer most important services to the librarian, include the Armed Services Technical Information Agency and the Office of Technical Services of the Department of Commerce. ASTIA uses the most up-to-date machine indexing methods to make report literature available to the military and its contractors. OTS performs the same task for the general public by acting as a clearinghouse for scientific, technological and engineering reports and translations.

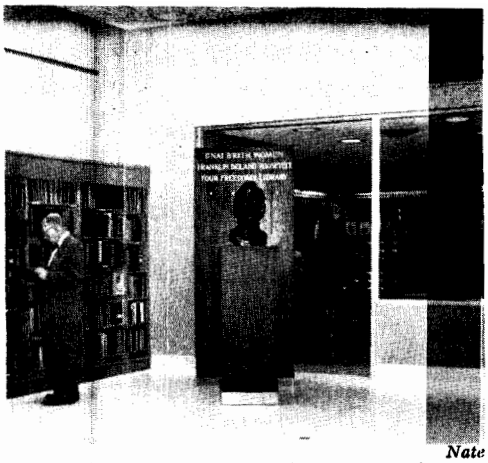
Privately owned special libraries may take a back seat in the capital city, but there are many you will want to visit and which will be happy to receive you. In the field of science and technology, there are the libraries of the American Chemical Society, housed in a brand-new building on 16th Street;* the American Institute of Architects, which you will have to visit simply in order to see Washington's most beautiful work of architecture, William Thornton's Octagon House with its rich history; Johns Hopkins Applied Research Laboratory located in Maryland; and the Harris Research Laboratories in the textile field. The National Geographic Society Library, almost directly opposite the Chemical Society's Library, offers one of the finest picture collections anywhere.

Social science specialists will not want to miss the beautiful library of the Brookings

ASTIA Computation Division. Left, Are Computer and Tape Synchronizer. Right, Are Magnetic Tapes and Punched Card Reader.
Harris & Ewing

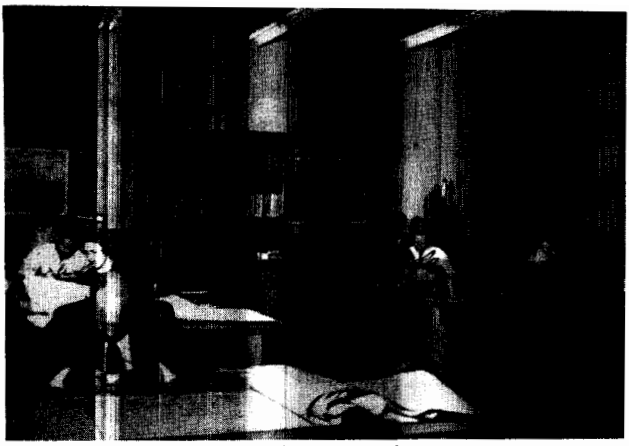
National Housing Center Library
Del Ankers

* There is a very conveniently located cluster of special libraries on lower 16th Street, close to the Statler Hilton Hotel. It includes, besides the ACS Library, the Four Freedoms Library of the B'nai B'rith Women, the National Education Association, the National Housing Center and the National Geographic Society libraries.



Nate

Franklin Delano Roosevelt Four Freedoms Library of the B'nai B'rith Women.



Army Map Service Map Library Reading Room

Institution, now housed in a new building and illustrating new ideas in the fields of planning and equipment. The newspaper librarians will put on their agenda the libraries of the Washington *Post,* the *Times Herald,* the Washington *Star,* the *Daily News* and, lo and behold, the New York *Times* (Washington Bureau). Insurance librarians will be welcomed at the Acacia Mutual Life Insurance Company Library. The Joint Bank-Fund Library of the International Monetary Fund and International Bank for Reconstruction and Development, Standard and Poor's Corporation and the Security and Exchange Commission will open their doors to the financial wizards of SLA. Art lovers will feel at home at the libraries of the Freer Gallery of Art (Far and Near East) and the National Gallery.

A characteristic Washingtonian phenomenon is the number of trade associations, most of which have libraries covering their subject fields. They range all the way from the National Paint and Varnish Association to the Chamber of Commerce of the United States, and from the National Association of Home Builders to the American Pharmaceutical Association (the only non-government building on monumental Constitution Avenue). To mention a few more, there are the National Association of Electric Companies, the National Association of Food Chains, the National Highway Users Conference and the American Automobile Association.

And where else can you find such libraries as those of the Daughters of the American Revolution, the Democratic and Republican National Committees, the National Society of Sons of the American Revolution, the Roosevelt Four Freedoms Library and the Library of the Scottish Rites Supreme Council?

At the risk of tiring the reader of this enumerative guide, let me mention also the numerous embassies whose libraries are forever helpful in supplying hard-to-get information on foreign lands.

