

Current Comments®

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**Announcing the *SCI Compact Disc Edition*:
CD-ROM Gigabyte Storage Technology, Novel
Software, and Bibliographic Coupling Make
Desktop Research and Discovery a Reality**

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ISI® is introducing a new version of the *Science Citation Index*® (*SCI*®) on compact disc read-only-memory (CD-ROM). A unique feature of the *SCI Compact Disc Edition* is its "related records" function. This feature, created by "bibliographic coupling," allows the user to examine relationships between papers based on the cited references that they share. The *SCI CD Edition* brings a creative, intuitive quality to desktop literature searching and information discovery.

I first encountered Vannevar Bush's "Memex" as a researcher at the Johns Hopkins indexing project in 1951. In his now classic 1945 *Atlantic Monthly* article "As we may think," Bush described his concept of the workstation of the future.¹ But even before "Memex," H.G. Wells in 1938 had imagined the "World Brain,"² which I have referred to in numerous essays. And if you visit ISI® you can see a holographic engraving so named.³

Fifty years after Wells, we can begin to talk realistically about putting the world's knowledge at everyone's fingertips. But the single most dramatic technological development in recent years, coming close to making "Memex" a reality, is the compact disc (CD). This technology has already revolutionized the music industry. But its huge data-storage capacity is an even more exciting application. Vast amounts of information—enough to fill several volumes in conventional book form—can be stored on a disc that is easily held in one's hand.

According to the usual popular descriptions of compact disc read-only-memory (CD-ROM), 250,000 pages of text can be stored on a single disc. In other words, the entire literature covered in *Current Contents*® (*CC*®) for one week could be stored on one disc. Using special compression techniques, even greater quantities can be packed onto a disc.

When you last visited your library, you may have seen the 18 huge volumes of the

Science Citation Index® (*SCI*®) that are produced each year. All of that information has now been compressed into CD form in the *SCI CD Edition*. A full year's worth of data is contained on two independently searchable discs. And, with quarterly updates, the *SCI CD Edition* not only provides the same comprehensive coverage as the print version, but also offers a variety of access and browse features not available in print or online.

But storage of information is only one facet of this new development. In order to access a CD-ROM disc from your personal computer (PC), software must be created. The software is stored on a diskette (floppy disk) that directs your PC. This software system permits you to access a huge file via instructions stored on your floppy disk or hard disk. Indeed, it permits you to work with the data without even dialing up a central computer or vendor. So, in addition to having a huge storage capacity, the technology reduces the need for telecommunications and online systems.

Enhancing the Power of Citation Indexing

The most significant aspect of ISI's use of CD-ROM technology is that it has made possible, for the first time, the implementation of the full power of citation indexing through bibliographic coupling. It also makes *Permuterm*® indexing available on a PC. No other existing computer search

system permits you to explore the vocabulary of science in these forms.

The features of the *SCI CD Edition* have been designed to enhance the unique advantages that citation indexing provides—in particular, the ability to explore interrelationships between papers, to make subtle and yet meaningful connections between seemingly unrelated material, and to locate pertinent information that might otherwise be overlooked. I believe the *SCI CD Edition* permits you to use the literature in a creative, intuitive manner. Searches can be performed, in Bush's words, "as we may think," without worrying about complex search protocols.

Complete Literature Coverage—and More

Like its print counterpart, the *SCI CD Edition* includes citation information for and full bibliographic descriptions of over 600,000 source articles published in 3,300 of the most significant scientific and technical journals each year. Since the *SCI* has always been multidisciplinary, every imaginable discipline is covered. Over 10,000,000 cited references are included each year.

One of the most exciting and useful features of this edition of the *SCI* is the ability to locate and examine "related records." No matter how you have identified a useful paper, whether in the author, subject, or citation index, you can use this feature to identify related or similar material. This unusual and unique form of cross-referencing is made possible through the use of "bibliographic coupling." First described in 1963 by Michael M. Kessler, Massachusetts Institute of Technology, Cambridge, this concept has been developed magnificently by Henry Small and George Vladutz of ISI's Corporate Research Department.

