

# **GEOSCIENCE INFORMATION SOCIETY**

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**GEOSCIENCE INFORMATION SOCIETY**

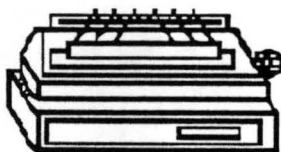
**PROCEEDINGS**

**16**









**GEOSCIENCE INFORMATION SOCIETY**

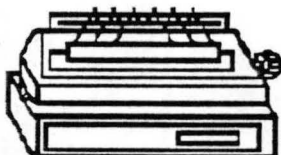
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**MICROS, MINIS, AND GEOSCIENCE INFORMATION**

**PROCEEDINGS, volume 16**



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**PART ONE:**

**SYMPOSIUM**

**Micros, Minis, and Geoscience Information**





- USE OF MICROCOMPUTERS IN EARTH SCIENCES LIBRARIES -

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Abstract

The use of microcomputers is spreading rapidly through earth sciences libraries. Many of the functions to which they have been put are standard library activities: acquisitions, circulation, building bibliographies, word processing, creation of bibliographic instruction aids, on-line retrieval of bibliographic citations. However, some functions are specific to earth sciences libraries, such as patron access to non-bibliographic files, and information published on disks. Sometimes, due to the size of planned applications, microcomputers have turned out to be less useful than originally supposed.

Microcomputers have been acquired through library funds, gifts, and departmental funds. Earth Sciences information specialists were surveyed on their use of microcomputers, and the results are presented in this paper.

## INTRODUCTION

How are microcomputers being used in earth sciences libraries. Is there anything special to geology libraries about that use? Has the acquisition of a microcomputer changed our work or changed the services available to the geologists using the library. To find help find the answers to some of these questions, we sent a survey to many earth sciences librarians. This paper is divided into three parts: 1) the results of the survey; 2) the status of front-end software; 3) some questions about trends and implications.

## GENERAL DESCRIPTIONS OF RESPONDENTS

The majority of respondents (62%) was from small libraries with collections of less than 50,000 volumes; 27% were from libraries of more than 75,000 volumes. 53% were academicians, 29% were corporate librarians, 18% of the respondents were government librarians, and 77% of the respondents did have access to microcomputers.

## NEGATIVE RESPONDENTS

23.5% of the respondents said that they did not have access to microcomputers. 50% of these were from academic libraries and 37% were from industry.

All who responded that they did not have access did see a need to have one. Size did seem to be a factor in getting a micro as all of the respondents whose collections were larger than 75,000 had access to one.

Lack of money was the preventing factor named by 63% of those who did not yet have access to a micro. Higher priorities and ignorance of the possibilities by those in decision-making positions were each cited by 25% of the respondents as a reason for lack of access. Lack of personnel, lack of space, and duality of reporting lines were other factors mentioned. One respondent reported that purchase of the microcomputer was in the planning stage.

## ANALYSIS OF THOSE WHO DO HAVE ACCESS TO A MICROCOMPUTER

More than 54% of the respondents who reported having access to a micro were from academic libraries, 27% were from corporate libraries and 19% of the respondents were working in government libraries. 54% were from smaller libraries of less than 50,000 volumes and 35% were from librarians working in libraries with more than 75,000 volumes. Access to microcomputers appears to be most common for large academic libraries (23% of the total) or for corporate libraries (27% of the total) all of whom had collections smaller than 50,000.

## KINDS OF MICROCOMPUTERS

69% of the respondents had access to an IBM PC or PC/XT. 80% of the government libraries and 85% of the corporate libraries were using IBM's. Medium-sized libraries are the least likely (only 33%) to have the PC or PC/XT's. An additional 15% of the respondents had access to an IBM compatible machine. All but one of the corporate libraries and all but one of the government libraries were using the IBM's. 70% of the small libraries and 77% of the large libraries use the IBM machine. One corporate library is using an Apple as are three of the academic libraries. None of the large libraries are using only an Apple, although one is using a Macintosh. 27% reported using other machines including a Tandy Randy Shack, a digital Rainbow, an OCLC M300, a BBC, a Wang, and a CIPHER.

Reasons for this preponderance of IBM-PC family use might include sale prices by IBM to universities or a desire to be compatible either with machines used by patrons or with machines used by other libraries in the system.

For 96% of the respondents the accessible machine was located right in the library. One small government library had access to more than one machine, one of which was not in the library.

The majority of the respondents (73%) did not provide patron access to the library's microcomputer(s). Unbelievable as it may seem, one medium-sized, academic library had a microcomputer located in the library which the staff was not allowed to use. Of those two libraries which allowed only certain patrons to use the microcomputer, one was a company library for which most users had their own terminals. The other was a large academic library where the only patrons who had access to the library's microcomputer were faculty and graduate students.



## FUNDING MICROCOMPUTERS FOR THE LIBRARY

Grant monies were not a source of funding for a microcomputer for any of the respondents. 46% purchased the microcomputer from library funds but 62% went outside the library but remained in the company or institution for funding.

50% of academic earth sciences collections are provided with microcomputer access via library funds. Both government (60%) and corporate librarians (71%) had better success seeking funds inside the company or agency but outside of the library. Two academic librarians found gifts funds to assist in the purchase of the personal computers.

## STANDARD LIBRARY USES OF THE MICROCOMPUTER

The most common uses of the microcomputer in earth sciences libraries include: word processing (85%), creation of in-house databases (62%), online retrieval of bibliographic citations (62%), and compilation of bibliographies (58%). No one reported that patrons used the library's microcomputer to try out software. Just two libraries, one academic, one corporate, reported using microcomputers to provide patrons with direct access to online catalogs. Notifying patrons of overdues and holds and selective dissemination of information using a microcomputer were only done by two libraries.

Among corporate libraries the most popular uses of the machine were online retrieval of bibliographic citations (86%), cataloging (71%), telecommunications (71%), word processing (71%), and administration (57%). Only one corporate library uses the microcomputer for computer-aided instruction. Corporate libraries averaged 7.9 different uses of the microcomputer per library.

93% of the responding academic librarians who use microcomputers use them for word processing; 71% use the machine for in-house databases, 64% use it for compilation of bibliographies and 57% for creation of bibliographic instruction aids. Only half of the academic machines are used for administration or for online retrieval of bibliographic citations. Only one academic machine is used for interlibrary loan, for circulation, or for serials checkin. Surprisingly, none of the academic librarians use the microcomputer for computer-aided instruction. In the academic geoscience setting, the microcomputer is used for an average of 6.1 different library tasks.

For government libraries the most popular standard uses are also word processing (80%) and creation of in-house databases (80%). Online retrieval of bibliographic citations (60%), compilation of bibliographies, and administration (60%) are also frequent tasks of government microcomputers. To date none of the geoscience librarians in government libraries use a microcomputer for serials checkin, notification of holds or newsletters or for acquisitions lists. Government librarians average only 6.0 standard library applications for their micros.

All of those who use the microcomputer for serials checkin, selective dissemination of information, and direct patron access to libraries work in libraries with collections of less than 50,000 volumes. All of the respondents who work in large libraries use the personal computer for word processing and all but one use it for creation of in-house databases. Medium-sized libraries, all of which are in academic settings, average only 5 applications for their respective microcomputers. Machines in small libraries average 6.6 applications and those found in large libraries average 7.0 uses.

#### APPLICATIONS SPECIFIC TO GEOSCIENCE LIBRARIES

As far as uses specific to geoscience were concerned, the response was rather small - 26 uses out of a possible 202. This is contrasted with 170 standard library uses from the 26 respondents out of 572 possible applications. A geoscience library thus is 2.3 times more likely, at least at present, to use the microcomputer for standard library applications rather than for specifically geoscience functions.

The most common geoscience use was for special in-house geoscience databases (35%). In sharp contrast to geoscientists themselves who reportedly favor the use of personal computers for maps and for graphics (Brown, 1985), geoscience information specialists report using the machine for these applications only 15% or 4% of the time respectively. No one is apparently using the powder diffraction files on library microcomputers. This might be due to the cost of those files.

No government librarians reported using a microcomputer for maps, accessing information published on discs, or for graphics. One respondent from a large academic library reported that the library's microcomputer was used for the preparation of theses. All of those using the microcomputer for maps are from small libraries with less than 50,000 volumes.

## CONFIGURATION AND STORAGE

Half of the respondents use the microcomputer as a stand alone machine. Most of the rest (46% of the total) use their microcomputers as both a work station and a stand alone unit. In one academic library, one with less than 50,000 volumes, the machine is used only as a workstation connected to a mini or a mainframe computer.

Most of the respondents (89%), including all of the librarians working with collections larger than 50,000 volumes, used floppies as a means of storing information. 35% used hard discs and 42% used mini or mainframes for storage of information. None of those from the medium-sized libraries stored information on mini or mainframe computers or on hard discs.

## USEFUL SOFTWARE APPLICATIONS

The majority of respondents (89%) found word processing software to be useful. Other commonly used software included database managers (65%) and telecommunications (54%). The latter was most heavily favored by corporate librarians (86%). At the time of the survey, none of the government librarians or the librarians from medium-sized collections had found graphics software to be useful. Front-end, user friendly software was not found in medium-sized libraries. One librarian from a small corporate library reported using integrated library software from Data Treks, Inc. Only two academic librarians reported carrying software (BASIC and DOS) for patrons use.

## NUMBER OF MICROCOMPUTERS IN GEOSCIENCE LIBRARIES

The number of microcomputers reported as being available in a single geoscience library ranged from one in the majority of cases (65%) to twenty three for one library. In the latter case fifteen machines were located in the technical services area of the library and the rest in the reference section. The number of machines is likely to escalate. For example, one respondent had 1 machine in July, two by the time of this conference, one more on order, and expects to have up to three more in the near future. In fact, the number of libraries having access to one or more machines and the uses to which these microcomputers are put may be changing very rapidly. Several respondents commented that their microcomputers were newly acquired or that they planned to use certain applications soon, though they were not yet doing so.



Microcomputers did not always turn out to be as useful as originally thought. Applications for which it was planned to use a microcomputer, but for which it was, in fact, not helpful included preparation of the current acquisitions list, for which one respondent found that there was no time savings when using the micro. Another librarian had planned to build a map index on the personal computer but found that the storage available was inadequate and the software not sufficiently sophisticated for the need so turned instead to a mainframe for that application. Another reported that downloading took longer than expected, so did not do so as often as expected. In this same vein a Canadian respondent mentioned that "most front-end, online searching packages have proven unsatisfactory either in themselves or because of telecommunications problems".

As part of our survey on microcomputers in geoscience libraries, the investigators conducted a literature search on so-called front-end or gateway software, with an eye to its appeal by geologist end users. As described below, we found that the interest shown in gateway software has been chiefly by librarians, not the end user. However, software packages designed as data base managers seem to us to have more initial appeal to geologists who are beginning to use a personal computer in their work.

#### FRONT-END OR GATEWAY SOFTWARE.

Front-end or gateway software refers to microcomputer software packages which act as interfaces between online searchers and the bibliographic retrieval systems they are searching. These interfaces translate a search statement formulated in natural language into the command language of the system being searched. They come in either menu-driven or graphic formats. The packages frequently offer enhancements such as auto-dial, automatic logon, downloading, uploading of search strategies performed offline, search strategy save features, and, sometimes, word processing.

#### GATEWAYS AND THE END USER

What makes discussions of front-end software so interesting is not what the software does, but how it is being marketed. It is aimed variously at the searcher of a particular system, at members of the scientific community as end users, and at the information intermediary -- AND the jury is still out as to which will be the most successful campaign. We pretty well know who and where the intermediaries are... the real mystery is the end user.

A DataPro feature report in April, 1985 (DataPro, 1985), reported that while sales of personal computers have jumped in recent years, their real impact on information retrieval is yet to be felt. The majority of personal computers are still used for database management, forecasting, modeling, word processing, and business applications. Surveys have also been done recently on microcomputer use trends in geology, and they, too, support our contention that individual researchers themselves are doing little remote database searching. Data gathered by Tedd F. Sperling and reported in the December, 1984, AAPG Explorer (Microcomputers, 1984) showed that geoscientists were using their micros for well database management (12.6%), reservoir analysis (11%), word processing (10.6%), lease database management (9.6%), accounting (9.6%), geology programs (8.8%), contouring (8.7%), spreadsheet (8.7%), graphs and pie charts (6.1%), geophysics programs (5%), seismic modeling (4.7%), and seismograph construction (4.3%). A recent Geotimes report (Krajewski, 1985) claims that similar data were obtained in surveys by the Computer Oriented Geological Society and AAPG's Computer Applications Committee.

There have been some studies, however, which have shown that the individual end use is receptive to new opportunities. Home computer owners, surveyed by Link Resources, said that they would like to access remote data bases (DataPro, 1985). A study by SRI Research Center in Lincoln, Nebraska, found that modems trail only printers as the peripheral products computer owners most want to buy. And more and more computers are being equipped with integral modems.

It was on the strength of these reports, and belief in a large untapped market, that a few entrepreneurs began to introduce database gateway software to the novice end user. One of these gateway packages was In-Search, a package introduced by Menlo Corporation in 1984 to make Dialog searching easier for end users. Although In-Search was a well-marketed product, Menlo soon discovered that many people did not understand what Dialog was, or indeed why online searching could be valuable to them (Newlin, 1985). As it turned out, the established market for In-Search was a limited one: information professionals, not the end user. Consequently, the people at Menlo redirected their efforts to create a front-end package for information intermediaries called ProSearch, which, in addition to serving as communications package to Dialog and BRS, allows searching in the nature command mode of the two systems. To further its appeal to information managers, ProSearch produces accounting reports.

## ROLE OF INTERMEDIARIES

What things are needed to attract end users in great numbers to online searching? This issue was addressed at the 6th National Online Meeting in New York in 1985. The most important thing, according to Phil Williams, Userlink Systems, Ltd., "is informing people how the information in databases can help them in their jobs" (Tenopir, 1985). Marketing efforts by database producers are certainly a way to achieve this, but the help of intermediaries may be crucial to the success of a product. Intermediaries can generate enthusiasm and translate this enthusiasm into searching skills. Intermediaries are also necessary to reduce the intellectual barriers to widespread end user searching; to assist with search formulation; to help in database selection and in formulating the initial search; and to assist in revising and improving the search.

## ONLINE SEARCHING IN ACADEMIA

End users in academia are the faculty and students. What could a software producer learn from their use or non-use of database searching?

In a study of faculty use of databases for research by Borgman et al, reported in Online Review, August, 1985 (Borgman, 1985), the authors concluded that "academic faculty are typically unaware of the range of databases available and few recognize the need for databases in research. Of those faculty who use databases, most delegate the searching to a librarian or an assistant. The major barrier to end users taking over the terminal appears to be lack of willingness to invest the effort in learning and maintaining online searching skills".