And now, as a dessert after these many hearty dishes, two special delicacies—places to rest your weary feet and feast your eyes—The Folger Shakespeare Library, with its splendid exhibits and Elizabethan stage, and in Georgetown, Dumbarton Oaks, Harvard's contribution to the Washington library scene.

After you have visited all the libraries listed here, plus a few others that you will find in *Library and Reference Facilities in the Area of the District of Columbia* (sixth ed., issued by the Library of Congress, Loan Division, 1959), you will agree that much progress has been achieved since 1948, SLA's last previous Washington Convention.

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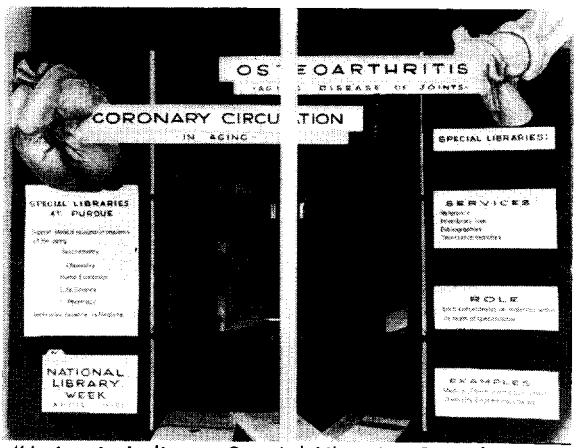
National Library of Medicine To Be Completed April 1962 *Sam Silverman*

Why I Participate in National Library Week

The Library and Research



"Aging in Indiana—Special Libraries Contribution"

LIBRARIES AND LIBRARIANS have made important contributions to research in one form or another since man learned to record his thoughts and accomplishments on stone or papyrus with the instruments he had at hand. Today that contribution is assuming monumental proportions, the ramifications of which have led to the growth of special collections and the development of special libraries. When the Indiana Chapter of Special Libraries Association enlisted the cooperation of the special librarians at Purdue University in a state-wide project publicizing "Aging in Indiana—Special Libraries Contribution" as a National Library Week project for 1961, we agreed that one of our major contributions was the acquisition of material and extension of services to support geriatric research. Exhibits were assembled for display in the foyers adjacent to the participating libraries—Life Science, General Library, Pharmacy and Veterinary Science and Medicine.

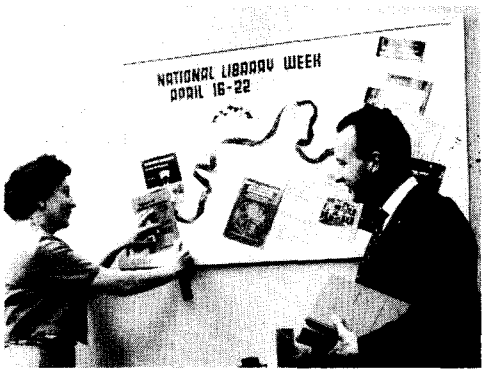
Cardiovascular research and studies of degenerative joint disease are outstanding projects of current interest to the staff of Purdue's School of Veterinary Science and Medicine. What segment of our population will benefit most from the results of such research? Surely our senior citizens! The library collection reflected the interest; all we needed was the artistic touch of our medical illustrator to help us assemble three outstanding exhibits, which furnished a visual demonstration of the interrelationship of our research and library projects. These produced an awareness on the part of our professional students in the veterinary medicine curriculum of their potential role in medical research and stimulated active interest in the library and its resources, not only by these students but also by our other clientele made up of Purdue University staff, graduate students and research workers in many areas of the biological sciences.

Even sophisticated faculty and graduate students gain motivation from being reminded of the great social values arising out of their research. National Library Week provides an opportunity for us to be dignified hucksters of our wares. What use shelves brimming with records of scientific achievement, if we don't sell our product to potential users, who gather respect for themselves as researchers and for librarians and libraries as resources

from refreshed knowledge of past performances and in awareness of what is yet to be accomplished?

ANN KERKER, Librarian, Veterinary Science and Medicine Library
Purdue University, Lafayette, Indiana

Promoting Library Awareness



June Kostyk, Technical Librarian, and Nate Sands post book jacket on 1961 NLW display

THE LIBRARY IS CONSIDERED an integral part of the engineering-research-management effort at General Precision's Librascope Division. Every employee is eligible to borrow and use the collection.

Some people automatically recognize the value of a company library and cannot do without it. Others have to be reminded that a library exists and where it is located. Promoting library awareness is a 52-week a year proposition.

I welcome such an event as National Library Week. It helps tremendously to publicize our efforts throughout the year. A definite reaction is evident from the public and company personnel.

National Library Week is growing each year and is gaining recognition from our scientists, engineers and administrative personnel.