Identifying related material through bibliographic coupling is based on the idea that the number of cited references shared by two or more papers is a measure of their similarity.^{4,5} Bibliographic coupling should not be confused with "co-citation," which is another term we use to describe relationships between papers. Co-citation is a measure of how often two or more papers are cited together. Bibliographic coupling, on the other hand, is determined by the number of cited

references that two or more papers share in their bibliographies (see Figure 1).

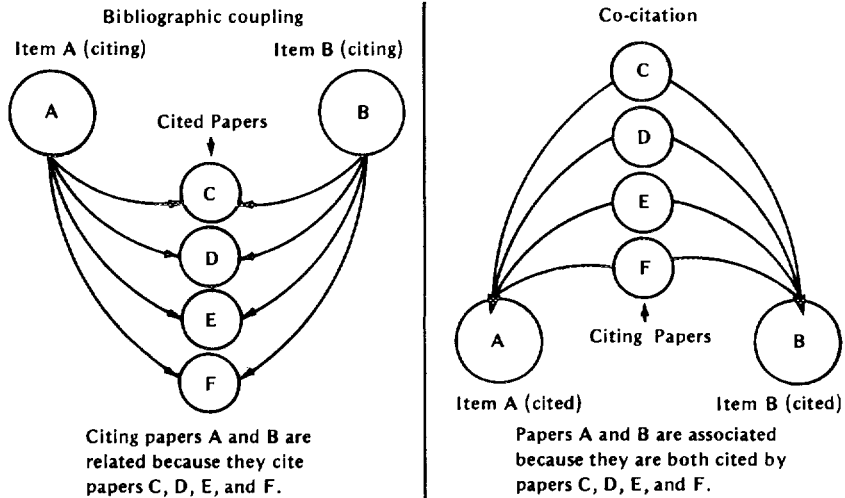
The effectiveness of bibliographic coupling in determining similarity or subject-relatedness was verified in a pilot study by Vladutz and ISI colleague James Cook. They sampled 10,000 publications chosen at random from the annual *SCI* database. They then compiled lists of all the papers, from the hundreds of thousands in the database, having at least one reference in common with these 10,000. The resulting pairs were sorted by "coupling strength"—a measure of the number of references shared by paired items. When strongly coupled papers were identified, their content was examined by a small staff of trained assistants. This evaluation demonstrated that strongly coupled pairs were quite related in subject content. As the authors noted, bibliographic coupling was shown to be an effective tool for identifying the "semantically closest neighbors" in a very large database.⁶

Their findings echoed those of Kessler, who, in his 1963 study, had used bibliographic coupling to show relatedness among a group of papers published in several volumes of the *Physical Review*. Kessler noted that, although bibliographic coupling was untested as a retrieval tool, the method had several favorable qualities. These qualities still apply. For one, the processing is done in terms of numbers and is independent of words and language. The text of the articles need not even be available. Kessler noted further that the method will not produce a static classification of papers. The groupings will undergo changes that reflect the current usage and interests of the scientific community.⁴

Related Records

With the *SCI CD Edition*, bibliographic coupling is put to work to increase the power and depth of your search. When you locate a record for a given paper, the video display includes such standard information as the names of the authors, the article title, and the complete bibliographic reference. Also displayed, however, is the number of related records—that is, the number of papers that share references with the first record you retrieved. These related records have been subjected to considerable statistical testing

Figure 1: Bibliographic coupling vs. co-citation.



and preprocessing to gauge their coupling strength. This ensures that the system will indicate only those articles with strong, significant links to your selected paper. While there may be hundreds, only 20 of the most strongly coupled papers are listed initially. You can of course continue to explore as many additional groups as desired.

