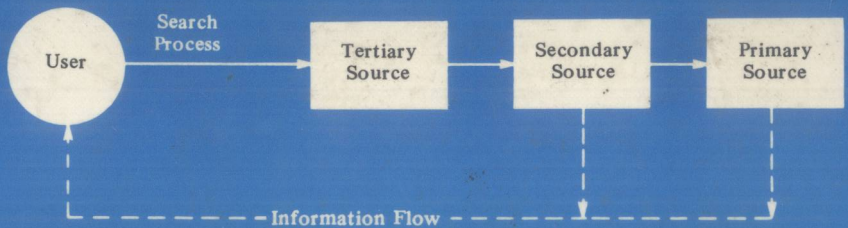


SCIENTIFIC AND TECHNICAL INFORMATION RESOURCES



KRISHNA SUBRAMANYAM

8261395



E8261395

SCIENTIFIC AND TECHNICAL INFORMATION RESOURCES

Krishna Subramanyam

School of Library and Information Science
Drexel University
Philadelphia, Pennsylvania



MARCEL DEKKER, INC. New York and Basel

Library of Congress Cataloging in Publication Data

Subramanyam, K

Scientific and technical information resources.

(Books in library and information science ; v. 33)

Bibliography: p.

Includes indexes.

1. Technical literature. 2. Scientific literature.
3. Reference books--Technology--Bibliography.
4. Reference books--Science--Bibliography. I. Title.

II. Series.

T10.7.S93 507 80-28531

ISBN 0-8247-1356-7

Copyright © 1981 by Marcel Dekker, Inc. All Rights Reserved

Neither this book nor any part may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, microfilming, and recording, or by any information storage and retrieval system, without permission in writing from the publisher.

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

SCIENTIFIC AND
TECHNICAL INFORMATION
RESOURCES



BOOKS IN LIBRARY AND INFORMATION SCIENCE

A Series of Monographs and Textbooks

EDITOR

ALLEN KENT

Director, Office of Communications Programs

University of Pittsburgh

Pittsburgh, Pennsylvania

- Vol. 1 Classified Library of Congress Subject Headings, Volume 1—Classified List, *edited by James G. Williams, Martha L. Manheimer, and Jay E. Daily (out of print)*
- Vol. 2 Classified Library of Congress Subject Headings, Volume 2—Alphabetic List, *edited by James G. Williams, Martha L. Manheimer, and Jay E. Daily*
- Vol. 3 Organizing Nonprint Materials, *by Jay E. Daily*
- Vol. 4 Computer-Based Chemical Information, *edited by Edward McC. Arnett and Allen Kent*
- Vol. 5 Style Manual: A Guide for the Preparation of Reports and Dissertations, *by Martha L. Manheimer*
- Vol. 6 The Anatomy of Censorship, *by Jay E. Daily*
- Vol. 7 Information Science: Search for Identity, *edited by Anthony Debons (out of print)*
- Vol. 8 Resource Sharing in Libraries: Why • How • When • Next Action Steps, *edited by Allen Kent (out of print)*
- Vol. 9 Reading the Russian Language: A Guide for Librarians and Other Professionals, *by Rosalind Kent*
- Vol. 10 Statewide Computing Systems: Coordinating Academic Computer Planning, *edited by Charles Mosmann (out of print)*
- Vol. 11 Using the Chemical Literature: A Practical Guide, *by Henry M. Woodburn*
- Vol. 12 Cataloging and Classification: A Workbook, *by Martha L. Manheimer (out of print; see Vol. 30)*
- Vol. 13 Multi-media Indexes, Lists, and Review Sources: A Bibliographic Guide, *by Thomas L. Hart, Mary Alice Hunt, and Blanche Woolls*
- Vol. 14 Document Retrieval Systems: Factors Affecting Search Time, *by K. Leon Montgomery*
- Vol. 15 Library Automation Systems, *by Stephen R. Salmon*
- Vol. 16 Black Literature Resources: Analysis and Organization, *by Doris H. Clack*
- Vol. 17 Copyright—Information Technology—Public Policy: Part I—Copyright—Public Policies; Part II—Public Policies—Information Technology, *by Nicholas Henry*
- Vol. 18 Crisis in Copyright, *by William Z. Nasri*
- Vol. 19 Mental Health Information Systems: Design and Implementation, *by David J. Kupfer, Michael S. Levine, and John A. Nelson*
- Vol. 20 Handbook of Library Regulations, *by Marcy Murphy and Claude J. Johns, Jr.*
- Vol. 21 Library Resource Sharing, *by Allen Kent and Thomas J. Galvin*
- Vol. 22 Computers in Newspaper Publishing: User-Oriented Systems, *by Dineh Moghdam*
- Vol. 23 The On-Line Revolution in Libraries, *edited by Allen Kent and Thomas J. Galvin*
- Vol. 24 The Library as a Learning Service Center, *by Patrick R. Penland and Aleyamma Mathai*