Last year we featured special book displays on computer technology, an orientation for new employees and publicity to the local papers.

This year an even greater effort will be made to reach Librascope's 4,100 employees. The employees are located in more than 30 buildings from Sunnyvale near San Francisco to San Marcos just north of San Diego. Our library is located in the headquarters building complex in Glendale, and we service all buildings.

We are planning a poster idea for the many bulletin boards throughout the company as well as a message in the *Librazette,* a company paper that is mailed to each employee's home.

As is customary each year, I discuss and exchange ideas about our goals and services with many of the engineers and scientists. My feeling is that National Library Week affords an excellent opportunity for the user and the librarian to know each other just a little bit better.

NATE SANDS, Supervisor of Library Services
General Precision, Library Division, Glendale, California

"Total Push" Method at VA Center

LAST YEAR DURING NATIONAL LIBRARY WEEK when one of the doctors at the VA Center, Wood, Wisconsin, said to a library staff member, "This is the week we should send you librarians flowers," we felt that we had arrived. It made us feel that the library and the services offered by our staff were appreciated.

If the praise expressed by this doctor were a daily occurrence, I would feel no compulsion to participate in National Library Week. Unfortunately, it is not. I participate in National Library Week because it offers our library program a "built-in" opportunity to reach the "theys" and the "those." The "theys" are the management people who determine how much space, staffing and budget should be allotted the library service. The "those" are the persons whom we reach with our services. I'm sure that it is a rare librarian who feels that her patrons are making maximum use of the library. Of course, we publicize

our libraries all-year round. However, National Library Week offers a "stepped-up" opportunity to use every creative and imaginative measure to publicize the library and its work. The SLA Wisconsin Chapter described it as the "total push" method, in which a variety of communication media were used by libraries to reach the various publics served.

On a smaller scale we have used the "total push" method in our National Library Week observance at the VA Center. Our objective has been to reach all of our publics and to increase support and usage of our program. Annually during NLW, the Center Director holds his staff meeting in our Wadsworth Library. This marks the beginning of a week-long observance with posters throughout our Center, spot announcements on the public address system and articles in both patients' and employees' publications publicizing the Week. Open house events for employees or VA voluntary service groups are featured. Patients and members are encouraged to submit entries on "What the Library Means to Me" to the Hospitalized Veterans Writing Project.

NLW provides a wonderful opportunity for the individual librarian working in one library or combining efforts with other librarians and library groups to bring the library story to the great unreached. As a member of our proud profession, I'm glad to use NLW to help tell that story.

FLORENCE MARKUS, Chief Librarian
VA Center, Wood, Wisconsin

SLA Sustaining Members

The following organizations are supporting the activities and objectives of the Special Libraries Association by becoming Sustaining Members for 1962. These are additions to the 59 Sustaining Members listed in News and Notes, January 1962.

AMERICAN HERITAGE PUBLISHING COMPANY, New York, New York
AMERICAN IRON AND STEEL INSTITUTE, New York, New York
ARGONNE NATIONAL LABORATORY, Argonne, Illinois
ASTIA, Arlington, Virginia
ATLAS CHEMICAL INDUSTRIES, INC., Wilmington, Delaware
BELL & HOWELL RESEARCH CENTER, Pasadena, California
BELL TELEPHONE LABORATORIES, New York, New York
BRIDGEPORT PUBLIC LIBRARY, Bridgeport, Connecticut
CHEMCELL LIMITED, Montreal, Quebec, Canada
CONSOLIDATED EDISON COMPANY OF NEW YORK, New York, New York
CORNELL UNIVERSITY LIBRARY, Ithaca, New York
FEDERAL RESERVE BANK OF NEW YORK, New York, New York
FORD MOTOR COMPANY, Scientific Laboratory, Dearborn, Michigan
GENERAL FOODS CORPORATION, Research Center, Tarrytown, New York
JOHNS-MANVILLE RESEARCH CENTER, Manville, New Jersey
WALTER J. JOHNSON, INC., New York, New York
LOCKHEED MISSILES & SPACE DIVISION, Technical Information Center, Palo Alto, California
MARQUETTE UNIVERSITY MEMORIAL LIBRARY, Milwaukee, Wisconsin
MELLON NATIONAL BANK AND TRUST COMPANY, Pittsburgh, Pennsylvania
NEW YORK PUBLIC LIBRARY, New York, New York
OHIO OIL COMPANY, Littleton, Colorado
PENNSYLVANIA STATE LIBRARY, Harrisburg, Pennsylvania
PERGAMON PRESS, INC., New York, New York
PITTSBURGH PLATE GLASS COMPANY, Chemical Division, Research Library, Barberton, Ohio
PUBLIC SERVICE ELECTRIC & GAS COMPANY, Newark, New Jersey
PURE OIL COMPANY, Palatine, Illinois
SPACE TECHNOLOGY LABS., INC., Redondo Beach, California
UNITED STATES AIR FORCE ACADEMY, Colorado
UNIVERSAL OIL PRODUCTS COMPANY, Des Plaines, Illinois
UNIVERSITY OF MARYLAND, Theodore R. McKeldin Library, College Park, Maryland
UNIVERSITY OF OKLAHOMA LIBRARY, Norman, Oklahoma
UNIVERSITY OF WASHINGTON LIBRARY, Seattle, Washington
WAYNE STATE UNIVERSITY, Serials Department, Detroit, Michigan
WYETH LABORATORIES, INC., Philadelphia, Pennsylvania