Other findings which are of interest are: younger faculty are the heaviest users of online searching; most online searching is funded from department or research project funds; very few grants are budgeted for database searching; heavy users care more about the quality of the databases.

The investigators' primary recommendation was that information about databases be directed at the information professional, librarians, and, yes, college and university faculty, but that the latter would be the most ambitious undertaking of all and its effectiveness unknown at present. "More research would have to be done before an information campaign could be aimed at this audience: Are faculty merely ignorant in ignoring available databases? Are their present information-seeking habits sufficient and the databases truly unneeded (doubtful, considering the amount of data published only in database form)? Or are they overloaded with information and avoiding new sources.?"

The other end user in academia is the student. Students search databases every day and know how important they are to their studies and assignments. These databases are online catalogs to the library's collections, and many schools have them or will be converting them.

Results of a 1981 study by the Council on Library Resources indicated strong user acceptance and satisfaction with library online catalogs, but identified subject searching as the most important aspect that required improvement (Micho, 1985). The users suggested enhancement to subject access, including access to periodical literature. This year librarians at the University of Illinois will test software designed, among other things, to search remote databases for periodical articles and link incoming citations to the library's online catalog via a second communications board located in the microcomputer. Illinois Search Aid, as the software package is called, will tap both remote and hardwired local systems simultaneously. It is the contention of the project that end user database searching can be performed most effectively in an 'analytic' online catalog environment where students can compare retrieved citations to local holdings and availability of information and obtain bibliographies customized to their use.

#### ARE GATEWAYS USEFUL TO THE INFORMATION PROFESSIONAL?

Are front-end products useful to the experienced searcher? Such features as auto-dial, automatic logon, and downloading, which are useful to searchers, are available on less expensive communications programs. What you pay for in gateway software is the interface feature. You pay for it and any auxiliary software, such as text processing or database managers. As an experienced searcher, you want to provide less expensive and more enhanced searches, but you may see little need for an interface. However, as Louise Levy points out in her article on gateway software, there are reasons why you should know about these packages (Levy, 1984).

1. Gateway software can ease the occasional search of an unfamiliar system. The interdisciplinary nature of geoscience inquiry requires that, in some cases, you have to search in a variety of databases.
2. Formulating search strategy before going online and other auxiliary features of interfaces may actually save you money and time.
3. You can use these programs to train inexperienced searchers to use a particular system -- first, its basics, through a menu format, and then its sophistications through a native language option.
4. The success of gateway software will mean improvements in future software; and higher sophistication is recognition that the personal computer is truly becoming the multi-use, one-stop work station that so many information professionals foresee.



## BIBLIOGRAPHIC DATABASE MANAGER SOFTWARE

Bibliographic database managers are computer programs which let you organize collections of information, such as journal articles, bibliographies, and research notes. A database manager lets you enter and edit information in the collection (or databases), search it and retrieve selected entries, reorganize them, and print them in different formats. A geologist, for example, can index his or her collection of reprints or books, search textual material collected over time, or prepare reference lists of published articles. The dedicated bibliography DBMs provide these basic functions, less or more extensively, depending on what one needs. "They omit the more mathematical and relational aspects of the general DBMs; instead they provide features designed to appeal to academics instead of computerniks, mainly ease of use and ability to handle lots of text. In addition, some provide highly controllable printed output to match the ridiculous diversity of styles of reference lists required by journals" (Hurlbut, 1985).

## THE APPEAL OF BIBLIOGRAPHIC DBMs FOR GEOLOGISTS

Geologists are purchasing personal computers in greater numbers, but only a few are using them to search remote databases. Basically, they still get information they need by personal contact, reading leading journals in their field, and tracking down retrospective literature through lists of references in journal articles. Geologists know about GeoRef, and for a thorough search on a topic, will go online through an intermediary (librarian). There is no current evidence that this pattern will change. Most geologists will not espouse front-end interfaces, at least not for awhile.

On the other hand, with the hardware they have already purchased (usually a computer and a printer), a software system which will help them index and retrieve information from personal files may have immediate appeal to them. Why? Because bibliographic database managers offer an attractive alternative to preparing 3 X 5 card files or inventing a punch card system for use in retrieving information by a subject. Output from the computer-produced database can be quickly organized for whatever the purpose at hand and printed in a format to match. Take, for example, the file on James Hutton which geologist Donald McIntyre at Pomona College has extracted from his database of book and periodical literature (McIntyre, 1985). The standard alphabetical listing of authors will group, by name, critics of Hutton's theory of the earth. A listing by journal title, however, will be more useful to McIntyre if he is browsing in the library's

journal runs. A listing of the file by date will group Hutton criticism by period, and therefore by stages of maturity in scientific thought. DBMs permit the quickness and versatility that the old manual systems of organization could not hope to achieve.

## CONCLUSIONS

Summing up, this is how we see things currently:

1. Until there is any clearly recognized need for bibliographic literature searching to be done by the end user, intermediaries will continue to play an indispensable role in remote access searching. As students move into the ranks of researchers, the number of tasks they will be willing to do at the PC work station is still unclear.

2. For intermediaries to use it, gateway software will have to be fast, friendly, at least as sophisticated as the database they access, and easily adjustable to changes and improvements in the databases they access.

3. Database managers, with their ability to store, search and format data, will have greater initial appeal to geologists who own PCs than gateway software. As geologists find that DBMs also allow the importing of the citations from remote databases, there is a chance that some of them may add online bibliographic searching to their other routines on the PC.

## FUTURE IMPLICATIONS FOR GEOSCIENCE LIBRARIES

Judging from the amount of software available for the different makes the IBM-PC appears to becoming the dominant machine. Products for the APPLE II are diminishing. If the geoscience librarian wishes to have equipment compatible with those of her/his users, the IBM appears to be the correct choice (Phillips, 1984).

The amount of software available appears to be escalating at a rapid rate judging from the catalogs of geoscience software available. This may be due to several factors: prices of the software are dropping, the rush towards computerization of geoscience is speeding up, publishers are taking over the market, software is easier to use and ever more powerful (Phillips, 1984), and, even though the amount of software aimed at geologists, geophysicists, and petroleum engineers is increasing, there are many areas of the discipline for whom little or no software exists (McCammon, 1985). Is the geoscience library going to buy all of this software, none of it, or

some of it? What is available now could rapidly eat up most collection development budgets. Is it necessary, or even appropriate for the library to have these materials? Is the acquisition of software not like providing a researcher's tools? What if the library doesn't buy any of this software? How are limits set? What is appropriate for libraries to acquire? The criteria that is being used at Stanford, for example, is that the software must be for geoscience applications and must be of potential use for several different researchers. Furthermore, any software purchased by the library is not intended to replace software that a researcher would otherwise buy for concentrated use. There is a certain amount of public domain software listed in the Geology Programs for Microcomputers directory published by the Computer Oriented Geological Society. However, remember that free or inexpensive software is still costly to process.

Another area that is proliferating rapidly is that of geoscience data published in machine readable form. This format of data has been available for many years, but now that access for researchers is becoming more and more common the question arises: "Why publish data in printed form at all? It will only have to be input again into machine readable form when a researcher wants to use the data". Are the libraries going to be left out of this? Is there a place for the library in this data accessibility? Either through searching outside sources or through acquiring data published in digital form? Should the library archive the data produced at its institution/corporation? Will maps be available only in digital form? Digital maps may well be the format most preferred by the researchers. Microcomputers, with graphics capabilities and ability to store and manipulate information, make accessing much of this information in the library possible.

Other factors to consider include the noise of the machines and its affect on the researchers using the library in more traditional ways, the cost of the paper for the printers and the cost of the disks, in addition to the cost of growing time spent accessing outside databases. The answers to these questions can and should vary according to the needs of the clientele and the type of institution/company which the geoscience library serves.

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# APPENDIX ONE

## ANSWERS TO QUESTIONNAIRE

QUESTION		FREQUENCY	PERCENT	CUM PERCENT
Q01	In what type of library do you work?			
	Government	6	17.6	17.6
	Academic	18	52.9	70.6
	Corporate	10	29.4	100.0
	TOTAL	34	100.0	
Q02	How large is your earth sciences collection (in volumes)?			
	Less than 50,000	21	61.8	61.8
	50,000-75,000	4	11.8	73.5
	75,000 or larger	9	26.5	100.0
Q03	Do you currently have access to a microcomputer?			
	Yes	26	76.5	76.5
	NO	8	23.5	100
RESPONSES FOR THOSE HAVING ACCESS TO A MICROCOMPUTER				
Q04A	How did you acquire (finance your library's microcomputer?			
	A. Library funds?			
	No	14	53.8	53.8
	Yes	12	46.2	100.0
Q04B	Grant monies?	No	26	100.0
	Department funds?	No	10	38.5
		Yes	16	61.5
Q04D	Gift?	No	24	92.3
	Yes	2	7.7	100.0
Q04E	Other?	No	26	100.0
Q05A	To what kind(s) of micro(s) do you have access?			
	IBM-PC/XT?	No	8	30.8
		Yes	18	69.2
Q05B	IBM-AT?	No	26	100.0
Q05C	AppleII/III family?	No	23	88.5
		Yes	3	11.5
Q05D	Macintosh?	No	24	92.3
		Yes	2	7.7
Q05E	Tandy/Radio Shack ?	No	25	96.2
		Yes	1	3.8



Q05F	IBM compatible ? (Compaq, AT&T, etc.)	No	24	92.3	92.3
		Yes	2	7.7	100.0
- Q05G	Other?	No	19	73.1	73.1
		Yes	7	26.9	100.0
Q06	Where is the micro located?	(MEAN	1.192)		
	In the Library		24	92.3	92.3
	Elsewhere		1	3.8	96.2
	Both		1	3.8	100.0
Q07A	Who uses the micro?				
	Library staff?	No	1	3.8	3.8
		Yes	25	96.2	100.0
Q07B	Patrons?	No	23	88.5	88.5
		Yes	3	11.5	100.0
Q07C	Certain patron groups?	No	22	84.6	84.6
		Yes	4	15.4	100.0
Q08	The following are some "standard" library activities for which a micro might be used. Please indicate those for which you or your staff currently use a micro.				
Q08A	Acquisitions?	No	20	76.9	76.9
		Yes	6	23.1	100.0
Q08B	Cataloging	No	16	61.5	61.5
		Yes	10	38.5	100.0
Q08C	Serials check in	No	23	88.5	88.5
		Yes	3	11.5	100.0
Q08D	Circulation?	No	22	84.6	84.6
		Yes	4	15.4	100.0
Q08E	Reserves	No	21	80.8	80.8
		Yes	5	19.2	100.0
Q08F	Overdues, holds?	No	24	92.3	92.3
		Yes	2	7.7	100.0
Q08G	Administration?	No	12	46.2	46.2
		Yes	14	53.8	100.0
Q08H	Telecommunications?	No	14	53.8	53.8
		Yes	12	46.2	100.0

Q08I	Word processing?	No	4	15.4	15.4
		Yes	22	84.6	100.0
Q08J	Electronic mail?	No	17	65.4	65.4
		Yes	9	34.6	100.0
Q08K	Bib.instruction aids?	No	14	53.8	53.8
		Yes	12	46.2	100.0
Q08L	Computer aided instr.	No	24	92.3	92.3
		Yes	2	7.7	100.0
Q08M	In-house databases?	No	10	38.5	38.5
		Yes	16	61.5	100.0
Q08N	Bib. compilation?	No	11	42.3	42.3
		Yes	15	57.7	100.0
Q08O	On-line retrieval of bibliographic citations?	No	10	38.5	38.5
		Yes	16	61.5	100.0
Q08P	SDI among users?	No	24	92.3	92.3
		Yes	2	7.7	100.0
Q08Q	Direct patron access to outside databases?	No	21	80.8	80.8
		Yes	5	19.2	100.0
Q08R	Direct patron access to online catalogs?	No	24	92.3	92.3
		Yes	2	7.7	100.0
Q08S	Patron use of micros/software?	No	26	100.0	100.0
		Yes			
Q08T	Newsletters and acquisitions lists?	No	18	69.2	69.2
		Yes	8	30.8	100.0
Q08U	ILL?	No	22	84.6	84.6
		Yes	4	15.4	100.0
Q08V	Other?	No	25	96.2	96.2
		Yes	1	3.8	100.0
Q09A	Uses that might be thought as specific to a library serving the needs of earth scientists. For which do you use microcomputers?	No	22	84.6	84.6
		Yes	4	15.4	100.0

Q09B	X-ray diffraction files?	No	26	100.0	100.0
Q09C	Nonbibliographic files?	No	22	84.6	84.6
		Yes	4	15.4	100.0
Q09D	Data enhancement after downloading?	No	22	84.6	84.6
		Yes	4	15.4	100.0
Q09E	Information published on disks?	No	23	88.5	88.5
		Yes	3	11.5	100.0
Q09F	Special inhouse geoscience databases?	No	17	65.4	65.4
		Yes	9	34.6	100.0
Q09G	Graphics?	No	25	96.2	96.2
		Yes	1	3.8	100.0
-Q09H	Other?	No	25	96.2	96.2
		Yes	1	3.8	100.0
Q10	What configuration do you have?				
	Microcomputer		13	50.0	50.0
	Micro used as workstation		1	3.8	53.8
	Combination		12	46.2	100.0
Q11A	What kind of storage do you have?				
	Floppies?	No	3	11.5	11.5
		Yes	23	88.5	100.0
Q11B	Hard disc?	No	17	65.4	65.4
		Yes	9	34.6	100.0
Q11C	Mini or mainframe?	No	15	57.7	57.7
		Yes	11	42.3	100.0
Q12A	What software applications do you find useful?				
	Spreadsheet?	No	18	69.2	69.2
		Yes	8	30.8	100.0
Q12B	Database manager?	No	9	34.6	34.6
		Yes	17	65.4	100.0
Q12C	Telecommunications?	No	12	46.2	46.2
		Yes	14	53.8	100.0
Q12D	Word processor?	No	3	11.5	11.5
		Yes	23	88.5	100.0

-----				
Q12E	Graphics?	No	23	88.5
		Yes	3	11.5
-----				
Q12F	Front end, user-friendly software	No	21	80.8
		Yes	5	19.2
-----				
Q12G	Other?	No	25	96.2
		Yes	1	3.8
-----				
Q13A	Do you provide software for patrons using microcomputers in your library?	No	24	92.3
		Yes	2	7.7
-----				
Q14	How many micros are in your library?			
		1	17	65.4
		2	4	15.4
		3	1	3.8
		4	2	7.7
		8	1	3.8
		10	1	3.8
				100.0
(MEAN	2.077)	TOTAL	26	100.0





# THE USE OF MICROCOMPUTERS IN SELECTING DIAMOND TERMINOLOGY FOR INDEXING GEMOLOGICAL LITERATURE

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**Abstract**--Existing geoscience sources of indexing terms do not meet the needs of gemologists attempting to retrieve diamond information. While thesauri such as GeoRef Thesaurus and Guide to Indexing contain diamond vocabulary, they were not designed to cover the unique assortment of topics of concern to gemologists. To develop vocabulary for properly indexing diamond literature, one must be aware of the specialized character of that literature. A comprehensive gemology indexing system would incorporate vocabulary usable in indexing three very different disciplines: science, business, and art.

