

WHAT EVERY ENGINEER SHOULD KNOW ABOUT

ENGINEERING INFORMATION RESOURCES

Margaret T. Schenk
James K. Webster





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*Science and Engineering Library
State University of New York
Buffalo, New York*



MARCEL DEKKER, INC.

New York and Basel

Library of Congress Cataloging in Publication Data

Schenk, Margaret T.,

**What every engineer should know about engineering
information resources.**

(What every engineer should know ; v. 13)

Includes bibliographies and index.

1. Engineering--Information services. 2. Technical
literature. I. Webster, James K. II. Title.
III. Series.

T10.7.S34 1984 620'.0072 84-11350
ISBN 0-8247-7244-X

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MARCEL DEKKER, INC.

270 Madison Avenue, New York, New York 10016


Current printing (last digit):

10 9 8 7 6 5 4 3 2 1

PRINTED IN THE UNITED STATES OF AMERICA



Preface



This volume in the *What Every Engineer Should Know* series developed out of a conviction that every engineer should know about engineering information resources, just as he should know about product liability or project management or micro-computers.

No engineer can afford to be unaware of the various types of information and data used in the practice of engineering—handbooks, tables, standards and specifications, technical reports—or to waste expensive time struggling to locate them when the need arises. Existing information represents an investment of manpower and dollars, and duplicating the research that produced it is an expenditure no company or other agency can afford. Francis Bello, the Science Editor of *Fortune* for several years, expressed it well in the September 1960 issue:

“Mankind is learning things so fast that it’s a problem how to store information so it can be found when needed. Not finding it costs the U.S. over \$1 billion a year.”

Technology is advancing at such a rapid rate that engineers must know how to use the literature to keep abreast of developments in their fields. The “life expectancy” of an engineering degree is estimated to be seven years. That degree must be updated with continuing education and monitoring of literature in the field. A change in assignment or in job may necessitate acquiring background knowledge in a new field of interest. Knowing how to locate the information that will supply an overview will save the engineer’s company time and money. In addition, the effective use of engineering information resources can lower the cost of research and the development of new products and improvement of existing products. Conversely, the lack of knowledge of what has been done and what is being done in the field can seriously affect an engineer’s value to his employer.

Engineers work in a variety of environments. They may be in a small company remote from a large research library, or in a company with a highly specialized information center. If they do not know how to utilize information resources, they are doubly handicapped: They do not know what exists, and they do not know where to go to access the information they need.

Unfortunately, an introduction to engineering literature is not a required course in engineering schools. At best, engineers’ knowledge of it, as they leave the college or university, is uneven. To quote from an ad for *Engineering Index*, a long-established and respected literature-indexing service:

“In some schools, engineering students rarely use their library’s resources until their senior year, if then. A pity. For learning to use those resources is the student’s first step in knowing where to turn for the right answers. Once a practicing engineer, this ability will be vital.”

Since most information is in libraries, learning to use library services is unavoidable. *Forbes*, the business magazine, in its February 16, 1981 issue calls libraries "the greatest source of untapped unfathomable riches." Using the sources described in the chapters of this book will help engineers to tap them.

Engineering literature includes a variety of formats—technical reports, periodicals, tables, etc.—all of them essential to engineers. The material in this book is arranged by these formats. Each chapter includes a brief description of the format, and includes a list, not comprehensive but selective, of representative reference tools. We have tried to balance titles that will remain current with those that have several editions, and titles that will serve the current awareness function.

The index is a quick means of locating an item at the moment it is needed. Since the index provides a subject approach, we have chosen to go with the format approach, surveying the various types with which members of the engineering community must be familiar. Further references can be obtained at scientific and technical libraries and from the indexes of *Scientific and Technical Books and Serials in Print*, which is published annually.

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Periodicals

By definition, periodicals are publications with regular frequency, intended to be ongoing or continuous. They may be published weekly, daily, monthly, annually, or at some other periodic interval. They may be scholarly journals, newsletters, government publications, house organs (or company magazines), transactions, or yearbooks. They may be called journals, magazines or periodicals.

They are vital to engineers, because they publish the results of research, within months, enabling engineers to keep current with new developments in materials and processes. In contrast to books, the information in periodicals is briefer, more specific in content, and more current. Periodicals range from newsletters to journals of a highly technical nature.

Periodicals were being published before the United States existed. The Royal Society's *Philosophical Transactions*, still being published today, began publication in 1665. From a few journals in the 17th century, the number of scientific and technical journals being published worldwide has risen to an estimated 60,000. New journals are published as new fields or aspects of engineering evolve. Journals cease publication from time to time for a variety of reasons. New developments may make the focal subject of a journal obsolete. Publishing costs or lack of leadership may cause journals to merge with others or be discontinued.