EDITOR'S NOTE: This list includes all applications received through January 16, 1962. Supplements will appear in future issues.

This Works For Us . . .

Library Information Meetings

The technical library serves the Direct Current Motor and Generator Department of the General Electric Company, Erie, Pennsylvania. While it primarily serves the engineering functions, it is also utilized by manufacturing, legal, finance and marketing functions. The library is housed in the same building as the administrative offices and laboratories, from which it serves five product sections, some of which are physically located at some distance. Records indicated the biggest library users, the laboratories, were located nearest our doors while the most distant building ranked last. Our records further revealed that this pattern had grown each year since the library was organized in 1956. This fact, together with the turnover in personnel since 1956, had left us with a group of engineering personnel that knew little of the library's original aims or the total services offered.

Our approach to the problem of keeping company personnel informed of library services was to hold a series of "Library Information Meetings" with representatives from each of the sections the library serves. The first two-hour meeting was scheduled, with a second feed-back meeting scheduled a month later. To obtain a good cross-section of opinion, we invited seven engineers and specialists. The meeting began with a formal talk by the technical data specialist, who outlined the growth of the library since it was established and a detailed description of all the services offered.

At the close of the first meeting, each participant was asked to request a literature search on a current project or a proposed future project. The completed search would be given to him at the next meeting. Second, any questions, suggestions or complaints regarding the library services should be made known, with the understanding all questions would be answered later.

A month later, a second meeting was held with the same group. All literature searches were returned for study and comments. These searches consisted primarily of company reports and data folders. Our aims in having the participants request such searches were *1)* to stress the idea that engineering personnel in all the allied plants had problems similar to theirs and had fulfilled their obligation by writing reports; *2)* to emphasize that the cliche of reinventing the wheel is not so hackneyed as it sounds; and, *3)* by obtaining a list of company reports in a given field, to give them a list of people (authors) with similar problems whom they could contact.

Each participant was asked to answer a series of questions to aid us in determining if the meetings should be extended to other sections and to obtain their impressions of the literature searches. It read:

DATA FEEDBACK SHEET

1. What do you think are the library's weak points?
2. Do you think these meetings should be continued and extended to other engineering groups?
3. Did you receive any new information of value, as a result of attending the two information meetings?
4. Was the literature search you asked for of any value? Yes____No____ Comments _____
5. What are some of the things you think should be changed in the technical information services?

On the basis of the answers received, we concluded that the meetings should be continued and the size of a group should not exceed eight people. The constructive remarks resulting from the question, "What are some of the things you would like to see changed in the technical information services," gave added weight to the library's requests to increase expenditures in basic text books and encyclopedias.

The time spent by the technical data specialist in preparing and giving the presentation was less than anticipated and did not add appreciably to his normal work load. We also found that one meeting was sufficient, since the feed-back meeting was only needed when we were trying to determine the validity of holding library meetings. In future meetings reference searches from the trial meetings will be used to make our points. We also realized that because of the diversified nature of

their work and work areas, some of the individuals attending were meeting formally for the first time. This consequently led to a "We do it this way" discussion. The interchange of ideas was most rewarding. The results of future meetings can only be anticipated, but on the basis of our sampling it appears this will be time well spent.

R. M. BOLE, Technical Information Specialist
General Electric Company, Erie, Pennsylvania

Have You Heard . . .

Citation Index Study

A $300,000 grant has been awarded to the Institute for Scientific Information, Philadelphia, Pennsylvania, by National Institutes of Health and National Science Foundation to study the practicability of citation indexes and to test their techniques of preparation during a three-year project investigating a new technique, the "citation index." This approach links together subject material that would not be collated by usual indexing systems. It lists all material containing a specific citation, or in other words, indexes citations. By focusing on the individual citation rather than specific subjects, the citation index may provide a significant new method of scientific documentation as well as a growing bibliographical aid. This particular project is aimed at producing a unified citation index for science including the publication of a genetics index. The citation index is intended to complement rather than substitute for indexes such as Beilstein, Chemical Abstracts or Biological Abstracts.