The development of this diamond thesaurus requires examination of the vocabulary itself and of the tools available to assist in selecting those terms. Tools for constructing thesauri from vocabulary lists range from books and journal articles to software available for computers. Using the American National Standards Institute Guidelines for Thesaurus Structure, Construction and Use, this project evaluates the application and limitation of these tools.

## Introduction

Gemology is the investigation of gemstones, their identification, grading, and appraisal. It is an ancient study that was resurrected and put on a scientific footing by the naturalists of the 18th and 19th centuries and formalized into an academic discipline in the 1930's. The Gemological Institute of America (GIA) is one of the schools responsible for this development. GIA is a non-profit educational center for the jewelry industry with headquarters in Santa Monica and an eastern division in New York City. It was founded in 1931 and began publishing a quarterly research journal Gems & Gemology in 1934. GIA offers gemology and jewelry manufacturing arts on an international basis to 600 resident and 20,000 correspondence students a year. GIA and the handful of gemology schools in other countries are one of the reasons there has been a steady increase in interest in gemology since the 30s. This has produced a greater demand for information on gemology and jewelry arts. Based on the number of questions referred to the GIA by geology librarians, I know that you receive queries about gem topics on a regular basis. But the retrieval of gemology information is a challenging task in today's information arena. Many of the technological advances and even standard indexing systems which have been applied to other areas of geoscience information have not been transferred to gemology.

One way to correct this imbalance is to create a bibliographic database on gemology and the jewelry industry. Having first used the ERIC thesaurus and later the Georef thesaurus, it seemed logical that one would begin a database by constructing a thesaurus. Certainly, there are databases such as GeoRef, Chem Abstracts, Geoarchive and Wilson Online that include gemology information and the business and newspaper databases include some jewelry industry news but most of the journals and trade journals the GIA Library subscribes to are not included in these databases. For that matter, they are not even indexed.

Today we are going to examine one aspect of gemology information, diamonds, before focusing on thesauri, the computer applications for their development, and the micro software that is available.

### **Nature of Diamond Information**

A key topic to gemologists and the jewelry industry is diamonds. Diamonds comprise about 60% of the value of jewelry sales in the U.S. But what is the nature of diamond information? It crosses three disciplines: science, art, and business. Of the 125 journals we subscribe to, 28% are science other than gemology, 15% are gemology, 12% are art, and 45% are jewelry industry. An examination of the GeoRef thesaurus entries for diamond and the Library of Congress Subject Headings is very useful in seeing how diverse the needs of gemologists are in retrieving information.

### **Thesaurus Definition**

Devadason and Balasubramanian describe a thesaurus as a list of structured compulsory keywords. It can be defined as "a controlled dynamic vocabulary of semantically related terms offering comprehensive coverage of a domain of knowledge." It is a controlled list with indications of conceptually associated terms for use in information retrieval systems. Wall stated that a thesaurus used in information retrieval "must list terms, exhibit relationships, and define vocabulary." The indexer and searcher make their selections from the thesaurus of terminology. There are also entries for non-approved terms and the user is referred to the appropriate approved terms.

### **Need for Thesaurus**

Does gemology need a thesaurus? Baltz says that "a system that does not use a thesaurus is based on the premise that words have precise meaning and that they do not derive any significance from context." Therefore, a word must mean the same thing to all attempting to communicate. Vocabulary control is needed when imprecisely defined words occur, the terminology is rapidly changing, and numerous synonyms exist for a term within a particular discipline (Baltz). All three conditions clearly exist in gemology. For example, lasering of diamonds can mean cutting diamonds with lasers or it can mean drilling holes into an already faceted diamond to burn out a noticeable inclusion.

### **ANSI Guidelines**

American National Standards Institute (ANSI Z39.18-1980) outlines the rules and conventions for how to structure, construct, and maintain a thesaurus of terms. Once constructed, the thesaurus provides operators and users of information systems with a systematic means of controlling the indexing and searching vocabulary.

The purpose of a thesaurus is to convert natural language, i.e., that used by authors of articles or that used by those searching for information into a "language that expedites the matching process which is the essence of the information retrieval." The system language, the special language of any particular retrieval system, is generally a subset of a natural language and may be limited to a group of specialists like gemologists. The information retrieval thesaurus is used in both searching and indexing processes (ANSI, 1980).

ANSI points out that it is important to consider the potential users of a retrieval system during the construction of the thesaurus if the resulting system language is to correspond to their retrieval needs. The utility and stability of that system language can be

enhanced through carefully considering the nature and characteristics of the material being indexed. Since the material and the ways of communicating that information will change over time, construction of a thesaurus should focus on who produces the information, who uses the information, and what are some of the forces that could alter the ideas and the language.

ANSI guidelines have established specific rules and conventions for term forms, term definitions, and cross references between and among terms. It is important to note that with an automated system it is even more critical that one adheres to carefully defined conventions and makes certain that these are strictly followed. Careful attention needs to be given to these guidelines before, during, and after construction.

### **Computer Applications**

Books by Soergel and Lancaster, classic works on thesauri, include chapters on computer applications to thesaurus construction. In 1974, Soergel pointed out that the application of computers is of growing importance in thesaurus construction. In addition to the intellectual work of deciding terms, there are a number of routine operations for which rules can be precisely specified. A computer can perform these operations much faster and even more important, much more reliably than a human clerk. Such tasks include checking alphabetical sorting and the inverse cross-references. But, it is important to note that all data manipulated by the computer was produced by intellectual work of humans first. It is people-machine cooperation, with the lexicographer doing what a lexicographer does best and a computer doing what it does best (Soergel, 1974).

The thesaurus is a file of data which is continuously modified and to which data is continuously added. What if (as will certainly happen) you decide one term needs to be changed? Every occurrence in the database must also be changed. The computer is an ideal tool for this. The computer also greatly facilitates updating and the publication of revised editions of the thesaurus (Soergel, 1974). All of the early work with computers was done on large systems -- mainframes or minis. What about personal computers?

### **Evaluation of Hardware & Software**

Although my hardware specifications have been predetermined by my company (with the prior purchase of an IBM 36, IBM 6000 and numerous IBM-PC's), it is important to consider future needs when choosing hardware as well as software. As Grosch (in 1984) points out, the adage that one buys software first and then gets hardware is no longer a truism. Mason (1984) in his article "Current and Future Microcomputer Capabilities" and Grosch (1984) in her article "Configuring a Professional Microsystem for Information Processing" in Vol. I, No. 1, Microcomputers for Information Management, offer useful background information as well as prescriptions for how to plan a microsystem you can live with for the next few years. Jane Anne Hannegan in Library Trends, Winter 1985, discusses evaluation of microcomputer software and gives helpful guidelines.

### **Lack of Software**

One major surprise in this investigation was the lack of software available for constructing thesauri using a microcomputer. Over the past four years there has been a dramatic increase in information on, and software for, creating private files and in-house databases. However, this has not produced much software for thesaurus construction using PC's. An announcement which appeared in the Microexchange column of the September 1985 issue of Small Computers in Libraries illustrates this situation. "Special librarian in NY is looking for a thesaurus program. A college librarian in Boston also seeks such a program. She questions whether anyone has experience with this using



dBase II. Information is sought for IBM and compatibles." I contacted Editor Nancy Jean Melin, who stated that she has received no responses to this query.

### **STAR Version for the PC**

Cuadra Associates of Santa Monica, California, who developed STAR, an \$18,000 high-end microsystem to create, maintain, and search in-house databases, has developed a STAR version which will run on a modified personal computer. The formal announcement will be made in 1986. It was demonstrated at the 1985 ASIS meeting in Las Vegas. One company, Sociological Abstracts Inc. (SA) of San Diego, California, has begun thesaurus development using STAR software on a personal computer (PC). By adding a special Alpha Microprocessor board to an IBM-PC with a hard disk, it is possible to run an Alpha Micro-PC version of STAR. The package uses an AMOS Operating System. AMOS was the first multi-user, multi-task operating system for microcomputers. You'll still be able to use all your MS-DOS software and have the added power of the multi-user AMOS system.

SA has created a thesaurus entry form composed of 14 fields with two additional fields, Descriptor Code and Descriptor Group to be computer generated at a later date. Once a worksheet for a thesaurus main term has been prepared, the data is entered into "Database 1." This STAR database is used subsequently as the source database to do a series of cross-load operations into a new "Update" database, "Database 2." At that time STAR will generate the reciprocal records automatically. From the Update database, one can generate preliminary reports which can be retrieved, thus allowing examination and revisions, if necessary, of the relationships.

Once the records from Database 1 have been entered into Database 2, it is possible to do a series of cross loads to create the reciprocal records. Examples are (1) USE terms become Main Terms and original Main Term becomes a USED FOR term -- and vice versa; (2) USE FOR terms become Main Terms and the original Main Term becomes a USE term; (3) BROADER terms become Main Terms and original Main Terms become NARROWER Terms; (4) NARROWER Terms become Main Terms and original Main Terms become BROADER Terms; (5) RELATED Terms become Main Terms and original Main Terms become RELATED Terms. Once all the operations have been submitted, you can return to the STAR Main Menu, while part of the system (Casper) is working on the global operations involved in doing the cross loads and indexing the terms. The file also functions as an authority list. STAR has the additional capability of generating reports on each of the relationships. This can be useful in determining where corrections are needed. These changes can be done globally when 10 or more records are involved (Wanger, 1985). The price of the STAR version to run on PC will include the hardware and software and will be about \$7,500 (as opposed to the high end Alpha Micro-1000 which now starts at \$19,560 for one user).

### **Other Software**

Access Innovations of Albuquerque, New Mexico, uses CAIRS to build vocabulary for databases. CAIRS from InfoDoc (Information Documentation 1-800-336-0800), which is located in Washington, D.C., is very similar in capabilities and price to Cuadra's PC version of STAR. It will generate Broad terms, Narrow terms, Preferred terms, Related terms, synonyms, and build the thesaurus. It is possible to make the thesaurus very specific to your information needs. You can store chemical registry numbers or correlate product name with generic name for example. It will also generate indented hierarchical terms -- so you can determine what term to search on. You can also do explosions on terms. There are a variety of PC packages -- the cheapest at \$1,800 just has a stop list. You need Micro B for real thesaurus capability, and for a single user that's \$3,500. The top of the PC line is Micro C at \$5,400, and for an extra \$900 you can

get the Batch Load option. Mr. Saboe at InfoDoc listed its advantages over Star PC as it runs on a greater variety of machines from PC on up; it is faster, builds a better thesaurus, and a better print thesaurus. Its big difference is that it is not limited to Alpha Micro computers.

I was able to track down that librarian from Boston who was looking for software in small computers for libraries. Mary Stevenson at Emerson College made the inquiry because she is developing a thesaurus of theatrical terms for the theater library. Her library school advisor at Simmons wanted her to use dBase II but Stevenson felt it would take too long to learn and then program and would be too complicated to use. She discovered a very inexpensive software called ask SAM -- a free text database manager that has been used for thesaurus construction. She inputs her hierarchy which can be retrieved and it also generates an alphabetical list. Stevenson said it will do global batches. It costs \$140, works on IBM-PC and compatibles, and is produced by Seaside Software, Corpus Christi, TX (1-800-327-5726).

Dr. Elaine Svenonius of UCLA Library School indicated that a graduate student is also developing software for IBM-PC which will generate thesaurus. The student, currently working at the Getty Foundation, stated that about two more months are needed before the program will be finished (Svenonius, 1985).

These are the thesauri-specific software I have located. If you are interested in modifying database management software, there are a number of useful tools. Dr. Ching-Chih Chen at Simmons College, editor of Microcomputers Journal and author of Microcomputers in the Library, has two such publications. In Micro Use Directory Software check the Indexing and Abstracting Section and the Relational Database Management Section. Also check the full-text searching software like Sire and Zy Index. The other tool, Micro Use Directory -- Applications, will be published later in 1986, and will include a category on thesauri construction.

What does the future hold? Undoubtedly Cuadra's efforts with STAR indicate a new trend. We can expect more software as well as modifications within library systems packages in the coming years.

At the GIA we have entered an exciting phase prompted by the availability of an important gemology book collection which the owner is interested in selling to us. With the services of a fund-raising organization, we have begun a feasibility study. Assuming that the study indicates the gemology and jewelry industry will support such a fund-raising effort and GIA is successful in reaching its goal, we will begin to implement the conversion of a small corporate special library into a state-of-the-art information center. A gemology and jewelry industry database may become a reality.



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USE OF COMMERCIAL SOFTWARE FOR BUILDING  
LOCAL-USE GEOSCIENCE INFORMATION DATA FILES

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Librarians in the Earth Sciences are often faced with requests for information contained in theses and dissertations. These requests are frequently difficult and/or time-consuming to fulfill. Colleagues in other science disciplines (for example, chemistry, biology, and physics) do not seem to have the same type of requests. Perhaps because master's level work may be the only geologic description or analysis of a particular area, geology librarians receive, in addition to the standard requests from academic institutions for use by other graduate students, requests from faculty members; researchers employed by oil, coal and other mineral industries; land developers; prospectors and lawyers. In order to meet the needs of these varying requests, I decided it would be very helpful to create a database which would allow for quick information access with greater detail than was being provided by standard library book cataloging. There was a very strong need for geographic locality identification more specific than was provided by subject headings such as "Paleontology--Indiana" or "Geology--Montana."

In addition to access to a specific locality, there was also a need to have a database which could be easily updated, and if possible, one in which the data could be manipulated in order to respond to specific inquiries. In looking at computer programs, I encountered information concerning the software package CITATION (Eagle Enterprises Inc.) This is a program designed for bibliographic citations, either book or journal, with room for abstracts or notes. It allows for access by six subject entries which can be assigned by the database creator. The format is well designed and easily understood (see Figure 1.) CITATION seemed ideal to meet our information demands. The use of commercially available software would allow the copying of data onto diskette for others to use with their own software if this was desired. With Indiana University having Geology Departments on four of its eight campuses, the distribution of this information would be very helpful. This was one of the reasons we did not want to create a local software package or use a modified dBase II. Additions to the database could be made without having to retype lists or create supplements and there would be no need to supply requestors with full lists when only portions were required.