With a few keystrokes, the reference for each related paper can be displayed in turn. For each, the display includes the number of *shared references*—the number of references in common with the original article. Figure 2 illustrates *related records* and *shared references*. At the end of this essay there is also a brief section, "Using *related records* to browse the *SCI*," that demonstrates how the *related records* feature retrieves and displays records. The section features sample displays from a search on Alzheimer's disease. For readers who may not be familiar with how the *SCI* works, we have included a separate section from a previous essay.⁷ This section briefly explains the *SCI* and the fundamentals of citation searching.

Related Records vs. Synonyms

The *related records* feature makes it easy to find papers that do not share title words or authors. You can locate related papers without the need to identify synonyms. If you choose, you can instantly modify your

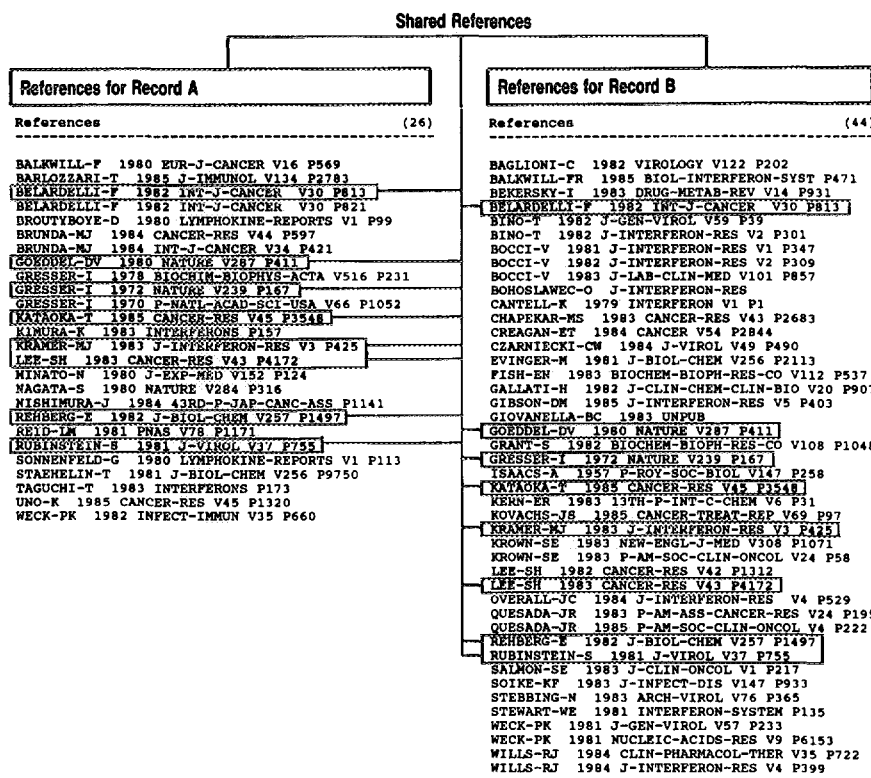
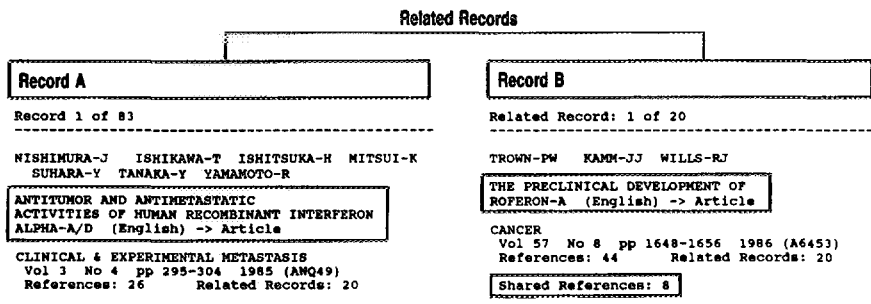
search to examine the set of records related to the first related record. In this way the software facilitates your exploration of the database in the intuitive way you would follow a research problem. We believe that these techniques give new meaning to the term "browsability."