- Vol. 25 Using the Mathematical Literature: A Practical Guide, *by Barbara Kirsch Schaefer*
- Vol. 26 Use of Library Materials: The University of Pittsburgh Study, *by Allen Kent et al.*
- Vol. 27 The Structure and Governance of Library Networks, *edited by Allen Kent and Thomas J. Galvin*
- Vol. 28 The Development of Library Collections of Sound Recordings,
by Frank W. Hoffmann
- Vol. 29 Furnishing the Library Interior, *by William S. Pierce*
- Vol. 30 Cataloging and Classification: A Workbook
Second Edition, Revised and Expanded, *by Martha L. Manheimer*
- Vol. 31 Handbook of Computer-Aided Composition, *by Arthur H. Phillips*
- Vol. 32 OCLC: Its Governance, Function, Financing, and Technology,
by Albert F. Maruskin
- Vol. 33 Scientific and Technical Information Resources, *by Krishna Subramanyam*

Additional Volumes in Preparation

PREFACE

The material presented in this book has its origins in the lectures given since 1973 to graduate students taking the Resources in Science and Technology course at the University of Pittsburgh and the Drexel University. The book is addressed mainly to two groups of users: (1) students and teachers of librarianship and information science, and (2) practicing librarians and technical information officers in science and engineering libraries and information centers.

Guides to the literature of science and technology can either be inventory guides, listing numerous publications (e.g., C. C. Chen's *Scientific and Technical Information Sources*), or expository guides containing narrative descriptions of sources (e.g., D. J. Grogan's *Science and Technology: An Introduction to the Literature*). Inventory guides are more useful as reference sources for practicing librarians than as textbooks for students and teachers of technical information. In view of the diversity and growing volume of reference works and other publications in science and technology, it is impossible for technical librarians and students of technical information to become familiar with large numbers of individual sources of information. Instead, a more useful approach would be to try to understand the total process of scientific and technical communication and the relationship between information needs and information sources.

A major feature of this book is the integration of the inventory approach and the expository approach, and the presentation of a didactic model for scientific and technical communication. The model includes a consideration of the various phases of scientific information—including its generation through R & D, and its recording, surrogation, synthesis, and dissemination. Information is seen as both the source material and the product of R & D activity. The emphasis in this integrative approach to technical information has been on: (1) an understanding of the information needs and information seeking (and dissemination) modes of scientists and engineers, and (2) an overview of the structure and characteristics of the totality of scientific and technical literature and other sources of information.

The emphasis throughout the book has been on current practices in scientific and technical communication, historical aspects, and characteristics and bibliographic control of various forms of scientific and technical literature. Science and engineering librarians and students of technical information cannot afford to remain oblivious to the rapid growth of computerized information dissemination systems and services. Accordingly, recent developments and current trends in the computerized bibliographic control and dissemination of scientific and technical information are also discussed.

Scientific and technical information is a global entity; its bibliographic control and dissemination are supranational concerns transcending linguistic and geographical barriers. Several examples of multinational bibliographic control systems and services are discussed. The products and services of numerous professional societies and national and international agencies including national patent offices and standards organizations are described.

Over 1500 sources have been listed under broad subject categories. These include tertiary sources (guides to literature, bibliographies of bibliographies), secondary sources (bibliographies and catalogs, abstracting and indexing services, databases, reference works of various types), and primary sources (journals, including translated journals). Almost all of the sources listed are English language sources produced in the United States or overseas. All the major branches of the physical and natural sciences and engineering and technology are covered, but health sciences and social sciences are excluded. No attempt has been made to evaluate the sources listed. The listings are illustrative, and not comprehensive.

I am grateful to Professor Allen Kent, Director, Office of Communications Programs, University of Pittsburgh, for his valuable support and encouragement in preparing this book. I wish to thank Alexis Swyerski, head librarian, Yeadon Public Library, Yeadon, Pa., and Vibiana Bowman, systems analyst, Planning Research Corporation, Philadelphia, Pa., for their expert assistance in proofreading.