Once it was determined that this was the approach we wanted to take, decisions were needed concerning the types of information most frequently requested, and the creation of thesaurus terms to use in order to maintain uniformity of access. The CITATION program provides

an author access key in addition to the six subject access fields. It was decided that only the author's last name would be used in this pre-assigned field. In this way, the searcher would not have to know the form of entry. All that would have to be entered for the data was the author's last name. (As you can see in Figure 1, the author's full name is located in the title paragraph, while the author access key -- last name only -- appears in the header.)

Consideration of past requests determined which information access points were important. First, there were requests for data about only Master's theses. It was clear that information about PhD dissertations was readily available through Dissertation Abstracts. But, since some requestors did not have easy access to DAI, and other data relating to PhD studies still had to be retained in the file, there was a definite need to identify the graduate level of the work.

Second, requests were often phrased in terms of the year the work was submitted. Certain researchers were familiar with previous literature, or had older Indiana University lists (or other bibliographies) and only wanted updates.

Third, requests were for specific geographic locations. The simplest approach would be by state name, or by country if not within the U.S. Works within the state of Indiana would also have county names as access points. County level identifications could then be used if we were trying to locate which theses or dissertations covered multi-county geographic areas -- frequently defined by the requestor as "geologic studies along the Ohio River" or "the furthest advance of the last glacial flow" or "the fifty mile area around the Tippecanoe Battlefield." Identification by county could provide a good selection field for this type of request, and, of course, it would also answer the simple request for information regarding the geology of an individual city or town.

One of my first introductions to the field of earth science librarianship was a request from Vivian Hall, at the University of Kentucky, for a complete list of Indiana University theses and dissertations needed for the Geoscience Information Society project in 1979/80. For that, we had created a card file with the required bibliographic information, and had continued to add to that file. It served as a control file of reports to GEOREF, and had been used in the past to help answer some of these types of requests. The file, which contained author, title, graduate level, and date, was easily transferred to disk using the CITATION program. The broad geographic area was added as a subject access point when it was immediately identifiable. If it was not evident from the title, the other data was entered and the card set aside for further research.

The question then arose whether to identify those works which did not relate to any geographic location. Would it be important to be able to sort these out if necessary? It was decided that they should be sortable, and so they were assigned the access label "NO PLACE." Thus, theoretical works, geochemistry, or geophysics could be pulled with the "NO PLACE" designation. See Figure 2.



Upon completion of the entry of about 250 citations, another problem arose: the data disk was full. This was something we had not anticipated. The advertisements and reviews of this software had clearly indicated that one could easily index libraries of reprints or books with no problems. Unfortunately, I don't think anyone ever tested it to determine how many citations a standard diskette would hold. The project was continued on a second data diskette while thought was given to the problem. At worst, the data would have to be divided in some rational manner which would not result in double searching each time we had a request. As the majority of our work was Indiana studies, we decided that there would be an Indiana disk and a non-Indiana disk. Until the entire master file can be transferred to hard disk, this will have to suffice.

Once the basic data had been entered, it was fairly easy to return to the shelves, look at the material, and determine the locality for those works where this was not evident from the title. Theses and dissertations about Indiana were checked for exact county locations. Now a new problem was uncovered: How could we access a work which covered more than three counties? CITATION provides for six subject access points, and three of them were being used for date, graduate level, and primary location (i.e., state or country.) The immediate solution was to create a duplicate record to accommodate additional county names. While this takes up additional storage space, it does allow for the retrieval of the study by the regular access points as well as each of the counties. See Figure 3.

It was decided that we would not identify the counties in geographic areas other than Indiana, as there was not sufficient demand for information about those other states or foreign countries. We may revise this in the future and assign specific localities to the Indiana University work done in Montana, as this is our second largest area of study.

The flexibility of the CITATION program allows for several methods of information retrieval. There is the capability of listing all of the thesaurus terms used, including author name (see Figure 4.) This listing allows the searcher to determine if the information required is available. In other words, there would be no sense in trying to retrieve works on Finland by running the database search if "Finland" did not appear in the thesaurus listing. It also helps to determine the correct spelling of an author's name or a specific geographic area. For example, I am always convinced that the county in Indiana is "Vandenburgh," when in reality it is "Vanderburgh."

Citations can be retrieved by combinations of thesaurus terms. This is not the sophisticated Boolean searching many of us are familiar with in using GEOREF and other databases -- this program allows for only "and" combinations. However, with a simplistic database, this is sufficient. One can combine up to seven terms in the search. However, most searches probably only require two or three terms. See Figure 5.

As the data entry process continued, I thought about other information which we might want in this database. What came to mind first is the name of the formation studied. Obviously, with the limitations already described, it would be impossible for this particular database to accommodate any additional information and another would have to be created to meet other needs. Due to these constraints, the Formation Index is being compiled at this time as a simple WORDSTAR alphabetical listing. It seemed just as simple to create this index without repeating all the data in the main data file. Simply put, it gives the formation name with the author and date of the study. For an example, see Figure 6.

The Indiana University dissertation and thesis database does serve its purpose. New works can be added as they are received. Upon request, we can list all the IU theses and/or dissertations, access them by author's name, graduate level of work, and date of study. It can be used to identify any Indiana University (Bloomington) Department of Geology graduate work done on a specific country, state or Indiana county. While it has limitations (some of which can be resolved by the use of a hard disk storage system) we can, at this stage, copy the diskettes for use by not only another library, but private industry as well. In addition, I would be willing to make the data available to GEOREF if they want to add this level of specificity to previously reported titles.

(FIGURE 1)

```

-- CITATION KEYWORD SEARCH --
Indiana Univ. Dissertation File
Date: 01/01/80 (SMITH) Page: 1
=====

TITLE      Hydrogeology
AUTHORS     Smith
DATE       / /
KEYWORDS    MASTERS, 1983, INDIANA, VIGO COUNTY, CLAY COUNTY, SULLIVAN COUNTY

Hydrogeology of the Carbondale and Raccoon Creek Groups, Pennsylvanian system,
Vigo, Clay, and Sullivan counties, Indiana, by Christopher R. Smith.

9 + 93 pages and 5 plates
=====

```

(FIGURE 2)

-- CITATION KEYWORD SEARCH --  
Indiana Univ. Dissertation File  
(NO PLACE)

Date: 01/01/80

Page: 1

=====

TITLE            Biogeochemistry  
AUTHORS         Jackson  
DATE            01/19/72  
KEYWORDS        PHD, 1972, NO PLACE

The biogeochemistry of thermal ecosystems, by Thomas Joseph Jackson.

-----

TITLE            Correlation  
AUTHORS         Henderson  
DATE            01/19/73  
KEYWORDS        PHD, 1973, NO PLACE

Correlation and analysis of geologic time series, by Gerald J. Henderson.

-----

TITLE            Determination  
AUTHORS         Sarwar  
DATE            01/19/83  
KEYWORDS        PHD, 1983, NO PLACE

Determination of the acoustical impedance of a layered medium by the Gopinath-Sondhi integral equation, by A. K. M. Sarwar.

-----

TITLE            Direct  
AUTHORS         Heger  
DATE            01/19/81  
KEYWORDS        MASTERS, 1981, NO PLACE

The direct detection of hydrocarbons: a quantitative approach, by Paul A. Heger.

-----

Date: 01/01/80

Page: 1

=====

TITLE            Petrographic  
AUTHORS        Merkl  
DATE            01/19/85  
KEYWORDS       MASTERS, 1985, INDIANA, SULLIVAN COUNTY

Petrographic and depositional characteristics of the Hymera and Danville coal members in southwestern Indiana, by Roland S. Merkl.

8 + 67 pages

-----

TITLE            Petrographic  
AUTHORS        Merkl  
DATE            01/19/85  
KEYWORDS       MASTERS, 1985, INDIANA, KNOX COUNTY, VIGO COUNTY,  
VERMILLION COUNTY

Petrographic and depositional characteristics of the Hymera and Danville coal members in southwestern Indiana, by Roland S. Merkl.

8 + 67 pages

-----

(FIGURE 3)

(FIGURE 4)

CITATION KEYWORD LIST

Date: 01/01/80

Indiana Univ. Dissertation File

Page: 1

MIAMI COUNTY  
MILLER  
MISSOURI  
MONROE COUNTY  
MOORE  
MURCHIE  
NEVADA  
NEW YORK  
NO PLACE  
OKLAHOMA  
OWEN COUNTY  
PERRY COUNTY  
PIKE COUNTY  
POSEY COUNTY  
PULASKI COUNTY  
SAINES  
SCOTT COUNTY  
SMITH  
STUMPF  
TENNESSEE  
THOMPSON  
UTAH  
VIGO COUNTY  
WASHINGTON  
WEBSTER  
WISCONSIN  
YODER

MICHIGAN  
MILLHOLLAND  
MITCHELL  
MONTANA  
MOREAU  
NEBRASKA  
NEVERS  
NEW ZEALAND  
NORTH CAROLINA  
ORANGE COUNTY  
PARKE COUNTY  
PETRICCA  
PORTER  
PRICE  
REMY  
SARWAR  
SELEN  
SOUTH CAROLINA  
SULLIVAN COUNTY  
TEXAS  
TIPPECANOE COUNTY  
VANDERBURGH COUNTY  
WARNER  
WASHINGTON COUNTY  
WEISS  
WYOMING  
ZINN

MIESCH  
MINNESOTA  
MOLL  
MOON  
MOUND  
NELSON  
NEW MEXICO  
NICOL  
OHIO  
OVEJERO  
PENNSYLVANIA  
PHD  
PORTO RICO  
PUERTO RICO  
RIPLEY COUNTY  
SCHUYLER  
SIEVERDING  
SPENCER COUNTY  
TAIWAN  
THOMAS  
TIPSWORD  
VERMILLION COUNTY  
WARREN COUNTY  
WAYNE COUNTY  
WHITEWATER RIVER  
YATES



(FIGURE 5)

-- CITATION KEYWORD SEARCH --  
Indiana Univ. Dissertation File  
(VIGO COUNTY, MASTERS)

Date: 01/01/80

Page: 1

TITLE Geological  
AUTHORS Frielinghausen  
DATE 01/19/50  
KEYWORDS MASTERS, 1950, INDIANA, VIGO COUNTY

A geological report of the Lewis Quadrangle, Vigo County, Indiana, by Karl William Frielinghausen.

TITLE Geology  
AUTHORS Hutchison  
DATE 01/19/52  
KEYWORDS MASTERS, 1952, INDIANA, VIGO COUNTY

Geology and mineral resources of the Seelyville Quadrangle, Vigo County, Indiana, by Harold Christy Hutchison.

TITLE Hydrogeological  
AUTHORS Funkhouser  
DATE 01/19/83  
KEYWORDS MASTERS, 1983, INDIANA, VIGO COUNTY

Hydrogeological study of the French Lake area, Vigo County, Indiana, by Roy V. Funkhouser.

15 + 171 pages

TITLE Hydrogeology  
AUTHORS Smith  
DATE / /  
KEYWORDS MASTERS, 1983, INDIANA, VIGO COUNTY, CLAY COUNTY, SULLIVAN COUNTY

Hydrogeology of the Carbondale and Raccoon Creek Groups, Pennsylvanian system, Vigo, Clay, and Sullivan counties, Indiana, by Christopher R. Smith.

9 + 93 pages and 5 plates

TITLE Petrographic  
AUTHORS Merkl  
DATE 01/19/85  
KEYWORDS MASTERS, 1985, INDIANA, KNOX COUNTY, VIGO COUNTY, VERMILLION COUNTY

Petrographic and depositional characteristics of the Hymera and Danville coal members in southwestern Indiana, by Roland S. Merkl.

8 + 67 pages

Carwood Formation  
    Beard (1936)  
    Bieberman (1950)  
    Fiandt (1950)  
Caseyville Formation  
    Basu (1975)  
Catahoula Formation  
    Hacker (1984)  
Cayley Formation  
    Houck (1982)  
Cement City Limestone  
    Bartle (1932)  
Center Grove Till Member  
    Gruver (1984)  
Chanute Shale  
    Bartle (1932)  
Cherokee Group  
    Anderson (1970)  
    Bartle (1932)  
Cherry Creek Series  
    Barnes (1954)  
    Burger (1966)  
    Christensen (1956)  
    Dahl (1977)  
    Hanley (1975)  
    Hess (1967)  
Cherryvale Shale  
    Bartle (1932)  
Chesterian Series  
    Amadi (1979)  
    Amadi (1981)  
    Balthaser (1969)  
    Barr (1951)  
    Bates (1932)  
    Bieberman (1950)  
    Bowen (1951)  
    Brookley (1955)  
    Brueckmann (1958)  
    Butler (1967)  
    Childs (1940)  
    Connaughton (1953)  
    Edwards (1956)  
    Erickson (1952)  
    Gates (1965)  
    Harrell (1933)  
    Hunt (1925)  
    Jenkins (1956)  
    Koenig (1956)  
    Kugler (1951)  
Chrysler Member  
    Belak (1978)  
Cincinnatian Series  
    Alexander (1972)  
    Galloway (1913)  
    Harrell (1933)



REF - A Multi-User Bibliographic Data Base Application  
for Geological Sciences

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One of the most important applications of computer technology to earth science is data management. Advances in analytical instrumentation and rapid publication of scientific data have resulted in a flood of information which the geoscientist can utilize in current research. Microcomputers and, in particular, data base and spreadsheet software, are well-suited for organizing and analyzing this information. At Washington State University, commercially available data base and spreadsheet software has been used in a variety of applications including bibliographic citations, investment portfolios, classroom grade books, admissions, budgets, and mineralogical formula calculations. Although most of these applications have been customized for the particular needs of faculty, staff, and students in the Geology Department at WSU, the general principles and development strategies should be generally applicable to a wide variety of uses, and many different hardware and software formats.

The heart of the hardware system is a Sage IV microcomputer (manufactured by Stride Micro, Box 30016, Reno, NV 90520-0016) with a built in 40 megabyte Winchester drive for data storage. The microprocessor is a Motorola 68000 operating at 8 mhz. As presently configured, the Sage IV is connected to 6 Qume 102A terminals and a four-color Infoscrite 200 cps dot matrix printer under a multi-user P-system operating system. The six terminals are located in classrooms, research laboratories, and faculty offices, thus enabling a variety of users to communicate and access common data sets.