Early reaction from users regarding the *related records* function has been most enthusiastic. At test sites, where a prototype of the *SCI CD Edition* was evaluated, this feature was particularly popular. Whereas some users had spent hours in online systems locating a few relevant articles, the *SCI CD Edition* enabled users to identify dozens of additional pertinent papers in minutes. With the *related records* feature, users could bypass the problem of identifying all correct search terms—usually a difficult and time-consuming part of the retrieval process.

Easy to Use

The *SCI CD Edition* has been designed to accommodate the first-time user as well as the more experienced online searcher. The system provides assistance at every turn, with pull-down menus, a help system that can be summoned from any portion of the program, and constant on-screen prompting. Knowledge of searching protocols and language is *not* needed. In short, with minimal training, anyone can perform productive, in-depth searches of the scientific literature.

Figure 2: Example of related records.



In the space that is available it is difficult to describe briefly yet fully what can be done with the *SCI CD Edition*. Exercising the variety of options available is made fairly simple. You can use or browse through extensive "dictionaries" containing cited authors, cited works, cited patents, title words, author names, and author addresses. There is also a dictionary of journal codes, containing the abbreviated and full titles of all journals indexed. Full titles are displayed

with each record. Journal codes are used to facilitate searches by journal.

Permuterm Searches

In the CD version of the *Permuterm Subject Index*, the dictionary "coterm" feature provides you with a list of other terms most commonly occurring in titles based on the one you selected. This gives you an idea of the size of the literature available and the

option to browse the combination of terms most appropriate to your search.

It is possible to move between dictionaries—from “cited authors” to “title words,” for example—to choose search terms. Or you can bypass the dictionaries by directly keying in your search term. It is easy to alternate between direct-search methods and spontaneous browsing. By switching between “dictionary” and direct-entry modes, you can easily develop and modify your own personal search strategy.

Since the space limitations of the print *SCI* do not apply, each record in the *SCI CD Edition* includes not only unabbreviated journal titles but also the names and addresses of all source authors. In addition, for each article, the complete bibliography of cited references is included. The CD edition is the first version of the *SCI* to provide this information on source authors and cited references. It has been available in the *Social Sciences Citation Index*® for many years.

When your search is finished, the software allows you to collect records into a file. It also automatically eliminates any duplicate records. Search results can be “downloaded” for printing or to a floppy disk for evaluation at a later date.

Equipment Specifications

The *SCI CD Edition* includes two CDs as well as a floppy disk containing search and retrieval interface software. The discs operate using an IBM PC, XT, AT, or compatible microcomputer with 640 K RAM and a hard drive. The setup requires an operating system that supports the MS DOS CD-ROM Extensions, and a compatible CD drive. ISI's CD products conform to High Sierra Group standards, meaning that they operate on the major manufacturers' CD readers with IBM-compatible systems.

As mentioned above, the *SCI CD Edition* includes two CDs containing a full year's worth of data: a title access disc and a citation access disc. Both are self-contained and independently searchable, each with its own entry points and features. Both discs contain basic source data found in the print *Source Index*. Table 1 shows the other features and dictionaries to be found on the discs. The table also demonstrates how these

features roughly correspond to the print *SCI*. Search statements created on one disc can be combined with statements created on the other. The software is designed to make disc-switching, when necessary, smooth and easy. Many searches, however, can be completed on a single disc.

In addition to the title access disc and citation access disc that you receive initially, the annual subscription fee includes quarterly cumulative updates. At quarterly intervals, in exchange for the “old” discs, you receive two new discs containing the most current data for the year (including, of course, all material from the previous discs). At year's end, you receive the yearly archival cumulation—two discs containing the full year's worth of data. And, unlike the leasing arrangements offered by other services, the annual subscription to the *SCI CD Edition* is a one-time purchase. When you receive the yearly cumulation, the discs are yours to keep.