Periodicals are produced by associations, academic and other institutions, government agencies, industrial firms and other companies, and commercial publishers. Refereed journals are those whose articles have been submitted for review to authorities in the field before they are selected for publication. This evaluative process ensures their accuracy and significance as a contribution to the literature.

Although some are free, most periodicals have an annual or biennial subscription fee payable in advance. Membership in a professional society often entitles the member to a subscription to one or more of the society's publications. Each of the largest engineering societies has one or more periodicals. Examples are *IE*, or *Industrial Engineering*, published by the Institute of Industrial Engineers; a whole series, including *Journal of Applied Mechanics*, *Journal of Engineering for Industry*, and several others, published by the American Society of Mechanical Engineers, as their *Transactions*; *AIChE Journal* and the recently created *Energy Progress* and *Plant/Operations Progress*, published by the American Institute of Chemical Engineers; the *Journals* of the various Divisions of the American Society of Civil Engineers. The publications of a society are listed in its entry in the *Encyclopedia of Associations*, to be discussed in a later chapter. Journals, by title, are described in *Ulrich's International Periodicals Directory*, described below.

Some journals are sent free to persons working in appropriate fields. *Materials Handling Engineering* is a case in point. The value to advertisers justifies the cost of publishing and distribution. House organs, the publications of companies for their customers (external organs) or employees (internal organs), are often disseminated to the engineering community as a form of advertising or recruiting.

The chances are that most engineers will not be satisfied with the random selection being sent to them. For awareness of the publishing in their field, they can turn to a list of current journals, issued annually, *Ulrich's International Periodicals Directory*. This directory, which has been published by the R.R. Bowker Company since 1932, has journal titles listed under approximately 200 categories such as engineering (subdivided by type, i.e., electrical, civil, etc), physics, mathematics, etc. Entries for each journal provide information on frequency, publisher, editor(s), price, indexing services that cover articles in the journal, and special features of the periodical, such as book reviews. It includes an index of journals by title and a list of cessations (journals no longer being published). It is updated between editions by *Ulrich's Quarterly*.

Another source of information on current periodicals is the *British Union Catalogue of Periodicals: New Periodical Titles*. It updates the *World List of Scientific Periodicals, Published in the Years 1900-1960*, and gives the holdings of selected British libraries.

Subscriptions to journals may be placed directly with the publisher or handled by a subscription agency. Libraries can provide the catalogs or information that will help in locating these agencies. Libraries will usually fill most of the engineer's information needs, since no engineer can afford to buy all of the books or journals in fields of interest.

Although the libraries that they use will have different methods of informing their users of the periodical titles in the collection, it is well for engineers to be aware of the types of

reference tools that are generally available. Most libraries have a list of their holdings in a notebook or a card file or in the library's card catalog. If the library is a unit of a system, there will be a combined record (called a union list) of the holdings of all of the units, and where they are located in the system. The Engineering Societies Library in New York has a major portion of the materials indexed and abstracted in the *Engineering Index*. CASSI, the acronym for *Chemical Abstracts Service Source Index*, is an extensive list of the materials indexed and abstracted in *Chemical Abstracts* and libraries holding them. The Engineering Societies Library and Chemical Abstracts Service supply copies of their materials directly to requestors for a fee.

Most engineers have the privilege of requesting inter-library loan through the libraries they use. The procedure is described in the chapter on libraries and technical information centers. Through interlibrary loan, they can often obtain free or inexpensive copies of journal articles, etc., but when time is at a premium, the immediate accessibility such services as Chemical Abstracts Service offers cannot be underestimated. Copying must comply with the Copyright Act. If the engineer is making the copy, one copy for utilization in research is construed as "fair use" and is permissible.

In 1965 the H. W. Wilson Company published the third edition of the *Union List of Serials in Libraries of the United States and Canada*. It is kept current by *New Serial Titles*, now issued monthly and cumulated four times a year and every five years. This compilation of serials (periodicals plus other continuing publications) makes it possible to determine the closest library holding a periodical and saves time for the library or engineer trying to obtain it. Entries give inception date of the serial and its publisher, title changes, and date of cessation, if appropriate. It lists the libraries in the United States and Canada currently holding volumes of the title. Monthly issues list new periodicals, title changes and ceased titles. Title changes are not unusual. *Journal of Fluid Mechanics* has borne the same title

since it began publication in 1956. On the other hand, *Factory Management* has been known as *Factory* and *Modern Manufacturing* during its years of publication.