In addition to programs written in Fortran, Basic, and Pascal, commercially available data base and spreadsheet software are used routinely. The currently used data base program is called Aladin (ADI



America, 8001 Frontridge Road, Sacramento, CA 95820) and utilizes B-tree hierarchy to provide very rapid access to large files. Aladin is broadly similar to d Base II and III but has considerably more speed, power, and functions.

#### Data Base Applications

Probably the most demanding use of the Aladin program at WSU is the bibliographic data base (REF). REF was created for a specific need that is not met by existing library facilities or universal computer data bases such as Georef or Dialog. REF is limited to the specific subject and interest areas of its users, a relatively small group of faculty and students. Input to REF consists of all articles of interest to the user group and it is updated whenever a new journal or book comes to the attention of a user. A typical input is an interesting article published in a journal to which a faculty member subscribes. If a user attempts to add a reference that is already in the data base, the program will notify the user to that effect. Likewise, if an incorrect data format is attempted, the program will rudely notify the user to that effect. Due to the speed of the system and the relatively small size of the user group, the REF thesaurus (key words) is relatively uncontrolled, i.e. a master key word list is maintained and users are free to add new key words as needed.

#### Defining a Data Base Customized Format

To develop a bibliographic data base such as REF it is first necessary to outline the types of information to be cataloged and define a format for data entry/search. In the format of Aladin this is done during an initialization routine which results in a terminal screen format (Fig. 1) that guides all subsequent computer functions. Because

this screen format is the most important step in the construction of a data base application, it is appropriate to discuss the rationale for each screen element. The first line "reference" and "date" contains the author citation as it would appear in a geologic scientific journal. There are three possible formats: 1) a single author appears as "Smith, 1985" 2) two authors appear as "Smith and Jones, 1985", and 3) three or more authors appear as "Smith et al., 1985". As with all elements of the screen form, the reference line can be searched in several ways which will be described in detail in a later section. The next line, "authors", contains the full authors' citation including all initials and titles. The third line, "citation", contains the complete article title, journal or book reference, and volume/page citation. By combining the author, date, and citation elements, it is possible to produce a complete bibliographic citation of any item in the data base. The "key words" line consists of a series of words which describe important concepts of the entered article. Key words from the master list (Thesaurus) are arranged in decreasing order of importance with the last entry usually being a geographic descriptor. The bottom line of the screen form consists of a series of flags which can be set to identify a particular subset of the data base such as a classroom reading list which may be used repeatedly. The definition of the screen form is quite flexible and can accomodate most needs. More categories can be added at a later date as well as limited changes to existing data fields. Any or all data fields can be searched or operated upon by the user. A typical data entry is illustrated in Figure 2.

REF currently contains about 1500 entries and about 300 new entries are added per year (Aladin is capable of handling more than 60,000

Figure 1. A blank screen from the REF database as defined by the Aladin database software initialization routine. For data entry the user simply types in the relevant data for each field (blank lines).

```

REFERENCE: _____ DATE: _____
AUTHOR(S):
_____  

TITLE:
.....  

.....  

.....  

.....  

.....  

KEY WORDS:
_____  

FLAGS:  _ _  CLASS:  _  CLASS2:  _

```

Figure 2. A sample data entry as it would appear on the terminal screen.

```

REFERENCE: Meinert_____ DATE: 1984
AUTHOR(S):
Meinert, L.D., _____
TITLE:
Mineralogy and petrology of iron skarns in western British Columbia,.....
.....Canada: Econ. Geol., v. 79, p. 869-882.....  

.....  

.....  

.....  

KEY WORDS:
skarn Fe' calcic. Au' British Columbia Canada.....  

FLAGS:  _ _  CLASS: 14  CLASS2: Au

```

entries so saturation should not be reached in the author's lifetime). A chronologic breakdown of the data base (Fig. 3) illustrates the dominance of recent references.

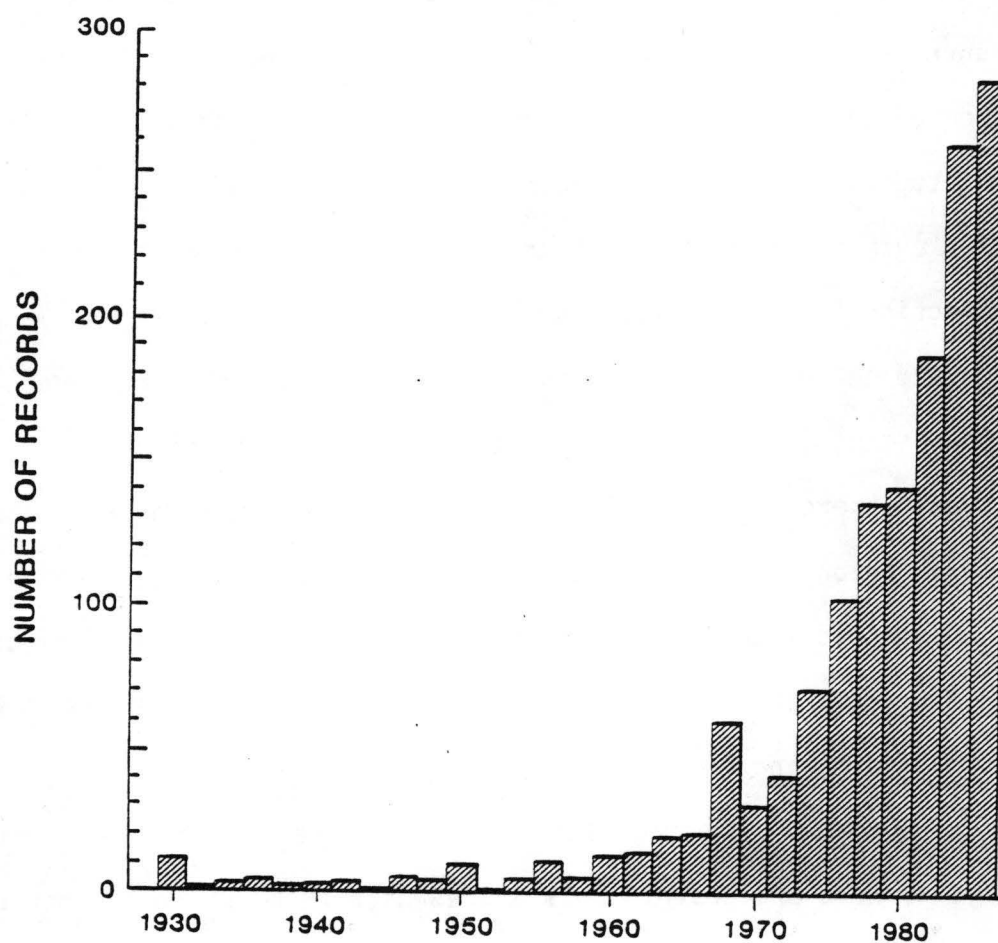
### Searches

Any field of data entry is searchable. If an exact author, date, etc. is requested, the response is instantaneous. "Wild cards" in the form of a "?" can be used to locate less precisely known data such as "Washing?" or "W?" for "Washington". The response to such a search will also be instantaneous but there will likely be more than one record which fits the search. In that case the user could step through all records which meet the search one at a time by simply pressing the return key. A more sophisticated way of searching the data base is by defining and saving a Query - a series of search commands connected by Boolean logic. An example of such an extended search by Query might be: search for all the records by authors (one of which is named Smith) published before or during 1979, in the journal Economic Geology, on the subject of ore deposits which contain either gold or silver in the State of Nevada. If such a Query were likely to be used again it could be saved for later recall. A very complicated search, which might require examining every letter of every data record in REF, would require less than 5 minutes of computer time on the Sage IV, even with all 6 terminals being used at the same time for different projects.

### Changes

Once data records are entered they can be changed individually, by selected groups, or globally. Typical mistakes include misspellings or typographical errors in a particular record. These would be corrected by calling up the file, fixing the error, and resaving the file. A more

Figure 3. Histogram of REF data entries by year of publication. The exponential shape of the histogram is due to the designed emphasis of the REF database on recent publications. In general most older publications are adequately referenced in existing library indexes, databases, and journals.





powerful technique involves the calculate command, by which the program could easily be instructed to find all occurrences of a number, word, or group of words and systematically change them to some other number, word, or group of words. The change and calculate commands can also be combined with search commands to selectively operate on the data base.

### Statistics

The Aladin program also provides commands to group data and perform statistical analyses. If one wanted to know what percentage of the entries in REF were published between 1960 and 1970, the statistics command could provide this information. It could also construct a histogram graphically illustrating the number of publications per year, per author, or per subject area. A more sophisticated statistical function is the correlation coefficient. For example, one could determine whether certain authors or subject areas are more important in the recent literature than in the past. Another application might be to see if there is a correlation between a particular journal and subject or geographical areas. As with other commands, statistical routines can be combined with Queries and search commands to analyze selected subsets of the data base.

### Word Processing

The Aladin program can link between the REF data base and the system word processor. This allows data from REF to be incorporated into reports, letters, and tables. A particularly useful feature is the ability to automatically compile a bibliography for a paper written on the word processor using references in the data base. It would also be possible to write a personalized letter to all authors in the file who had published an article on a certain topic within the previous five

years. The full capabilities of this word processing link with the REF data base have not yet been fully explored.

### Output

Although much of the use of the REF data base is interactive on-line searching via one of the terminals, probably the most important feature of a bibliographic data base is the ability to produce clear, well-organized, and sorted output on a printer. Aladin is extremely flexible in this regard. Report formats can be defined and saved using any combination of fields in the data file (Fig. 1). The fields also can be arranged in any order on the printed page so that almost any desired output format can be achieved. Headings or comments can be inserted in the defined report format and the output can be sorted alphabetically or numerically by any field or by any sequence of fields. There is no limit to the number of print formats which can be defined and saved for later use. Typical output formats and sorting styles are illustrated in Figures 4-6.

### Security

Any data base that is used by more than one user needs some form of security to ensure that the system is used properly and that an inexperienced user cannot cause too much damage to the system. This is particularly important for REF which is routinely used by both experienced users and by classes in which some students may never have used a computer before. For the REF data base there are two levels of security - a user ID and a password. The user ID is usually the person's initials or a class number like Geology 470. The password identifies what the user is allowed to do. At the lowest password level, the user is only allowed to look at data in REF but cannot enter,

change, destroy, or save anything. Other levels of use allow data entry and limited changes but prohibit destruction of large blocks of records. Some users can use all functions of the existing data base, but only the system manager's password will allow change in the structure and definition of the data base.

### Summary

A relational data base program called Aladin has been used to create a bibliographic data base called REF on a Sage IV microcomputer system. REF is a specialized reference data base for a specific group of users. The data base program is quite flexible and powerful but does require some practice to set up and use. The speed and power of the computer hardware makes it practical to use the sophisticated searching, sorting, statistical, and output features of the Aladin data base program.

Display of the data files: GEO (Select) (\*Keywords\*)

KEYWORDS DATE REFERENCE

skarn Zn' Pb' Argentina	1950, Spencer
skarn Zn' Pb' Nevada	1960, Gulbrandsen and Gielow
skarn Zn' Pb' New Mexico	1961, Titley
skarn Zn' Pb' vein volcanic New Mexico	1936, Lasky
skarn Zn' sphalerite Fe' New Mexico Utah	1961, Rose
Sn' Mexico general	1942, Foshang and Fries
stylolites diagenetic F' Zn' flourspar Illinois	1967, Amstutz and Park
supergene enrichment chalcocite pyrite Cu' Mexico	1930, Elsing
tectonics California	1969, Hamilton
tectonics USA	1968, Hamilton
Ti' magnetite anorthosite magmatic Quebec Canada	1968, Anderson
tourmaline Fe' mineralogy	1966, Frondel et al.
tourmaline geochemistry transport	1948, Smith
tourmaline mineralogy structure	1969, Barton
U' exploration	1968, Rackley et al.
U' granite rhyolite volcanic veins alunite Utah	1968, Kerr
U' sediment hosted sandstone Wyoming	1968, Harshman
U' Th' Bokan Mountain Alaska	1963, MacKevett
U' V' sediment hosted sandstone USA	1968, Fischer, R.P.
vein Pb' Zn' Ag' tetrahedrite Idaho	1968, Hobbs and Fryklund
veins Pb' Zn' Ag' New Mexico	1910, Graton
vein structure San Juan caldera Colorado	1965, Steven and Ratte
VMS Arizona	1968, Baker and Clayton
VMS Cu' Arizona	1968, Gilmour and Still
VMS Cu' Zn' California	1948, Heyl
VMS Cu' Zn' California	1956, Kinkel et al.
volcanic ash flows igneous petrology general	1960, Smith
W' quartz vein tourmaline wolframite Bolivia	1945, Ahlfeld
W' Sb' xenothermal high temperature Guatemala	1969, Collins and Kesler

Number of Data Records: 265 ( 1461 )

Figure 4. Sample print-out of REF records sorted alphabetically by key words using a search limiter (or query) of publication prior to 1970. The sorting and searching procedure for this print-out was faster than the 200 cps dot matrix printer, thus the slowest part of the REF database system is the printer hardware.

Figure 5. Sample print-out of REF records sorted by date of publication.

Display of the data files: GEO (Select) (\*DATE\*)

DATE REFERENCE KEY WORDS

1909, Paige	skarn Fe' New Mexico
1910, Graton	veins Pb' Zn' Ag' New Mexico
1910, Emmons	porphyry Cu' skarn Sonora Mexico
1911, Lindgren and Irving	sediment hosted Pb' Zn' Cu' shale Germany
1912, Lee	skarn Cu' Mexico
1923, Bastin	Ag' Au' epithermal volcanic veins Nevada
1924, Mitchell	porphyry Cu' chalcocite supergene Mexico
1924, Swanson	skarn Fe' Texada British Columbia Canada
1929, Osborne	diabase sill gold with cobalt minerals
1930, Elsing	supergene enrichment chalcocite pyrite Cu' Mexico
1932, Warren	mineralogy tetrahedrite Ag' porphyry Cu' Mexico
1933, Perry	porphyry Cu' exploration
1934, Farmin	breccia pebble dike Utah
1934, Kerr	skarn W' Nevada
1935, Kelley	breccia pipe Cu' paragenesis porphyry Mexico
1936, Gunning	sediment hosted Pb' Zn' skarn British Columbia
1936, Valentine	porphyry Cu' skarn geology Mexico
1936, Lasky	skarn Zn' Pb' vein volcanic New Mexico
1938, Emmons	breccia pipes diatreme general genesis
1938, Wright	mineralogy garnet composition igneous petrology
1939, Schmitt	skarn Zn' New Mexico
1940, Short	ore microscopy determinative tables minerals
1940, Coats	Ag' hydrothermal alteration propylitic Nevada
1941, Schneiderhohn	ore deposits general
1942, Knopf	skarn general structure
1942, Foshang and Fries	Sn' Mexico general
1945, Bayramgil	skarn Au' arsenopyrite
1945, Pulfrey	Au' contact metamorphism
1945, Ahfeld	W' quartz vein tourmaline wolframite Bolivia
1946, Toit	skarn Au' Cu' Ni'
1946, Sohnge	skarn Au' Cu'
1946, Pulfrey	skarn Au' Mo'
1946, Juan	mineral resources skarn general ore deposits China
1947, Kerr et al.	porphyry Cu' alteration New Mexico
1947, Patterson and Kerr	porphyry Cu' alteration New Mexico
1947, Guild	petrology structure Moa district Cuba
1948, Heyl	WMS Cu' Zn' California
1948, Smith	tourmaline geochemistry transport
1949, Koschmann	Au' alkalic igneous syenite telluride Colorado
1949, Cameron et al.	pegmatite granite structure
1950, Koutek	skarn magnetite scapolite
1950, Bastin	ore microscopy textures general
1950, Bateman	ore deposits classification general
1950, Burbank	alteration volcanic hydrothermal Au' Cu' Ag' Pb' Zn'
1950, Osborn	ore deposits general geochemistry
1950, Spencer	skarn Zn' Pb' Argentina
1950, Graf and Kerr	geochemistry trace element zoning New Mexico



Figure 6. Sample print-out of REF records sorted alphabetically by author and secondarily by date of publication. The print-out is arranged in the typical format required by geological journals.