A Complement, Not a Replacement

Since most of the present *SCI* print customers are libraries, we fully expect that initially the CD-ROM edition will supplement their use of the print version—especially for satellite libraries with space restrictions. Experienced online searchers will want to continue to use *SCISEARCH*® to obtain the most up-to-date information. Until many years of the *SCI* are available on CD-ROM, most libraries will continue to use the print version, especially the 5- and 10-year cumulations. And in many libraries several students and faculty members need to search at one time—a need for which the print edition remains best-suited, at least for now.

In a recent issue of *ONLINE*, Paula D. Watson, assistant director of General Services, Central Reference Services, University of Illinois, Urbana-Champaign, discusses the cost ramifications of the optical information revolution. This new technology has come at a time when some libraries are struggling to keep up with the rising costs of print products. However, as Watson notes, many libraries have been able to purchase CD equipment by using “nonrecurring funds,” including private gifts, endowment funds, foundation grants, state grants, and various discretionary funds.⁸ But the

Table 1: Features of the *SCI*[®] *CD Edition* and their approximate equivalents (if available) in the print *SCI*.

<i>SCI CD Edition</i>	Print <i>SCI</i>
Data available on disc:	Currently found in the print <i>SCI</i>:
Source (citing) records	<i>Source Index</i> (First 10 authors only)
All author names	
All author addresses	<i>Source Index</i> (First author only)
Cited references displayed	Not available
Related records	Not available
Dictionaries/Searchable Access Points	
Source author names	<i>Source Index</i> (Cross-reference to first author)
Cited author name	
Cited author name and cited work	<i>Citation Index</i>
Title words	
Coterms	<i>Permuterm</i> [®] <i>Subject Index</i>
Address word	<i>Corporate Index</i>
Source journal	
Language	
Document type	Shown but not
Update period	searchable

fact is that the equipment is a one-time purchase that can be amortized over many years of use. Even Third World scientists with limited funds have informed me that they regard CD-ROM as a practical solution to some of their problems.

And CD-ROM technology is already demonstrating its potential to change the way people use libraries and seek information. Discussing the introduction of CD-ROM databases (including an early version of the *SCI CD Edition*) at Hahnemann University, Philadelphia, reference librarian Howard Silver notes several positive effects. For one, library users were provided with substantially improved access to current scientific and medical literature. Positive word-of-mouth advertising about the new services brought a number of new users into the library—users who would be less likely to use the library under other circumstances. Furthermore, users found the equipment easy to learn and use, and more than 90 percent of those questioned said they were able to locate relevant citations on the databases.⁹

Real-Time Searching

CD-ROM is another step on the way to the World Brain. It would be absurd to claim

that it is now fully realized. When I dream of the ultimate system I imagine a real-time system that literally provides instantaneous access. By eliminating telecommunications delays, one makes real-time searching possible. Someday you will be able to use electronic or optical files to literally verify references with utility programs on your PC. But unless you can afford a leased line connected to a huge database you will have to compromise with the 5 or 10 seconds required to find a record with CD-ROM. This is so much faster than your typical online search that you may wonder why I would bring it up. Everything is relative. So if I tell you that moving to the next related record averages one second you may wonder why I hesitate to say the millennium has arrived. CD-ROM technology is moving fast. Multidisc jukebox players are on the way. Remember, one year of the *SCI only* stores about five million cited papers and books. So we're only one or two orders of magnitude away from the ideal.

* * * * *

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For more information about the *SCI® CD Edition*, call the ISI® Customer Services Department at 800-523-1850, ext. 1405. Outside the US and Canada, contact the nearest ISI representative listed on the inside front cover of this *Current Contents®*. Ask about the *SCI CD Edition Demonstration Diskette* and *Trial Copy* of the CD.

Appendix

Using *Related Records* to Browse the *SCI*

Searching the topic of Alzheimer's disease in the *SCI® CD Edition*, the first article you come across is a paper from *Federation Proceedings* by S.G. Younkin and colleagues: "Molecular forms of acetylcholinesterases in Alzheimer's disease" (Figure 1). This study examines 26 cases of Alzheimer's disease and 14 age-matched controls. Investigating biochemical changes in Alzheimer's disease, the authors examined the level of

cholinergic neurons in the area of the brain known as the nucleus basalis of Meynert. As the on-screen display indicates, the article itself cites 30 older references. There are also 20 more recent related records—that is, 20 "nearest neighbors" on the basis of shared references. It is this *related records* feature that allows you to expand and deepen your search, depending entirely on where you choose to go.