When an engineer needs an old issue or volume, he can send his request to any of a number of firms handling back issues or back runs. The library can help in supplying names and addresses of these firms.

Most journals have an annual index. Some have cumulative indexes covering from five to fifty years. There is nothing regular about the cumulations or the intervals. There is a cumulated index of publications of the American Institute of Chemical Engineers, *AIChE Publications: Combined Cumulated Index, Subject and Author, 1955-72*. The journal, *Human Factors*, has a cumulated index for volumes 1-22, 1958-1980. The Institute of Electrical and Electronics Engineers (IEEE) publishes an annual index to all of its publications each year, *Index to IEEE Publications*.

Subscribers to journals may frequently receive a bonus in the form of a special issue, a collection of articles on a topic of current interest, a directory of products or manufacturers, or a membership directory. Some journals have special annual issues. An example is *Machine Design's* issue on drives. Most special issues come as part of the subscription, but occasionally supplements must be purchased separately.

There are now a number of specialized journals that are cover-to-cover translations of the original language journals, notably Russian. (Occasionally, an article is lacking, but they are usually inclusive.) The translations can be identified by consulting *Guide to Scientific and Technical Journals in Translation* which lists translated titles cross-referenced to original titles. There are journals in one language; others contain articles in one language with abstracts in another; and still others, a random distribution of articles in two languages. Language should be verified before a subscription is placed by the engineer who wishes to read only English on a regular basis. Language of the text can be checked in *Ulrich's*.

Journals are still serving their original purpose of communication among members of the scientific and technical community. Some day microform may replace today's printed copies. It is easy to mail, easy to read and easy to file. Computer-aided methods of printing will cut down publication time and costs. The future of periodical literature is the "electronic journal," and a few journals, especially the newsletter type, are already available for reading using computer searching services and can be accessed by those with computer terminals.

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World List of Scientific Periodicals Published in the Years 1900-1960 (Vols. 1-3). Peter Brown and G. B. Stratton (eds.), Butterworths, Washington, D.C., 1963-1965.

Updated by *British Union Catalogue: New Periodical Titles* (see above).

2

Abstracts and Indexes (Printed and Computerized)

There are thousands of technical and scientific journals publishing articles every year. No engineer could read them all or even scan them, assuming they were readily attainable. Furthermore, every article is not of importance or of interest to every engineer. That is why abstracts and indexes are indispensable to engineers. Engineers can use them to locate a specific article, find reports and other information on particular subjects or by particular authors, and maintain currency in their special fields of interest by reviewing them regularly. Since there are so many periodicals covering so many subjects, the chances of zeroing in on the right periodical or the right issue that contains the right article or appropriate information is almost nil. Helping to locate articles, etc. by subject or author is the function of index-

ing and abstract services. This function is analogous to that of the card catalog in locating books.

Of course, not all periodicals are abstracted or even indexed. The percentage is estimated to be 25% to 35% of the published periodicals, but it seems safe to say that this proportion includes most of the major journals. The existence of approximately 2000 abstracting or indexing services is evidence of their value to scientists and engineers. At least one has been developed for each of the major scientific/technical fields. An index service lists the subjects covered in a group of periodicals, supplying the information on title, volume, etc. needed to retrieve the articles. An abstracting service adds summaries of the articles being indexed.

Finding the right indexes or abstracts for locating articles appropriate to a field of interest is the engineer's first step. *Engineering Index* is the most frequently used by engineers. Physicists have *Physics Abstracts*. (That is not to say that electrical engineers, for example, would not find this useful.) While *Chemical Abstracts* is most heavily used by chemists and chemical engineers, this abstract service covers so many fields other than chemistry that it is widely used by all of the sciences and engineering. Some services are highly specialized, as for example, *Ergonomics Abstracts*, *Zinc Abstracts* or *Abstract Journal in Earthquake Engineering*.

Most abstracting and indexing services are issued at least once a month, some weekly or bi-weekly, so that their users can scan the appropriate sections or indexes to identify articles, reports, etc. to stay current in their subject areas. Most have a similar format. They are usually arranged by subject, but may vary from one service to another, with different subject headings used for the same subject area. Some are arranged by fairly broad subject areas with subdivisions like *Engineering Index*; some by more specific headings like *Applied Science & Technology Index*. Some have their own classification systems like *Electrical and Electronics Abstracts*. *Current Contents* has a keyword index. Although this service is somewhat different from