Display of the data files: GEO (\*AUTHOR(S)\*)

AUTHOR(S) DATE TITLE(1)TITLE(2)TITLE(3)TITLE(4)TITLE(5)

- Abbott, G., 1985, Silver-bearing veins and replacement deposits of the Rancheria Districts: Yukon Exploration Geology, Geology Section, 1983, D.I.A.N.D., Whitehorse, p. 34-45.
- Abel, M.K., Buchan, R., Coats, C.J.A., and Penstone, M.E., 1979, Copper mineralization in the footwall complex, Strathcona mine, Sudbury Ontario: Canadian Min., v. 17, p. 275-286.
- Abramson, B.S., 1981, The mineralizing fluids responsible for skarn and ore formation at the Continental mine, Fierro, New Mexico, in light of REE analyses and fluid inclusion studies: Unpub. M.S. thesis, New Mexico Institute of Mining and Technology, 143 p.
- Abrecht, J., 1980, Stability relations in the system  $\text{CaSiO}_3\text{-CaMnSi}_2\text{O}_6\text{-CaFeSi}_2\text{O}_6$ : Contrib. Mineral. Petrol., v. 74, p. 253-260.
- Abrecht, J., and Peters Tj., 1980, The miscibility gap between rhodonite and bustamite along the join  $\text{MnSiO}_3\text{-Ca(0.60)Mn(0.40)SiO}_3$ : Contrib. Mineral. Petrol., v. 74, p. 261-269.
- Abrecht, J., and Peters, Tj., 1975, Hydrothermal synthesis of pyroxenoids in the system  $\text{MnSiO}_3\text{-CaSiO}_3$  at  $P_f=2$  kb: Contrib. Mineral. Petrol., v. 50, p. 241-246.
- Aggarwal, P.K., and Nesbitt, B.E., 1984, Geology and geochemistry of the Chu Chua massive sulfide deposit, British Columbia: Econ. Geol., v. 79, p. 815-825.
- Ahern, J.L., Turcotte, D.L., and Oxburgh, E.R., 1981, On the upward migration of an intrusion: Journal of Geology, v. 78, p. 421-432.
- Ahlfeld, F., 1945, The Chicote tungsten deposit, Bolivia: Econ. Geol., v. 40, p. 394-407.
- Ahmed, Zulfiqar, 1984, Stratigraphic and textural variations in the chromite composition of the ophiolitic Sakhakot-Qila complex, Pakistan: Econ. Geol., v. 79, p. 1334-1359.
- Albers, J.P., 1983, Distribution of mineral deposits in accreted terranes and cratonal rocks of western United States: Canadian Journal of Earth Sciences, v. 20, p. 1019-1029.
- Aleksandrov, S.M., 1974, Geochemistry of boron-tin mineralization in the magnesian skarns of eastern Chukotka: Geochemistry Internat., v. 11, p. 532-539.



## **GEOSCAN: A Bibliographic Data Base for Canadian Geoscience Literature**

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K1A 0E8

**ABSTRACT:** GEOSCAN is a data base which provides bibliographic, geographic and subject access to publicly available geoscience literature concerning the Canadian landmass and offshore regions. This bibliographic data base is cooperatively produced from the indexing contributions of twelve federal, provincial and professional geoscience organizations located throughout Canada. The Geological Survey of Canada coordinates these indexing activities and provides computer resources in support of this project.

Document types covered in GEOSCAN include published serials, periodicals, theses, published and unpublished maps, open files and mineral assessment reports. GEOSCAN's data base structure is based on the UNISIST guidelines for bibliographic data and is supplemented with additional fields for geographic and subject information. A standard approach to indexing is maintained through use of a thesaurus, controlled authority files and detailed indexing documentation. GEOSCAN indexing is performed by geologists and the data base can be updated using either interactive or batch methods.

GEOSCAN is maintained on a Hewlett-Packard 3000 minicomputer and the data base is managed using MINISIS software. The HP3000 minicomputer is located in Ottawa and participating organizations access the system using the Canadian telecommunication network Datapac. A wide range of paper and microfiche products are produced from GEOSCAN and it is anticipated that the data base will be publicly available through a commercial vendor in 1986.

### **INTRODUCTION**

Controlling a nation's information base in any scientific discipline is a mammoth task in the best of circumstances. However, consider for a moment the case of controlling the geoscience literature for Canada. Canada has a land area second in size only to that of the USSR, the longest coastline in the world and an offshore area that is 60 percent of its onshore area. Due to the importance of the mineral and energy sectors to Canada's economy, a disproportionately large geoscience knowledge base has been built up and continues to increase rapidly. However, Canada is a nation of 25 million people and we have only a small population of professionals to control and access this important knowledge base. How could we cope with a widely scattered yet rapidly increasing literature base? How could the "grey literature" be brought under control? How could wasteful duplication of efforts be avoided by this small population of geoscience information professionals?

These were the concerns facing the Canadian geoscience community in the mid 1960s and like many other nations, Canada turned to data base building as one method of controlling its geoscience literature.

Senior representatives of provincial and federal governments, academia and industry, who were members of the National Advisory Committee on Research in the Geological Sciences (NACRGS) turned their attention to the situation in 1965 by appointing the ad hoc Committee on Storage and Retrieval of Geological Data in Canada. A sequence of gradually more detailed studies by the latter Committee led to a set of recommendations which were presented to, and accepted by, the Conference of Provincial Ministers of Mines and NACRGS in 1967 and 1968. Action on these recommendations led to the creation of the Canadian Index to Geoscience Data in 1969. In 1979 the name of the data base was changed to GEOSCAN.

#### GEOSCAN Indexing Network

The GEOSCAN data base is produced through the voluntary indexing efforts of 12 Canadian geoscience organizations. Participating organizations include eight of ten provincial governments (only British Columbia and Manitoba do not contribute records), three federal government agencies and one professional society.

	<u># of records</u>
Newfoundland and Labrador Department of Mines and Energy.....	6 669
Nova Scotia Department of Mines and Energy.....	7 551
New Brunswick Department of Natural Resources.....	3 423
P.E.I. Department of Energy and Forestry.....	68
Ministère de l'Énergie et des Ressources, Québec.....	18 821
Ontario Geological Survey.....	17 629
Saskatchewan Department of Mineral Resources.....	5 732
Alberta Geological Survey.....	2 769
Canadian Society of Petroleum Geologists.....	2 334
Department of Indian Affairs & Northern Development (Canada)..	6 855
Department of Energy, Mines and Resources (Canada)	
Geological Survey of Canada.....	21 881
Earth Physics Branch.....	671

This cooperative approach to data base building has resulted in coverage of a larger population of documents. Indeed, many types of documents indexed by provincial participants would be difficult for a centralized indexing system to acquire and index. A cooperative approach spreads the total workload over a number of organizations and thus insulates the data base from budgetary problems or other difficulties in any one organization. In the

Canadian situation it would be difficult for any single organization to carry the full workload of a national data base and therefore the cooperative approach has been utilized for GEOSCAN

However, with the cooperative approach to data base building come several difficulties arising from a decentralized indexing network. GEOSCAN indexers are located in 11 cities and 5 different time zones. Communications among indexers and between indexers and the National GEOSCAN Centre require additional effort on everyone's part. Electronic mail, a GEOSCAN newsletter, telephone communication and annual 5 day indexer's meeting are tools used to overcome communications difficulties. Indexer training is more difficult in a decentralized system and of necessity, training is compressed to several days and becomes very intensive. Comprehensive documentation is very important in a decentralized environment since indexers depend on documentation to provide all of the answers to indexing questions. It is just not possible to "ask the indexer at the next desk" in a decentralized system.

Despite these drawbacks, we believe the benefits of the cooperative approach to data base building outweigh the difficulties. The greatest benefit of this approach is that we have produced a single standardized national data base instead of a number of smaller and widely varying regional data bases.

#### **Role of the National GEOSCAN Centre**

The primary role of the National GEOSCAN Centre is to act as indexing network coordinator and data base administrator. A staff of four people perform the following activities:

- a) Coordinate the indexing activities of the participating agencies by providing comprehensive system documentation, administering the data base structure, resolving indexing disputes, maintaining the quality and commonality of GEOSCAN indexing and training new indexers
- b) Provide and support a computer "home" for GEOSCAN and provide assistance to participating agencies in their use of the computer system
- c) Develop and support mechanisms for communication among participants in GEOSCAN at the indexing and management levels
- d) Provide guidance and assistance to participating agencies in the production of their information products from GEOSCAN
- e) Coordinate public access to GEOSCAN and promote GEOSCAN products and services
- f) Plan for future developments in GEOSCAN



## Management and Financial Support

The Geological Survey of Canada (GSC) supports the GEOSCAN indexing program by providing funds for a minicomputer, software, system support, and telecommunications usage. As well, the GSC funds the activities of the National GEOSCAN Centre and devotes four people to the program. The participating organizations support GEOSCAN by committing staff to indexing activities and by providing terminals and telecommunications equipment.

The National GEOSCAN Centre is a part of the Geological Information Division and receives management direction from this unit. As well, the GEOSCAN Management Subcommittee (a subcommittee of the National Geological Surveys Committee) provides policy guidance and general direction for the data base. The GEOSCAN Management Subcommittee is composed of management level representatives from the participating organizations, the GSC and National GEOSCAN Centre and the Subcommittee provides a "management link" between the "operator" and "contributing" organizations.

## GEOSCAN Coverage

GEOSCAN presently contains over 94 000 bibliographic records and approximately 7 500 new records are added to the data base each year. Over 13 000 records have been indexed at the analytic level while the remainder are monographic citations.

A document must meet the following criteria in order to be indexed and entered into GEOSCAN:

- a) the document must deal with a geoscience topic
- b) the document must be available to the public for viewing and/or acquisition
- c) the document must concern either the Canadian landmass and offshore regions or report the findings of Canadian geoscience research

It is important to note that documents need **not** be published in order to be indexed for GEOSCAN. In fact, 59% (55 278 records) of the references in GEOSCAN were produced from unpublished yet publicly available geoscience documents. Unpublished material indexed for GEOSCAN includes theses (2 252 records), open file reports (3 553 records), internal reports and maps (5 017 records) and mineral assessment reports (44 456 records).

Since mineral assessment reports account for 47% of the records in GEOSCAN, an explanation of this relatively unknown yet potentially useful document type is in order. Mineral assessment reports are submitted by exploration companies, consultants and individuals in order to document their mineral exploration work performed during a specified period of time (usually

one year). A mineral assessment report must be submitted to the appropriate provincial or federal government department as a requirement for maintaining the mineral rights to a property under a claim, permit or license. Although they are usually held as confidential for between one and three years, assessment reports provide a detailed description of the geological setting and economic potential for a specific area and can be most useful to both the explorationist and geoscience researcher.

Published documents (39 125 references) account for 41% of the records in GEOSCAN and include the following document types:

Published Series and Maps	35 272 records
Journal Articles and Books	3 853 records

GEOSCAN coverage is most comprehensive for government produced and government administered documents. GEOSCAN coverage in the areas of journal literature and conference proceedings is strong for some regions but overall, these document types are more completely covered in GeoRef and Geoarchive. A comparison of the coverage of Canada by these three geoscience data bases is shown below:

GEOSCAN	GeoRef	Geoarchive
94 403 records	51 997 records	10 598 records

Appendix A shows a geographic breakdown of GEOSCAN and GeoRef coverage of Canada. Since GeoRef's strength is in its coverage of journal literature it becomes apparent that GeoRef and GEOSCAN coverage of Canadian geoscience literature are complementary rather than overlapping.

### **Data Base Structure**

The data base definition for GEOSCAN consists of 81 fields of which 56 fields contain bibliographic data elements. GEOSCAN uses the field structure recommended for bibliographic data elements in the UNISIST Reference Manual for Machine-Readable Bibliographic Descriptions. The remaining 25 fields contain geographic or subject data elements. Appendix C lists the more commonly used fields in GEOSCAN and Appendix D provides a sample of a GEOSCAN record.

Geographic access to geoscience documents is extremely important since a considerable amount of the literature is location dependent. On a broad level, indexers assign codes for the provinces, territories and offshore regions covered in the document. As well, fields have been defined to record counties, townships, mining districts and other geopolitical units used throughout the country.

The most detailed and systematic geographic control is provided through use of the National Topographic System (NTS) for Canada. Under this grid system, Canada is divided into numbered primary quadrants, each being 4 degrees latitude by 8 degrees longitude. This primary quadrant is further subdivided into 5 progressively smaller quadrants with the most detailed unit being .125 degrees latitude by .25 degrees longitude. NTS is a well known national grid system and it provides one of the most useful access methods to GEOSCAN records.

Subject access is provided primarily through the following fields:

- Geological Age
- Subject Category
- Keyword
- Named Descriptor

Geologic eras and periods are assigned in the Geological Age field. Twenty-nine broad Subject Categories have been defined and indexers assign one or more subject codes to each GEOSCAN record. Appendix A contains a list of Subject Categories along with the postings for each value. Keywords are controlled through a 3 900 term thesaurus and these terms are generally non-systematic in nature. Systematic terminology is assigned to the Named Descriptor field and more than 20 000 unique terms have been used in this field.