Figure 1: Paper by S.G. Younkin with 20 related records.

DISPLAY	SCI Title 1/86-12/86
1	
<p>YOUNKIN-SG GOODRIDGE-B KATZ-J LOCKETT-G NAFZIGER-D USIAK-MF YOUNKIN-LH</p> <p>MOLECULAR-FORMS OF ACETYLCHOLINESTERASES IN ALZHEIMERS-DISEASE (English) → Article</p> <p>FEDERATION PROCEEDINGS Vol 45 No 13 pp 2982-2988 1986 (F2475) References: 30 Related Records: 20</p>	

(continued on next page)

With a few keystrokes, it is possible to examine each of these records in turn. The first related record (Figure 2), shares 14 references with the Younkin paper. Published in *Neuroscience*, it was written by I. Kostovic and concerns "Prenatal development of nucleus basalis complex and related fiber systems in man—a histochemical study." Note that its title does not contain the term "Alzheimer's disease." However, in the introduction Kostovic cites biochemical studies of Alzheimer's disease focusing on cholinergic markers and choline acetyl-

disease. If you desire, you can explore the nearest neighbors for the Kostovic paper. These records, in turn, will provide leads that you may want to examine further.

Or you may choose to remain with the Younkin paper. The next related record (Figure 3) is a paper by P.L. McGeer and colleagues from *Progress in Neuro-Pharmacology & Biological Psychiatry*: "Positron emission tomography and the possible origins of cyto-pathology in Alzheimer's disease." This paper's nearest neighbors include other articles dealing with

Figure 2: First related record to the Younkin paper, by I. Kostovic, sharing 14 references.

DISPLAY		SCI Title 1/86-12/86

YOUNKIN-SG GOODRIDGE-B KATZ-J LOCKETT-G NAFZIGER-D USIAK-MF		
M (E FI V f	KOSTOVIC-I	
	PRENATAL DEVELOPMENT OF NUCLEUS BASALIS COMPLEX AND RELATED FIBER SYSTEMS IN MAN - A HISTOCHEMICAL STUDY (English) → Review	
	NEUROSCIENCE	
	Vol 17 No 4 pp 1047-1077 1986 (C2736) References: 161 Related Records: 20 Shared References: 14	

transferase activity in the nucleus basalis of Meynert. Many of the sources cited in this section of the article are also cited by Younkin and colleagues. Kostovic goes on to examine in detail the prenatal development of the nucleus basalis. Although the paper does not concentrate solely on Alzheimer's, it would certainly be of interest to anyone seeking background information on this area of the brain and its role in the

computed tomography and other techniques in the study of Alzheimer's.

This is a brief illustration of just one of the unique capabilities of the CD version of the *SCI*. With its real-time display of related records, the *SCI CD Edition* permits you to explore the literature by an associative process in which you define the limits and extent of your search.

Figure 3: Second related record to the Younkin paper, by P.L. McGeer, sharing 10 references.

DISPLAY		SCI Title 1/86-12/86

YOUNKIN-SG GOODRIDGE-B KATZ-J LOCKETT-G NAFZIGER-D USIAK-MF		
M (E FI V f	MCGEER-PL KAMO-H MCGEER-EG WONG-K	
	POSITRON EMISSION TOMOGRAPHY AND THE POSSIBLE ORIGINS OF CYTO-PATHOLOGY IN ALZHEIMERS-DISEASE (English) → Review	
	PROGRESS IN NEURO-PSYCHOPHARMACOLOGY & BIOLOGICAL PSYCHIATRY	
	Vol 10 No 3-5 pp 501-518 1986 (F0338) References: 101 Related Records: 20 Shared References: 10	

How to Use the *Science Citation Index*®

In 1986, the *Science Citation Index*® (*SCI*®) listings reflected the contents of over 3,400 highest-impact journals that published over 620,000 articles. The *SCI* is issued bimonthly and cumulated in annual, 5-year, and 10-year editions.