ATLA Library Development Program

The Sealantic Fund, Inc., has granted $875,000 to the American Theological Library Association for a Library Development Program to benefit accredited members of the Association. The objectives of the grant are to strengthen the book collections of member libraries through increased book purchases, to extend all phases of work and services of these libraries and to provide visiting teams of librarians and faculty to advise the libraries.

New NSF Office

The National Science Foundation has established an Office of International Activities, headed by Dr. Arthur Roe. The duties of the Office include providing staff and policy guidance on international aspects of science education, research support, exchange of scientific information and coordination of Foundation activities involving new programs or policies of international scope. It will also be charged with the development of experimental programs in science cooperation and administrating Foundation staffs in Tokyo and Paris.

Recruiting Council

Seventy-five librarians were among representatives of the book world attending an organizational meeting of the Middle Atlantic Library Recruiting Council at the Drexel Institute of Technology on November 14. Each member of the Council agreed to undertake a number of specific activities during 1962 to spearhead a coordinated recruiting program in the Middle Atlantic area.

Coming Events

The American Mathematical Society and the Association for Computing Machinery will co-sponsor a symposium, INTERACTIONS BETWEEN MATHEMATICAL RESEARCH, April 16-19, at the Chalfonte-Haddon Hotel, Atlantic City, New Jersey. The U. S. Army Research Office, Durham, North Carolina, and the National Science Foundation will finance the meeting. The objective of the symposium is to enable mathematicians to become familiar with the potentialities of the current types of computers and with the problems involved in their proper exploitation and to stimulate activity in related areas. For further information write the Society, 190 Hope Street, Providence 8, Rhode Island.

The Graduate School of Library Science, Drexel Institute of Technology will hold a

SEMINAR IN SEARCH STRATEGY, April 30-June 8. The course is designed for persons experienced in electronics or documentation to study current techniques in information retrieval, and will include explanations of leading documentation systems, methods of thesaurus construction, methods of indexing and personal contact with various types of equipment from the simplest automation devices to complex electronic computers. It will be directed by Mrs. Claire Schultz. Details may be obtained from Mrs. M. H. Davis, c/o the Seminar in Search Strategy at the Institute in Philadelphia.

CLR Grant to Archivists

The Council on Library Resources, Inc. has given the Society of American Archivists a $42,000 grant to make a study of state archival agencies and programs in order to set standards and discover improvements. Dr. Ernest Posner, Professor Emeritus of History of the American University in Washington and former President of the Society, will conduct the 18-month study. It is expected to cover budgetary requirements, educational and other qualifications of staff, arrangements for the administration of current as well as historical archives, physical facilities, description of records and publication and service to the government as well as to the non-official inquirer.

Members in the News

WAYNE R. CAMPBELL has been appointed Chief Librarian of the Scientific Library of the United States Patent Office in Washington, effective July 31, 1961. Mr. Campbell has been a librarian in the federal service since September 1951.

LORRAINE CIBOCH, formerly Librarian at the Charles Bruning Company, Mt. Prospect, Illinois, has taken a position as Chief Librarian with Fansteel Metallurgical Corporation, North Chicago. Miss Ciboch is a Director on the Executive Board of SLA.

PAULINE HUTCHINSON, formerly Librarian at the Canada Life Assurance Company in Toronto, has been appointed Executive Secretary of the Ontario Library Association, also in Toronto. Miss Hutchinson was elected to the SLA Hall of Fame in 1960.

CONSULTANTS
to the
Special Libraries Committee

Alberta L. Brown

Because she has had long and varied experience as a professional librarian and consultant; Because she is knowledgeable about the entire library field and is an active member of the Medical Library Association, American Library Association, Chemical Literature Division of the American Chemical Society and of Special Libraries Association; Because she is an outstanding pharmaceutical librarian and was head of The Upjohn Company library for 18 years; Because she is a Past-President of the Association, is a member of its Hall of Fame and is acquainted with all aspects of the Association's work; Because she has written many articles on library topics and is conscious of the value of professional publications.

Dr. I. A. Warheit

Because he is an expert on information storage and retrieval systems both for government and industry; Because he has organized and administered large technical libraries for the Allison Engine Division of General Motors Corporation and the Atomic Energy Commission and is now associated with the Information Retrieval Program of the Advanced Systems Development Division of IBM; Because he delineates, in print and in speeches, complicated concepts and techniques of documentation in a cogent, intelligible manner; Because he participates in the American Documentation Institute, American Association for the Advancement of Science and the Chemical Literature Division of the American Chemical Society and is a Past-Chairman of SLA's Documentation Division, for which he has planned a continuing series of programs at the Association's annual conventions.