K. Subramanyam

CONTENTS

Preface	iii
1/ Scientific and Technical Communication	1
1.1 Introduction	1
1.2 Characteristics of Scientific Literature	2
1.3 The Structure of Scientific Literature	4
1.4 Scientific vs. Technical Literature	10
1.5 Nonformal Communication	13
1.6 Information Exchange Groups	15
1.7 Use of Scientific Literature	16
References	18
2/ Scientific Societies	21
2.1 Introduction	21
2.2 The Royal Society	22
2.3 Scientific Societies in the United States	24
2.4 Publications of Scientific Societies	26
References	28
3/ The Primary Journal	30
3.1 Historical Overview	30
3.2 Functions of the Primary Journal	32
3.3 Problems of the Primary Journal	33
3.4 Current Trends in Journal Publishing	43
3.5 Alternatives to the Scientific Journal	47
3.6 The Future of the Scientific Journal	51
3.7 Bibliographic Control of Journals	55
References	61

4/	Conference Literature	66
4.1	Scientific Conferences	66
4.2	Preconference Literature	68
4.3	Literature Generated During the Conference	69
4.4	Postconference Literature	69
4.5	Bibliographic Control of Conference Literature	69
4.6	UNESCO-FID Recommendations	74
	References	75
5/	Dissertations, Theses, and Research in Progress	77
5.1	Dissertations	77
5.2	Master's Theses	79
5.3	Foreign Dissertations and Theses	80
5.4	Bibliographic Control of Dissertations and Theses	82
5.5	Research in Progress: SSIE	85
	References	87
6/	Patents	88
6.1	Introduction	88
6.2	The United States Patent and Trademark Office (PTO)	89
6.3	Foreign Patents	91
6.4	Patents as a Source of Technological Information	92
6.5	Bibliographic Control of Patents	93
	Publications of the Patent and Trademark Office	97
	List of Patent Depositories in the United States	98
	References	99
7/	Technical Reports	100
7.1	Introduction	100
7.2	History of Report Literature	100
7.3	Characteristics of Technical Reports	104
7.4	Security Classification	109
7.5	Technical Report Numbers	110
7.6	Bibliographic Control of Technical Reports	116
	References	129
8/	Standards and Specifications	132
8.1	Introduction	132
8.2	Specifications	134
8.3	Types of Standards and Specifications	135

8.4	Sources of Standards and Specifications	137
	References	148
9/	House Journals	149
9.1	Introduction	149
9.2	Internal House Journals	150
9.3	External House Journals	150
9.4	Bibliographic Control of House Journals	153
	References	154
10/	Trade Catalogs	155
10.1	Introduction	155
10.2	Characteristics and Types of Trade Catalogs	157
10.3	Acquisition and Control of Trade Catalogs	164
	References	165
11/	Bibliographical Literature	166
11.1	Introduction	166
11.2	General Biographical Works	166
11.3	Specialized Biographical Works	167
11.4	Biographical Serials	168
11.5	Collective Biographies	170
11.6	Biographical Monographs and Autobiographies	171
11.7	Other Sources of Biographical Information	172
11.8	Bibliographic Control of Biographical Literature	172
	Selected List of Biographical Works	173
	References	178
12/	Dictionaries and Thesauri	179
12.1	Dictionaries	179
12.2	Thesauri	181
12.3	Bibliographies of Dictionaries	181
	Selected List of Dictionaries	183
13/	Directories and Yearbooks	193
13.1	Directories	193
13.2	Yearbooks	195
13.3	Bibliographies of Directories	196
	Selected List of Directories	196

14/	Handbooks and Tables	208
14.1	Handbooks	208
14.2	Tables	210
14.3	National Standard Reference Data System (NSRDS)	212
	Selected List of Handbooks and Tables	214
	References	229
15/	Encyclopedias	231
15.1	Specialized Encyclopedias	231
15.2	Single-Volume Encyclopedias	232
15.3	Multivolume Encyclopedias	233
15.4	Encyclopedic Dictionaries	234
15.5	Updating Encyclopedias	235
	Selected List of Encyclopedias	236
16/	Review Literature	242
16.1	Introduction	242
16.2	Review Authors and Review Preparation	244
16.3	Functions of Reviews	247
16.4	Characteristics of Reviews	250
16.5	Types and Sources of Reviews	251
16.6	Bibliographic Control of Reviews	255
	Selected List of Review Serials	257
	References	263
17/	Translations	266
17.1	Introduction	266
17.2	Translated Journals	268
17.3	Bibliographic Control of Translations	270
	Indexes of Translations	273
	Selected List of Translated Journals	274
	References	282
18/	Bibliographic Control of Scientific and Technical Literature	283
18.1	Proliferation of Literature	283
18.2	Bibliographies	285
18.3	Abstracting Services	293
18.4	Indexing Services	295
18.5	Characteristics of Abstracting and Indexing Services	297
18.6	Guides to Literature	304