The *SCI* is a system of four basic indexes.

The *Source Index* is an alphabetic listing of all authors and all papers published during the period covered by the index. Full bibliographic information is provided for each item, including article or book title; journal title, volume, and issue number; full pagination; year of publication; number of references cited; type of article or item; and the author's full address.

The *Citation Index* is an alphabetic listing by first author of cited papers, books, etc. Listed under each cited item is the condensed citation for each citing paper.

The *Permuterm*® *Subject Index (PSI)* uses words appearing in the titles of books and articles as indexing terms. All significant words in a given title are matched with each of the other significant words in that title to create all possible pairs; each pair then becomes a separate entry in the *PSI*.

The *Corporate Index* consists of two complementary parts. The geographic section is subdivided by country, state or province, city, institution, and department. The alphabetic organization section cross-references each institution with its geographic location.

The following examples, taken from the 1980-1984 cumulated *SCI*, illustrate the versatility of the *SCI* and the depth and currency of its indexing.

To find the most recent information relevant to the 1981 review of "Organic compounds in meteorites and their origins," by R. Hayatsu and E. Anders, turn to the *Citation Index*, illustrated in Figure A. Complete bibliographic information for the citing papers can be obtained

from the *Source Index*.

If one knows little about such organic compounds, a search can be started in the *PSI*. As illustrated in Figure B, a check under the main heading of "Meteorites" reveals that it has been used together with numerous other terms. Among these are "achondrites," "crystal," "nuclear," etc., followed in each case by the names of relevant authors. Turn to the *Source Index* for full titles and the rest of the bibliographic information.

To check whether a particular author has published a book or an article in a covered journal during the indexing period, look for the name in the *Source Index*. The *Source Index* provides full bibliographic information for verification. For example, Figure C shows that J. Geiss, 1 of the 16 authors who cite the review by Hayatsu and Anders, published four articles during the 1980-1984 period.

The *Corporate Index* identifies all papers published at a specific institution. For example, Figure D illustrates the hierarchical structure of the geographic index, which permits you to find all the papers published by researchers working in Swiss institutions. The entry for Switzerland is subdivided by city. Under "Bern" you find the University of Bern, where the Institute of Physics is located. The Geiss paper is listed among the dozens of others published by authors at the institute.

A distinct advantage of the *SCI* lies in its multidisciplinary coverage and cross-referencing. For example, biochemistry, physics, and astronomy may all be relevant to the topic discussed by Hayatsu and Anders. Likewise, citations to this work may reveal relationships to other fields.

A detailed, schematic explanation of search techniques appears in the front matter of each issue. A complete "guide" and journal list are printed separately each year.

Figure B: Sample entry from the *SCF's Permuterm® Subject Index*.

Main Heading	METEORITES	
	ACHONDRIITES	WHEIRA YWA
	ACHONDRIOTIC	ASHNAL LD
		DESNOYER C
	ACTINIDE	MURRELL MT
	ACTINIDES	SRIWAS B
	ACTIVITIES	BRADT R
	CRYSTAL	GRIMM RE
	CURATION	YANAI K
	CZM	MACKINNOID
	D/M	FALLICK AE
	DARKENING	FRENCH LM
	DATA	STRAIT MM
	DATING	BALLEGE CJ
		BOGARD DD
	ISOTOPICAL	KAISER T
	ITALIAN	LEVIDONA GR
	JILANTAI	ZHOU XX
	K-40	NITOM O
	KIRIN	DURRANI SA
	LAARGE	MUSS GI
	LATTICE	ALBERTSE JF
	LEAD	ABRANCHE WC
		DVCHINIGV
		LEVI FA
	NON-DESTRU	FOX SW
	NOTES	
	NUCLEAR	RAJAN RS
	NUCLEAR RE	BRESDY RC
	NUCLEOSYNT	SCHRAMM DN
	NUCLEIDS	BAROS F
	ORGANIC-CO	HAYATSU R
		KOTRA RK
		BLAWLESS JG
	OSBORNITE	KHODAKOV IL
	OXYGEN	CLAYTON RN
	PAIRS	REGIER S
	ROTATING	EASTON AJ
	RUST	TAYLOR LA
	SAMPLES	BIRCK JL
	THERMODYNA	ALBERTSE JF
	THERMOMETRY	PELLAS P
	TIESCHTZ	TOPELSCHJ
	TIME	HUTCHISO R
	TIN	KHODAKOV IL
	YEARS	SCHAEFFE DA
	ZAGAMI	VIEIRA YWA