Off the Press . . .

Book Review

ON RETRIEVAL SYSTEM THEORY. *B. C. Vickery,* Washington, D. C.: Butterworths, 7235 Wisconsin Avenue, 1961. 170 p. $5.75.

Librarians, unfortunately, have had practically no training nor have they shown much interest in the theory of those elements which go to make up librarianship. The theoretical foundations of cataloging, shelf arrangement, reference service—generally referred to as the theory of information retrieval, or IR theory—have largely been ignored. American schools have taught these subjects much as a trade school would teach a practical trade. However, if we are to pretend to any professional competence and not be considered just high class clerks, we shall have to probe more deeply into the fundamentals that go to make up librarianship.

The scientists, mathematicians and engineers coming into the field of information retrieval are trying to establish some theories of IR. Like all newcomers who are ignorant of history, many of them are simply rediscovering the wheel. However, out of all the noise and confusion, gradually a body of IR theory is beginning to emerge. To date, however, there has been no book presenting any comprehensive or unified theory.

Vickery's small volume is a first modest attempt to cull the literature and bring together a few of the basic elements of IR theory. Like most first attempts and like most compilations, it is an extremely uneven and unsatisfying work. Where Vickery has set down some fundamentals, he has performed a real service. Where, however, he has tried to derive theory from a few scattered articles —and this forms the bulk of his book—he leaves much to be desired. He probably was premature in making the attempt, and, in his introduction he is careful to point out that it is an incomplete work and that he hopes it will stimulate others "to produce a more balanced survey."

The first three chapters are generally simple statements of fact, which attempt to define information retrieval, describe the basic elements of a retrieval system and the elements that make up document specification (descriptive cataloging) and discuss the description of contents (indexing). If for no other reason, librarians should find these few pages interesting for the vocabulary that systems analysts use to describe what a librarian does.

Chapters 4 and 5 on descriptor languages and the relationships between descriptors form the most substantial part of the book. Here Vickery brings together the fruits of the Classification Research Group's studies and discussions. Condensed to the essentials, the text is difficult to follow, and Vickery avoids pointing out the practical applications that may be derived. He does furnish, however, a good summary of current thinking, especially by the classifiers, about analytical and hierarchical relations, generic level and depth of indexing and discrimination.

The fact that user needs are so varied that no single hierarchy or synthetic relationship can satisfy these needs is not discussed. Nor is there the slightest hint about the very high input costs of the major systems mentioned. (Being a typical librarian's book, it slights economic analysis.) And what is the value of applying hierarchies to subjects with weak or nonexistent hierarchies such as theoretical physics? Actually, however, it is this exploration of relationships, of descriptor networks, that may in time lead to some very sophisticated search strategies programmed in a computer. In this regard, these theoretical studies can turn out to be very fruitful. It is too bad that Vickery, not fully understanding machines, did not connect this analysis of descriptor relationships with his chapters on search procedures and automation.

The chapter on file organization and coding is, as the author states, only a summary and a condensation. It is an important topic to anyone setting up a mechanized information retrieval system. Again, it is a difficult chapter to read. One could only wish it had been expanded with actual examples rather than symbols to show the working of term entry or inverted files (lookup) and item entry or serial files (search) and the economics of each. Incidentally, the standard subject card catalog is a term entry file and not, as the author calls it, an item entry file.

The overly brief chapter on search procedures shows the logical relations used in making searches and quotes Bernier on the probabilities in conjunctive search. This skimpy presentation is a great disappointment, for so much could be written on the theory of search strategy.

Chapter 8 on automation had best be skipped. It is essentially a compilation of various unrelated articles and an attempt by the author to generalize machine principles from a few reports. There seems to be no understanding of machine fundamentals, nor does there seem to be any acquaintance with actual operating machine systems. The errors are so numerous that it would serve no purpose to try to correct them.

A few generalizations about measuring retrieval efficiency, a description of Cleverdon's test and some comments on terminology conclude the text.

As stated above, this is a first attempt to cover a very difficult subject. It must be judged in this light and full credit should be given to the author for making the attempt. Librarians will probably find the subject matter and the presentation confusing and often unintelligible. This is too bad be-

cause we have such a crying need for some coherent analysis of the theoretical foundations of our profession.

DR. I. A. WARHEIT
IBM, Advanced Systems Development Division
San Jose, California

Bowker Buys Cattell Press

The R. R. Bowker Company has purchased the Jaques Cattell Press, Inc., of Phoenix, Arizona. Mrs. Elizabeth Walsh Cattell continues as Vice-President, and will be in charge of editorial operations in Phoenix where the S-Z volume of the tenth edition of *American Men of Science* is being completed. The first four volumes, a 5,000-page coverage of 90,000 scientists in physical and biological sciences, were completed in November; the fifth volume, covering the social and behavioral sciences, will be ready in the spring.