#### **GEOSCAN's Approach to Subject Analysis**

Since GEOSCAN does not include abstracts, there is increased importance placed on consistent and thorough document analysis. GEOSCAN subject analysis is performed by either a geologist or geological technician. These subject specialists start by quickly scanning the entire document to determine the broad subject categories. Once subject codes have been assigned the entire document is reviewed in more detail in order to assign Keywords and Named Descriptors. The GEOSCAN thesaurus has been subdivided using the broad Subject Categories and indexers use this tool to identify appropriate Keywords. Thus, in this broader-to-narrower approach, the Subject Categories assigned are supported by the more detailed Keywords. Indexers are obligated to use a minimum of one Keyword in support of each Subject Category code assigned.

The depth of indexing is affected by the size of the document and the level at which it has been written. Special attention is given to economic aspects of the document and we consider this to be a strength in our data base. A typical GEOSCAN record is assigned the following subject and geographic data:

2 to 3	Subject Category codes
10 to 12	Keywords and Named Descriptor terms
1 to 2	Geologic Age terms
1 to 2	Province/Region codes
2 to 3	NTS values

This data, when taken in combination with title words, provides good subject and geographic access to the original document.

### Updating and Quality Control Procedures

Records can be entered into GEOSCAN either through an online interactive session or a batch procedure. The online method prompts the terminal operator on a field by field basis. At the end of the prompt sequence the operator may make modifications to the record before it is added to the master data base. Using the online entry method, records are immediately available for retrieval purposes. An example of a completed work sheet for online entry is provided in Appendix E. The batch entry method requires that data be formatted in a style identical to the machine storage format of the data base. Records to be entered via the batch method are sent to the National GEOSCAN Centre on magnetic tape and batch loads are processed 5 to 6 times per year.

Updating existing records is done using the modify module. Interactive modifications are performed one at a time and it is possible to "globally" modify larger sets of records using a batch method.

A number of quality control procedures have been developed to identify incomplete and incorrectly indexed records. When records are entered or modified, the data in 16 fields are validated against authority files. This process controls the terminology and eliminates spelling mistakes in these fields since non-validating data is not written to the record. Indexers review records as they are entered into the data base and NGC staff also examine all new records on a monthly basis. A further series of record checks are carried out using "trap" retrievals. Finally, indexing consistency tests are periodically run to evaluate and improve the subject analysis process used by all indexers.

### GEOSCAN's Computer System

The GEOSCAN data base is maintained using a relational data base management system named MINISIS. This software package was developed by the International Development Research Centre (Canada) to support bibliographic applications and MINISIS is presently used at 103 installations around the world. MINISIS is menu driven and provides modules for data entry, modify, query, data sorting, print, file maintenance and data base creation. The software also provides online thesaurus and authority file capabilities.

The system hardware consists of a HP3000 model 48 minicomputer with 2 megabytes of memory and 940 megabytes of disc storage on three drives. The minicomputer is located in Ottawa and can be accessed by indexers using the Datapac telecommunication network. This configuration can support 22 concurrent interactive sessions and the system is shared with several other departmental library applications. The master data base file is approximately 100 megabytes in size and the entire GEOSCAN application occupies 250 megabytes.

### Utilization of GEOSCAN

At present, the primary use of the data base is in the production of bibliographic indexes for participating organizations. In 1984, 33 products were created from GEOSCAN for publication and other forms of distribution and this number is steadily increasing each year. Products are prepared for the participating agencies in a number of different formats including microfiche, laser printed paper output, floppy diskette and magnetic tape.

Access to GEOSCAN for online searching is presently limited to the libraries of the Geological Survey of Canada (Ottawa, Vancouver, Calgary) and to the participating organizations. The public can have a GEOSCAN search performed through a search intermediary who will negotiate the topic and provide a cost estimate for the retrieval. Access to and acquisition of documents identified through a GEOSCAN search is coordinated by the organization that indexed the records.

While several hundred online retrievals are performed in this manner each year, our ultimate goal is to make GEOSCAN publicly available through one or more data base vendors. It is anticipated that GEOSCAN will be available through a vendor in 1986.



## **APPENDIX A:** Summary of GEOSCAN's Subject and Geographic Coverage

### 1. Comparison of GEOSCAN and GeoRef coverage of Canada (breakdown by province)

	<u>GEOSCAN</u>	<u>GeoRef</u>
NEWFOUNDLAND	7 903	3 211
NOVA SCOTIA	8 350	3 276
NEW BRUNSWICK	4 260	2 191
PRINCE EDWARD ISLAND	240	260
QUEBEC	22 058	9 619
ONTARIO	20 521	14 597
MANITOBA	2 044	3 466
SASKATCHEWAN	7 388	4 430
ALBERTA	4 623	6 596
BRITISH COLUMBIA	2 762	7 913
YUKON TERRITORY	4 248	2 587
NORTHWEST TERRITORIES	9 412	7 009
Canada	94 403	51 997

### 2. Broad Subject Categories with postings

AREAL GEOLOGY	35 289	MARINE	1 016
ECONOMIC GEOLOGY	7 405	MATHEMATICAL GEOLOGY	462
EDUCATIONAL GEOLOGY	188	METALLIC MINERALS	30 369
ENGINEERING GEOLOGY	674	MINERALOGY	2 695
ENVIRONMENTAL GEOLOGY	430	MISCELLANEOUS	369
EXTRATERRESTRIAL	40	PALEONTOLOGY	2 578
FOSSIL FUELS	3 698	PETROLOGY	1 162
GENERAL GEOLOGY	381	RADIOACTIVE MINERALS	2 439
GEOCHEMISTRY	11 775	SEDIMENTOLOGY	1 660
GEOCHRONOLOGY	978	SOILS SCIENCE	46
GEOHYDROLOGY	781	STRATIGRAPHY	4 909
GEOMORPHOLOGY	354	STRUCTURAL GEOLOGY	13 022
GEOPHYSICS	36 391	SURFICIAL GEOLOGY	3 026
HYDROGEOLOGY	111	TECTONICS	32
INDUSTRIAL MINERALS	8 500		

### 3. Selected Keywords with postings

AGGREGATES	1 890	MORAINES	506
ASSAYS	12 773	NICKEL	3 840
BARITE	1 105	PEAT	701
COAL	1 997	RADIOMETRIC SURVEYS	4 036
COBALT	1 619	SILVER	8 274
COPPER	15 517	STREAM SEDIMENT	
E M SURVEYS, GROUND	10 204	GEOCHEMISTRY	1 844
FOSSIL DISTRIBUTION	1 163	TILLS	921
GOLD	11 940	TRENCHES	4 324
LEAD	8 771	URANIUM	5 152
MOLYBDENUM	3 838	ZINC	10 310

**APPENDIX B:** GEOSCAN Coverage by Publication/Preparation Date

pre 1900	525
1900-1929	3 323
1930-1949	6 909
1950-1959	11 466
1960-1969	22 798
1970-1974	15 380
1975-1979	17 340
1980-1985	16 662

**APPENDIX C:** GEOSCAN Data Base Structure - Commonly Used Fields

**BIBLIOGRAPHIC DATA FIELDS IN GEOSCAN**

SERIAL TITLE CODE (A030)	ISBN (A260)
VOLUME CAPTION (A051)	EDITION NUMBER (A270)
VOLUME NUMBER (A052)	COLLATION MONOGRAPH PAGES (A291)
ISSUE CAPTION (A061)	COLLATION MONOGRAPH INFO (A292)
ISSUE NUMBER (A062)	MEETING (A300)
ISSUE SUBDIVISION (A063)	MEETING PLACE (A310)
ISSUE: OTHER ID (A070)	MEETING DATE DESCRIPTION (A320)
ANALYTIC TITLE (A082)	REPORT NUMBER (A390)
MONOGRAPH TITLE (A092)	THESIS UNIVERSITY (A410)
COLLECTION TITLE (A102)	THESIS DEGREE LEVEL (A420)
ANALYTIC AUTHOR INDICATOR (A111)	AVAIL. FOR ACQUISITION (A430)
ANALYTIC AUTHOR NAME (A112)	NUMBER OF REFERENCES (A450)
MONOGRAPH AUTHOR INDICATOR (A121)	NOTES (A990)
MONOGRAPHIC AUTHOR NAME (A122)	AGENCY (C010)
CORPORATE AUTHOR-ANALYTIC (A170)	DOCUMENT TYPE (C060)
CORPORATE AUTHOR-MONOGRAPH (A180)	CONTENT DESCRIPTION (C070)
PAGE NUMBERS (A200)	ILLUSTRATIONS (C590)
PUBLICATION DATE (A211)	GENERAL MAP TYPE (601)
TEXT LANGUAGE (A230)	MAP SCALE (C603)
SUMMARY LANGUAGE (A240)	NUMBER OF MAPS (C663)
PUBLISHER NAME (A251)	DOCUMENT MEDIUM (C800)
PUBLISHER CITY (A252)	TEXT DESCRIPTION (C820)

**SUBJECT DATA FIELDS IN GEOSCAN**

MINING/PETROLEUM COMPANY (C580)  
KEYWORD (C703)  
NEW TERM (C713)  
NAMED DESCRIPTOR (C753)  
GEOLOGICAL AGE (C770)  
SUBJECT CATEGORY (C810)

**GEOGRAPHIC DATA FIELDS IN GEOSCAN**

CLAIM IDENTIFICATION (C040)  
NTS (C540)  
PROVINCE/REGION CODE (C552)  
COUNTY (C610)  
TOWNSHIP (C620)  
GEOGRAPHIC AREA (C680)

**APPENDIX D: Sample GEOSCAN Records**

<b>GEOSCAN NUMBER</b>	6620
<b>MONOGRAPHIC TITLE</b>	STRATIGRAPHY, PETROLOGY, AND GENESIS OF THE ELLIOT GROUP, BLIND RIVER, ONTARIO, INCLUDING THE URANIFEROUS CONGLOMERATE
<b>MONOGRAPHIC AUTHORS</b>	PIENAAR, P J
<b>SOURCE</b>	GEOL. SURV. CAN., BULL. 00083 1963.
<b>INDEXED BY</b>	GEOLOGICAL SURVEY OF CANADA
<b>SUBJECT CATEGORY</b>	GEOCHEMISTRY; METALLIC MINERALS; STRUCTURAL GEOLOGY; STRATIGRAPHY
<b>GEOLOGIC AGE</b>	PRECAMBRIAN
<b>KEYWORDS</b>	CHEMICAL ANALYSES; CHLORITIZATION; CONGLOMERATES; CROSSBEDDING; CROSSBEDDING, FESTOON; CROSSBEDDING, PLANAR; DEPOSITIONAL ENVIRONMENT; ELEMENT DISTRIBUTION; GRAIN SIZE DISTRIBUTION; MODAL ANALYSES; PALEOSOLS; PETROFABRICS; PROVENANCE; SPECTROGRAPHIC ANALYSES; URANIUM BRUCE CONGLOMERATE FM; COBALT GP; ELLIOT GP; ESPANOLA FM; GOWGANDA FM; HOUGH GP; MATINENDA FM; MISSISSAGI FM; NORDIC FM; QUIRKE GP; QUIRKE LAKE SYNCLINE, ONT; SERPENT FM; WHISKEY FM
<b>DESCRIPTOR TERMS</b>	CROSS SECTIONS; STRATIGRAPHIC SECTIONS
<b>ILLUSTRATION</b>	ONTARIO(N)
<b>PROVINCE</b>	041J/SE
<b>NTS</b>	
<b>GEOSCAN NUMBER</b>	107219
<b>MONOGRAPHIC TITLE</b>	GRANULAR RESOURCES IN THE LOCH LOMOND MAP-AREA [NTS 21H/5], NEW BRUNSWICK
<b>MONOGRAPHIC AUTHORS</b>	FINAMORE, P F; LOHSE, H
<b>SOURCE</b>	N B DEPT. NAT. RES. TOPICAL REPT. 77-9 101 P. 1977. 12 REFERENCES.
<b>SUBJECT CATEGORY</b>	INDUSTRIAL MINERALS; ECONOMIC GEOLOGY (PRODUCTION/RESERVES); SURFICIAL GEOLOGY
<b>GEOLOGIC AGE</b>	QUATERNARY
<b>KEYWORDS</b>	AGGREGATES; ALLUVIUM; GLACIAL HISTORY; GLACIAL STRIATIONS; GLACIOFLUVIAL DEPOSITS; ICE CONTACT DEPOSITS; LITHOTYPES; MARINE DEPOSITS; OUTWASH; PITS; QUARRIES; RESERVES; RESOURCES; TILLS
<b>NEW TERMS</b>	MECHANICAL DEPOSITS;
<b>DESCRIPTOR TERMS</b>	WISCONSIN GLACIAL STAGE
<b>MAP INFORMATION</b>	1 MAP(S) /MAP ACCOMPANIES DOCUMENT/
<b>PROVINCE</b>	NEW BRUNSWICK(N)
<b>NTS</b>	021H/05
<b>GEOSCAN NUMBER</b>	107014
<b>MONOGRAPHIC TITLE</b>	URANIUM, FALKLAND RIDGE, ANNAPOLIS COUNTY, NOVA SCOTIA. SHELL CANADA RESOURCES LIMITED. REPORT ON GEOLOGICAL AND SOIL GEOCHEMICAL SURVEYS
<b>MONOGRAPHIC AUTHORS</b>	DICKIE, G B
<b>SOURCE</b>	N. S. DEP. MINES ENERGY, ASSESS. REP. 21A/10C 54-A-23(03) 30 P. 1980. 1 REFERENCES.
<b>MINING COMPANY</b>	SHELL CAN RES L
<b>INDEXED BY</b>	NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
<b>SUBJECT CATEGORY</b>	RADIOACTIVE MINERALS; GEOCHEMISTRY
<b>GEOLOGIC AGE</b>	CAMBRIAN; ORDOVICIAN; DEVONIAN
<b>KEYWORDS</b>	CHEMICAL ANALYSES; SOIL GEOCHEMISTRY; URANIUM; URANIUM GEOCHEMISTRY
<b>DESCRIPTOR TERMS</b>	SOUTH MOUNTAIN BATHOLITH, N S; MEGUMA GP
<b>MAP INFORMATION</b>	4 MAP(S) /MAP ACCOMPANIES DOCUMENT/
<b>PROVINCE</b>	NOVA SCOTIA(N)
<b>NTS</b>	021A/10C; 021A/10D
<b>AVAILABILITY</b>	COPIES MAY BE PURCHASED RELEASE DATE 198304