18.7 Information Analysis Centers	307
18.8 Decentralized Bibliographic Control	308
Selected List of Guides to Literature, Bibliographies, Catalogs, and Abstracting and Indexing Services	310
References	338
 19/ Current Trends and Prospects	 341
19.1 Introduction	341
19.2 Integrated Primary and Secondary Publishing	342
19.3 Computer-Based Bibliographic Control Systems	343
19.4 Online Access to Scientific and Technical Literature	346
19.5 Science Information: A Global Concern	350
Selected List of Bibliographic Databases Available for Online Searching	353
References	360
 Bibliography	 361
Appendix: Abbreviations	383
Author Index	387
Subject Index	401

SCIENTIFIC AND TECHNICAL COMMUNICATION

1.1 Introduction

The date of the first scientific writing is not known precisely. Contributions to science were made by the early civilizations of Assyria, Babylonia, China, Egypt, and India. In these early civilizations, knowledge was transmitted largely through oral communication, and the fragments of papyri and cuneiform clay tablets that are extant from these periods do not give us a precise picture of the pattern of scientific communication during these early periods. The invention of the moveable type by Gutenberg in 1455 was a landmark event in the history of written communication. The printing press made it possible to prepare and disseminate multiple copies of manuscripts.

During the sixteenth and seventeenth centuries, great advances were made in intellectual, economic, technological, and social spheres by natural philosophers such as Francis Bacon and René Descartes, who placed great emphasis on the scientific method of inquiry. During this period, written communication was largely through books and gazettes. The book was not particularly suited to the rapid dissemination of new ideas, since the author had to work for several years and accumulate enough results to warrant publication of a book. Accounts of single observations and discoveries began to be disseminated through booklets or pamphlets. For example, William Harvey's work on the circulation of blood was published as a 72-page booklet in 1628 [1].

Though many changes have taken place in recent times in the modes of dissemination of scientific information, the basic function of scientific literature, namely, to serve as a foundation for advances in science, has remained unchanged. In his opening address to the Royal Society Scientific Information Conference, 1948, Sir Robert Robinson, President of the Royal Society, said [2]:

The sciences have deep human interest and are not devoid of spiritual value. The object of our Founders was declared to be the improvement of natural knowledge. By that they meant, and we still do mean, improvement and spread of knowledge of nature. Neither they could, nor we can, condone the scientific miser who investigates for his own satisfaction, or profit, and keeps the results to himself for selfish reasons, whether they be aesthetic or economic.

Faraday expressed it very well (he always did) when he described the three necessary stages of useful research—the first to begin it, the second to end it, and the third to publish it.

Sir Robinson was reiterating the principle that the march of science rests on its published record, and that ready access to scientific and technical information is a fundamental need of scientists everywhere. More recently, Elmer Hutchisson, director of the American Institute of Physics, asserted his “conviction that the written record of the accomplishments of scientific research constitutes one of civilized man’s most important intellectual resources” [3]. Scientists constantly draw upon this growing volume of records, and also strive to contribute their individual share, however small, to the total body of recorded knowledge.

1.2 Characteristics of Scientific Literature

Scientific knowledge is the objective knowledge of the universe and its phenomena, generated by the scientific method of inquiry and validated to conform with empirical observations of natural phenomena. Every new addition to the store of objective knowledge is an extension of the existing body of knowledge as recorded in the primary literature of science. The new knowledge so developed is recorded on tangible media and thus adds to the stockpile of scientific literature. Therefore, scientific literature, which embodies the existing store of objective knowledge, is at once the foundation on which the incremental progress of science rests and also a product of such advances in scientific knowledge. In the humanities, new developments do not necessarily replace past achievements: Bernard Shaw’s plays do not make Shakespeare’s plays obsolete, and Picasso’s paintings do not replace those of Rembrandt. But the nature of the objective knowledge of science is quite different; each incremental advancement in scientific knowledge in some way adds to, modifies, refines, or sometimes totally refutes the prior knowledge on which the advancement was based to begin with. Einstein’s general theory of relativity is an extension and a generalization of Newton’s classical mechanics; the heliocentric theory of Copernicus rejected and replaced Ptolemy’s geocentric theory, then prevailing. This noncumulative quality of science is shared by the literature

of science; hence the clamor of scientists and other users of scientific information for the most recent literature.