Mexican Bibliography Published

R. R. Bowker Company has made available, *Mexico Bibliografico,* a comprehensive bibliography of Mexican book output, compiled by Josefina Berroa. It covers the years 1957-60 and lists 4,332 works from 212 publishers, by author and then under 1,347 detailed subject headings. Science, economics, history, political science and children's books and fiction are covered, and translations and notes on original title and publisher are included. Information given includes author, title, publisher, publisher's address, binding, pages, price in Mexican pesos, series, year, translator and the original title if a translation. Outside Mexico and Cuba copies may be obtained from Bowker, at $12 each.

New York Chapter Directory Published

The ninth edition of the *Special Libraries Directory of Greater New York,* listing 845 libraries within a 50-mile radius of New York (thus including many libraries in Connecticut and New Jersey), is now available. Entries are arranged in 28 subject categories. There are alphabetical library and personnel indexes and a cross-referenced subject index. An additional feature of this edition is an alphabetical listing of the entire membership of the New York Chapter of SLA. The directory may be ordered from Roslyn S. Glicksman, Hydrocarbon Research, Inc., 115 Broadway, New York 6, at $3 to SLA members and $5 to nonmembers. Checks should be made payable to Special Libraries Association, New York Chapter.

New Serials

INFORMATION STORAGE AND RETRIEVAL, including mechanical translation, is an international quarterly journal, to begin publication early this year. The object of the journal is to provide a medium for the publication of advances in theory and techniques relating to information storage and retrieval, with special consideration of scientific information and the intellectual problems involved. On the theoretical side, research includes new departures in indexing, classification and notation, recording and disseminating information and the application of such disciplines as experimental psychology, semantics, linguistics, logic and information theory. The techniques include methods of representation and transmission of information, punch-card methods, mechanical and electronic selectors and mechanical translation. International news, letters to the editor and book reviews will be included. Annual subscriptions, $20 to multiple readers and $10 to individual readers, are available from Pergamon Press, 122 East 55th Street, New York 22.

ODYSSEY REVIEW is a quarterly publication in English of contemporary Latin American and European literature, including fiction, drama, poetry and criticism. Each issue contains over 200 pages and includes material of two Latin American and two European countries. The annual subscription price is $10; single copies are $2.95. Orders may be sent to Odyssey Review, Department 7 RW, 415 West 118th Street, New York 27.

PHYTOCHEMISTRY, International Journal of Plant Biochemistry, is a quarterly publication of Pergamon Press and was first issued in September 1961. The magazine publishes research, and provides a forum for the publication of papers from all parts of the world, on all aspects of pure and applied plant biochemistry. The annual subscription price is $20 to multiple reader organizations and $10 to private individuals, and it may be ordered from the publisher, 122 East 55th Street, New York 22.

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CARBONE, CARMELA. Audrey, Sibyl, and Alice in the Technical Information Libraries. *STWP Review,* vol. 9, no. 1, January 1962, p. 14-5.

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FIELD, OLIVER T. The Effective Administrator. *Southeastern Librarian,* vol. 11, no. 3, Fall 1961, p. 213-21.

GALFAND, SIDNEY. Organized Jewish Libraries. *Library Journal,* vol. 87, no. 1, January 1, 1962, p. 31-4.

GROESBECK, JOSEPH. The Dag Hammarskjold Library. *Stechert-Hafner Book News,* vol. 16, no. 4, December 1961, p. 43-4.

HINES, THEODORE C. Circulation Systems. *Library Journal,* vol. 86, no. 22, December 15, 1961, p. 4240-3.

JACKSON, EUGENE B. Special Libraries. *Library Trends,* vol. 10, no. 2, October 1961, p. 209-23.

NECKER, WALTER L. Deduct It From Your Income Tax. *Library Journal,* vol. 87, no. 1, January 1, 1962, p. 43-5.

OBOLER, ELI M. Attitudes on Segregation. *Library Journal,* vol. 86, no. 22, December 15, 1961, p. 4233-9.

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Dictionaries and Directories

AMERICAN ART DIRECTORY, vol. 41. *Dorothy B. Gilbert.* New York: Bowker, 1961. 448 p. $22.50; American Federation of Arts members, $20. (L. C. 99-1016)

1,762 museums, organizations and schools having art schools and classes. New section: listing of supervisors and directors of art education in U.S. school systems; Museum publications omitted; museum and art schools abroad enlarged. Subject-author index.

BOOKMAN'S GLOSSARY, 4th ed. *Mary C. Turner,* ed. New York: Bowker, 1961. 212 p. $5. (L. C. 61-13239)

A guide to terminology used in production of books. Enlarged to include latest technical developments in book manufacturing and the graphic arts and new terms in advertising, publicity and merchandising since 1951, the date of the previous edition. Index of foreign book trade terms. Reading list.