Figure D: Sample entry from the *SCF's Corporate Index*, geographic section.

Main Heading	SWITZERLAND	
City	BERN	
Entry	UNIV BERN	
Institutional Subdivision	AUGEN KLIN.	
	BABEL J	KLIN MONATS 176 600 80
	FLURY W	SCHW MED W 112 448 82
	GOLDMANN H	KLIN MONATS 176 547 80
	GRAF HP	173 577 80
	HAEBERLIN	DOC OPHTHAL 50 123 80
	LORTSCHEM	KLIN MONATS 180 360 82
	NIESEL P	176 572 80
		T OPHTH SOC 102 327 82
	CHEM & MINERAL KRISTALLOG LAB	
	CHRISTOP GG	104 784 82
	CREVOISEM	ACT CRYST C 40 979 84
	EATON PE	CAN J CHEM 62 2612 84
	KELEBE G	ACT CRYST A 40 C 97 84
	LAGER GA	Z KRISTALL 142 660 83
	MEIER K	HELV CHIM A 64 1406 81
	DEPT BIOCHEM.	
	EICHENBEW W	PL CELL REP 1 255 82
	GMUNDER H	BIOC BIOP A 493 359 82
		EUR J BIOC 142 153 84
	FRAUENKLIN.	
	AMATO M	Z GEBU PERI 106 13 82
	DAVIS BW	J CANC RES 106 222 83
	J HIST CYTO	32 82 84
	DREHER E	THER UMSCH 40 600 83
		WIEN KLIN W 96 464 84
	GIGON U	THER UMSCH 37 510 80
	MEICK C	HELV PAED A 37 589 82
	HERRMANN U	SCHW MED W 113 149 84
	KUCHEN JD	GEBURTSH FR 40 423 80
	ANST GEN BRUNNEN	
	BRAUN R	BK# 12653 13 306 79
		SOOL BIOL RP 9 128 83
	CURMIRGHM	ANALYT BIOC 128 415 83
		SIOD BIOP 40 600 83
	GROSSENBLAM	EXPERIENTIA 11 37 81
		MUTAT RES 81 37 81
	GUBLER U	EXPERIENTIA 11 36 746 80
		NUCL ACID R 11 119 84
	MEYER WD	J BIOL CHEM 259 2856 84
	HOFER F	CURR GENET 1 43 79
	EMST PHYS.	
	AESCHLIN U	HELV PHYS A 11 55 211 82
		METEORITES 11 287 81
	BALZER R	HELV PHYS A 11 55 283 80
	BANNER M	PHYS LETT B 115 59 82
	BARNOLA JM	NATURE 303 410 83
	BAUGHER CR	GEOPHYS R L 22 227 80
	BERNER W	93 415 84
	COPLAN MA	SOLAR PHYS 09 769 84
	DEBRUNNEN	J GEO R S P 234 1169 79
	EBERNARDP	ASTROPHYS J 15 160 81
	EICHER U	QUATERN RES 300 735 82
	ELMIRE D	NATURE 303 735 82
	EUKSTER O	HELV PHYS A 54 366 83
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