The second important attribute of science, which is shared to a large extent by the literature of science, is its universality. Scientific truth is “supranational,” and transcends political, sociological, cultural, and linguistic limitations, although these factors influence the organizational dynamics of scientific research in any given society. For example, the organization of scientific research activity in the United States is different from that in the Soviet Union because of the vast differences in the political ideologies and socioeconomic infrastructures of these two countries. However, Soviet physics could not be different from American physics inasmuch as the laws of physics, regardless of the nationality of the physicists who discover them, or of the language in which they are expressed, are as immutable as the natural phenomena they depict. Any aberration that may be deliberately or inadvertently superimposed upon scientific truth by political demagoguery or other ideological considerations, as exemplified by the Lysenko affair in the USSR, is bound to be discovered and rejected sooner or later [4].

Likewise, scientific literature, which is a record of the objective knowledge generated by science, is quintessentially universal, although there may be vast differences in its language, bibliographic format, and physical medium. These differences can be resolved by appropriate transformation (e.g., translation and reformatting), and then the scientific literature produced in one country can be used by the scientists of another country. The abstracts in *Referativnyi Zhurnal*, a Russian abstract journal, are translated and incorporated into *Applied Mechanics Reviews* of the American Society of Mechanical Engineers. Many physics journals produced in the USSR are translated from cover to cover by the American Institute of Physics, Plenum Publishing Corporation, and other agencies, and are made available to English-speaking physicists throughout the world. This could not have been done if scientific literature, like science itself, were not essentially universal. The same cannot be said of the literature of other branches of knowledge, however. Some branches of the social sciences and the humanities are more or less culture specific, and are not transplantable across cultural-geographical interfaces. Islamic law, for example, cannot be practised in the United States, even if books on Islamic law can be translated into English, because of the culture dependency of law. Such translations are useful, though, for academic pursuits.

Scientific literature is the validated record of the achievements of science. Traditionally, scientists have been zealous in guarding the high standards of scholarship and quality of the work reported in scientific literature. Research articles submitted by scientists for publication in scholarly journals are refereed by a panel of experts to ensure accuracy and quality. In order to obtain

impartial assessment of the manuscripts, the refereeing process is usually done anonymously. The author is not aware of the identity of the referees, and in some cases, the referees also do not know the identity of the author. Scientific societies play a dominant and useful role in maintaining this tradition of validation of scientific literature.

Scientific literature is also a “public” record of scientific knowledge. The channels of communication (e.g., the primary journal and the conference platform) are accessible to anyone who satisfies the requirements of quality as set forth by scientists themselves. Also, the literature of science is “public” in another sense: With the exception of documents containing proprietary matter or information pertaining to national safety, the literature of science is accessible by anyone for use. Very elaborate bibliographic control mechanisms have been set up to promote easy and rapid access to scientific literature. Since science is sustained by its own literature, the accessibility of scientific literature is crucial for the unimpeded growth of science.

1.3 The Structure of Scientific Literature

The structure of scientific literature can best be understood by tracing the progression of scientific information from its generation as a result of research and development (R & D) endeavors through its dissemination in primary literature, its surrogation in secondary services, and its eventual integration and compaction in reviews, textbooks, and encyclopedias. Figure 1.1 is a schematic diagram of a bibliographic chain showing the progression of scientific information from the idea stage until the new information generated is disseminated through various channels and eventually becomes an integral part of prior scientific knowledge. The numbers within the small inner circles indicate the time frame in years, with research starting from the idea stage at time zero. The products or bibliographic packages emanating from each of the activities are shown in boxes connected to the activity circles in the diagram.

1.3.1 Primary Sources

Unpublished Documents: Primary information derived from R & D activity can be communicated by a variety of channels. When the investigation is still in progress, there is a continual interaction among the members of the research team, and between the research team and members of the larger scientific community who may be interested in the research. At this stage, information flows in both directions: as input to the research team in the form of data and ideas from the scientific community, and as output from the research team in the form of experimental data and preliminary findings. Such interaction almost always takes place through nonformal channels (e.g., oral