SCANDINAVIAN RESEARCH GUIDE: Directory of Research Institutions within Technology and Science Exclusive of Life Sciences, 2 vols. Blindern-Norway: Scandinavian Council for Applied Research, 1961. xix, 1173 p. pap. $10 each. Available from Office of Documentation, National Academy of Sciences, National Research Council, 2101 Constitution Avenue, Washington 25, D. C.

Over 1,500 research institutions in Scandinavia, giving name, address, telephone, head, staff, activities, contract policy, serial publications. Listed according to subject. Cross referenced. Volume 1: Research Institutes. Volume 2: Central Research organizations; universities and institutes of technology, information centres, scientific societies, subject index, institution index and persons index.

SYNONYM FINDER. *J. I. Rodale* and *Edward J. Fluck,* eds. Emmaus, Pennsylvania: Rodale Books, Inc., 1961. 1388 p. $10.95, regular; $16, deluxe limited ed.

Extensive alphabetical listing of keywords. Each keyword divided into categories: literal, figurative, transferred, specialized, rare and obsolete.

Miscellaneous References

ANIMAL SOUNDS AND COMMUNICATION (AIBS pub. no. 7). *W. E. Lanyon* and *W. N. Tavolga.* Washington, D. C.: American Institute of Biological Sciences, 1961. xiii, 443 p., illus.; 12-inch long playing record. $9.50; $8.50 to AIBS members. (L. C. 60-13370)

Proceedings of a Symposium held at the AIBS meetings at Bloomington, Indiana, September 1958, under joint auspices of the American Institute of Biological Sciences, the Ecological Society of America and the American Society of Zoologists. Record illustrates principles discussed in each chapter.

DOCUMENT REPRODUCTION SERVICES: Their Efficient Organization and Management. *F. Donker Duyvis* and *M. E. Schippers.* New York: Columbia University Press. 23 p. pap. 50¢.

Reprinted from Unesco Bulletin for Libraries vol. 14, no. 6, November-December 1960. Managerial principles for applying available means of reproduction, especially the haloid, silver and diazo processes.

GUIDE TO TECHNICAL LITERATURE PRODUCTION: A Concise Handbook of Production Methods. *Emerson Clarke.* River Forest, Ill.: T W Publishers, Box 152, 1961. xii, 192 p. pap. illus. $3.

Describes the elements of technical literature production and how to hire, evaluate and train the technical writer. Appendices; supplement.

GUIDE TO TECHNICAL WRITING. *C. Baker.* London and New York: Pitman, 1961. x, 101 p. illus. $3.50.

Basic guide containing selected material for reference in writing and illustrating. Index.

INDUSTRIAL EDITING: A Handbook on House Journals. *Bernard Smith.* London and New York: Pitman, 1961. xi, 225 p. illus. $6.75.

A guide to editing internal and external house journals; printing, blockmaking, design and layout covered. Appendices and index. Published under the auspices of the British Association of Industrial Editors.

PROCEEDINGS OF THE 36TH ANNUAL CONFERENCE OF THE AMERICAN INDUSTRIAL DEVELOPMENT COUNCIL, April 9, 10, 11, 1961, Sheraton Dallas Hotel, Dallas, Texas. 283 p. pap. $5. Available from the Council.

Directory of members by classification.

PUBLIC PAPERS OF THE PRESIDENTS OF THE UNITED STATES: Containing the Public Messages, Speeches and Statements of the President, April 12 to December 31, 1945. *Harry S. Truman.* Washington, D. C.: Government Printing Office, 1961. xxxi, 668 p. $5.50.

Part of annual, indexed series. This volume contains 230 items, appendices. Prepared by the Office of the Federal Register of General Services Administration's National Archives and Records Service.

RESEARCH AS A SCIENCE—ZETETICS. *Joseph T. Tykociner.* Urbana, Illinois: author, 306 West

Iowa St., 1959. xi, 205 p. pap. $2. (L. C. 60-18286)

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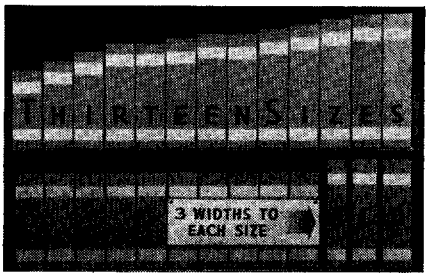

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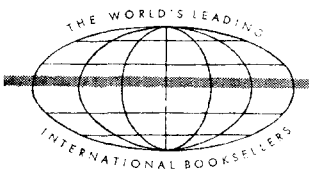

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