# APPENDIX E: Online Entry Worksheet

GEOSCAN Worksheet 1 - Serial Entry Side 1  
August 1984

SERILXPS

☒ Analytic  
☒ Monographic

ISN 6620

ANALYTIC RECORD ONLY	A080	Indicator (A081) 0 1 2 3 4	Analytic Title (A082)		
	Analytic Title				
	A080	Indicator (A081) 0 1 2 3 4	Analytic Title (A082)		
	Analytic Title				
A110	Indicator (A111) 0 1 2 3 4 5 6 X	Analytic Author (A112)		Corporate Author - Analytic (A170)	
Analytic Person	0 1 2 3 4 5 6 X				
	0 1 2 3 4 5 6 X				
	0 1 2 3 4 5 6 X				
	0 1 2 3 4 5 6 X				
C010 Agency	GSC		C310 Date	C311 Date Added	YYYYMMDD → 1976
C050 UNISIST	C051 Lit. Type	SER	C052 Biblio. Level	A	
A090	Indicator (A091) 0 1 2 3 4	Monographic Title (A092) STRATIGRAPHY, PETROLOGY, AND GENESIS OF THE ELLIOT GROUP, BLIND RIVER, ONTARIO, INCLUDING THE URANIFEROUS CONGLOMERATE			
A030 Serial	GSCBULL		A050 Volume	Vol. Caption (A051)	
A060 Issue	Issue Caption (A061)		Issue No. (A062) 00083		
A120	Indicator (A121) 0 1 2 3 4 5 6 X	Monographic Author (A122) PIENAAR, P J		Corporate Author - Monographic (A180)	
Analytic Person	0 1 2 3 4 5 6 X				
	0 1 2 3 4 5 6 X				
	0 1 2 3 4 5 6 X				
	0 1 2 3 4 5 6 X				
A211 Pub. Date	1963		C840 Record Status	1	
C770 Geol. Age	PREC		C060 Doc. Type	PUB SER	
C700 Keyword	C701 D. ind 0	C703 Keyword Term	C701 D. ind 0	C703 Keyword Term	
		CHEMICAL ANALYSES		ELEMENT DISTRIBUTION	
		CHLORITIZATION		PALEOSOLS	
		CROSSBEDDING		URANIUM	
		CROSSBEDDING, FESTOON		PETROFABRICS	
		CROSSBEDDING, PLANAR		PROVENANCE	
		CONGLOMERATES		MODAL ANALYSES	
		SPECTROGRAPHIC ANALYSES			
		GRAIN SIZE DISTRIBUTION			
		DEPOSITIONAL ENVIRONMENT			
C710 New Key Term	C711 D	C713 New Term	C711 D	C713 New Term	

APPENDIX E:  
(Cont'd)

GEOSCAN Worksheet 1 - Serial Entry Side 2

SERILOPS

August 1984

C750 Species Term	C751 D	C753 Species Term	C751 D	C753 Species Term
		BRUCE CONGLOMERATE FM		QUIRKE GP
		COBALT GP		QUIRKE LAKE SYNCLINE, ONT
		ELLIOT GP		SERPENT FM
		ESPANOLA FM		WHISKEY FM
		GOWGANDA FM		
		HOUGH GP		
		MATINENDA FM		
		MISSISSAGI FM		
		NORDIC FM		
C810 Subject Category		GEOCHM METMIN STRUCT STRAT		
C340 NTS		041J/SE		
C350 Province	C351 Y N	C351 Y N	C351 Y N	C351 Y N
	ONT			
C500 Map Descrip.	C501 General Map Type	C502 Specific Map Type	C503 Scale	
C390 Illustr.	CROSS SECTIONS			
	STRATIGRAPHIC SECTIONS			
C560 Map	C561 Map Present	C562 Map Relationship	C563 No. of Maps	
	Y	1		
C800 Medium	0 1 2 3 4 5 6	A230 Lang.	E F O Ca Cu J R	
A291 Coll. Page		A200 Page No.	A450 No. Ref.	
C200 Analytic Person - Print Only		C210 Monographic Person - Print Only		

Non-prompted fields for Serial Entry - Required fields

A040 Series Designation	A240 Summary Language	A420 Thesis Degree Level
A053 Volume Year	A260 ISBN	A990 Unisist Notessence
A054 Date, Other	A270 Edition Number	C070 Content Description
A063 Issue Subdivision	A292 Collat. Mono. Information	C140 Secondary Series
A070 Issue: Other I.D.	A300 Meeting	C530 Related Reference
A212 Publication Date Part	A310 Meeting Place	C580 Mining/Petroleum Company
A213 Publication Date: Other	A320 Meeting Date Description	C690 Country
A220 Date, Other	A410 Thesis University	C820 Text Description

Non-prompted fields for Serial Entry - Optional fields

C020 Accession Number	C370 Legal Subdivision	C640 Map Sheet Name
C030 Local File Number	C610 County	C650 Mining District
C040 Claim Identification	C620 Township	C680 Geographic Area
C560 Latitude/Longitude	C630 District	C760 Agency Term

C020 000287

C680 BLIND RIVER





**PREPARING A BIBLIOGRAPHY ON A PERSONAL COMPUTER:  
THE WASHINGTON THESIS BIBLIOGRAPHY, 1901-1985**

Connie J. Manson

I've been using a personal computer for about 2 years, primarily to prepare fully indexed medium-sized bibliographies (500 - 3000 citations).

In this talk I'll be discussing the specific procedures I use to do these bibliographies on the computer. But more importantly for your purposes I'll also be discussing some of the things I've learned about using the computer, and some of the things I'm still having problems with.

If I seem to talk too negatively about computers, don't think that I don't like them-- I do. I think they're wonderful, certainly the most revolutionary development in special libraries since I've been working in special libraries. But computers are not magic. They're only a tool, like a typewriter or a dictionary is a tool. They won't do all our work for us automatically (like we wish they would), and they're not perfect: every computer system I've seen forces us into some kinds of compromises.

I've looked at a lot of computer software packages for libraries and for bibliographies. I'm certainly not an expert on the state-of-the-art, but I do know that I've yet to see a program that is "perfect": the different programs are simply imperfect in different ways.

**HARDWARE AND SOFTWARE CONFIGURATION**

We use a common configuration: the IBM XT personal computer with a 10-megabyte hard disc. We recently purchased a Bernoulli box for additional hard-disc memory and that's worked quite well. We use database management system (dBaseII) and word processing (Wordstar) software.

We initially got the computer because we needed a way to continue our Bibliography and Index of Washington Geology series. The Bibliography, of course, is the comprehensive list of all citations on Washington geology for a span of years, with joint author cross references and with full, detailed subject and geographic indexing. We needed a system that, no matter what the procedures, would prepare this bibliography, and, as the final product, could generate camera-ready copy. When we bought the computer in August, 1983, we couldn't find commercially available software that would do all this, so we wrote our own Bibliographic Information System (BIS) programs using dBaseII. As I'll be discussing, we use the database management and word processing programs in tandem: we enter the citations and do the major sorts on dBaseII and then transfer the files to Wordstar to edit to camera-ready style copy. (For in-house and open-file reports, we print the bibliographies on a dot-matrix printer.

For published reports we transfer the computer files to the State Printer to be typeset electronically.)

Like other computer programs, BIS is not perfect, and it forces us into various kinds of compromises. Some of these problems are unique to BIS, but I'm convinced that others are common to all computer programs. For our purposes, though, the only important issue is that the final product from the computer is the fully-edited copy.

### **PREPARING ANY BIBLIOGRAPHY IS A LOT OF WORK**

In practice, preparing citations for a bibliography is just like doing original cataloging, except that instead of only cataloging monographs, we're cataloging abstracts and journal articles, too. (Figure 1)

In the first 5 steps the computer gives little if any help.

Of course front-end systems can be used to download citations from a file like GeoRef or OCLC. If you use these, be cautioned: Computers are notoriously fussy about the smallest differences in punctuation, capitalization, etc. You'll have a terrible mess if the format of the parent file doesn't exactly match, or can't be made to match, your file. And too, some bibliography production programs will automatically check the authority files for you. But again, the computer will only alert you that the term you've input is or isn't exactly the same as an existing term in the authority file. It won't tell you whether the term is "correct" or well-advised. (Our BIS system, however, isn't this sophisticated. It won't do either of these things.)

However after step 5 the computer can do a lot for you. Using the cataloging analogy, these later steps (duplicating the cards, adding the headings, interfiling the cards, compiling the lists), when done manually, are very labor intensive and very error prone. The computer can do that labor, error free.

Thus the proofing and editing, arguably the worst steps of all, are much easier and faster. But it should be remembered that while computers eliminate some problems they always add others. The files must still be edited, to correct both the computer glitches and the human errors.

So, the computer won't do the whole bibliography, automatically: it will only do parts of it.

### **THE 1980 THESIS BIBLIOGRAPHY**

In 1978 I cataloged the 900 masters and doctoral theses on Washington geology held in the Washington Division of Geology and Earth Resources library. In 1979 we published a bibliography of these theses with a full author list, a subject-geographic index, a list of the schools, and an index to thesis geologic mapping.

Figure 1. The steps in manual indexing compared to computer indexing

MANUAL INDEXING	COMPUTER INDEXING
1. Find the item	1. Find the item
2. Describe it (assign correct author, title, etc.)	2. Describe it (assign correct author, title, etc.)
3. Assign subject headings	3. Assign subject headings
4. Check authority files	4. Check authority files
5. Type master for duplication	5. Type citation into computer
6. Process cards	6. Computer generates authority files
A. Duplicate cards	
B. Add headings	
C. Interfile	
7. Prepare and type bibliography and subject indexes	7. Computer generates bibliography and subject indexes
8. Proofing and editing	8. Fine-tune editing (on word processor)
9. Retype for publication	9. Print out for publication
10. Proof	

Figure 2. BIS Main menu

# BIBLIOGRAPHIC INFORMATION SYSTEM

## \*\* MAIN MENU \*\*

1. SEARCH for records
2. ADD new records
3. EDIT records
4. AUTHORITY FILE production
5. BIBLIOGRAPHY production
6. UTILITY functions
7. QUIT to system menu

\* File in use: C:TEST.DBF

Please select an option 1-7:

To prepare the subject-geographic index for this first edition I didn't go back and re-index each thesis, but simply drew the indexing from the card catalog. Consequently, that subject index had very few subject subdivisions.

That edition went out of print in 1984. Because theses are so important, and because over 250 theses on Washington geology had been issued since that first edition, we decided not to just reprint the old index with an addendum but to prepare a whole new cumulated edition. We decided to issue this index in basically the same format we'd used before and to prepare it using our personal computer and our BIS programs.

### **PREPARING THE THESIS BIBLIOGRAPHY ON THE PC**

BIS is largely menu-driven (Figure 2). The first step in doing the thesis bibliography was very standard: We created a database file and then added records to it, entering the full bibliographic citation with subject and geographic indexing.

We enter the citations in the format shown in Figure 3. This data entry screen is very simple, giving only the AUTHOR, DATE, TITLE, and PUBLISHER fields, with CALL NUMBER and SUBJECT and GEOgraphic indexing. This isn't a cataloging system, like OCLC, so there's no notation for LC or ISBN numbers, no mention of the author's affiliation, nor a separate field for city of publication. We even lump the pagination statement with the publisher.

The subject and geographic headings are also quite simple. Compared to on-line systems, we use very few headings with very little subdivision. The reasons for this are explained in the SUBJECT INDEX section, below.

Most of the simplicity is intentional, because this system is designed to ultimately produce bibliographies, and only bibliographies. So, following Elizabeth Eddison's (1985) principle that "the input must be driven by the output," we only put in the data elements that are needed for the bibliography, in the same order and in the same format, or as close to that as we can get.

But we also have software constraints. We use dBaseII, and dBaseII uses fixed-length fields, a maximum field length of 256 characters, and a maximum record length of 1000 characters. This really isn't enough space, especially in the TITLE, SUBJECT and GEO fields, and we often must abbreviate or truncate. (Remember, I said BIS wasn't perfect.)

So we input all 1150 citations. The new ones (1981 to 1985) were already entered into the computer in another file, so we just downloaded those to this file, and then keyed in the citations for the older ones.



## AUTHOR INDEX

In the author list, the theses are listed by author, giving the full citation, with references to publications and abstracts, a notation on the geologic mapping, and any other pertinent notes.

To prepare this, I first used option 3 of the BIS menu: AUTHORITY FILE PRODUCTION (Figure 4). I wanted to do the author index, so I first had the machine prepare the AUTHOR AUTHORITY FILE (Figure 5)-- every unique author keyed to record number, put into alphabetical order. Going then to BIS option 5, BIBLIOGRAPHY PRODUCTION (Figure 6), the machine uses this author authority file to create a file of all the citations in alphabetical order by author with joint author cross references interfiled. When this is done, I transferred this database file to Wordstar (Figure 7) for editing.

This initial file looks awfully rough: each citation is on one line, stretched out to 200 or 300 characters; all the citations are crammed together on the screen/page; there are all those "garbage" characters. This is what I meant about the computer adding problems. But the situation isn't as bad as it looks: it's very easy to clean up this file, using automatic word processing procedures (Figure 8).

We then typed in the citation numbers, the notes on publications, abstracts and mapping, the printing codes for publication, and we were done (Figure 9).

## WHY USE WORD PROCESSING?

In all cases, with our BIS system, we enter the full citations in dBaseII, do the necessary sorts in dBaseII, transfer the files to Wordstar, and then word-process them to final editorial format.

This process (using two different programs on one data set) was the only way we could figure out to get the well-edited final product we needed.

When we first set BIS up, I insisted on having the ability to make editorial changes in the final bibliography without going back and changing the original data set, and to be able to make those changes quickly and easily. Why? Because people are smart but they make mistakes, and computers don't make mistakes but they're very stupid.

The original citation is prepared by a person, typed into the machine by a person, and proofed by a person. People make mistakes and you need a simple way to correct those mistakes. No matter how careful you are in every step (Figure 1, steps 1 - 5), you're correcting typos right up to press time, and kicking yourself for the errors you missed, once it's printed.

Figure 3. A typical BIS citation

RECORD # 00813  
AUTHOR :PHILLIPS, WILLIAM MORTON,  
:  
DATE :1979:  
TITLE :Structural geology and Cambrian stratigraphy of the Crown Creek-Bowen  
Lake area, Stevens County, Washington:  
:  
PUBLISHER :Washington State University Master of Science thesis, 82 p., 1 plate.  
:  
CALL :QE3 P564w 1979 :  
GEO .:STEVENS CO./CROWN CREEK-BOWEN LAKE AREA  
:  
SUBJECT :STRUCTURAL GEOLOGY/AREAL GEOLOGY/MAPS - GEOLOGIC/CAMBRIAN/STRATIGRAPH  
Y/THESES  
:  
NOTE :  
:  
TYPE :MB :

Figure 4. Authority file production

**\*\* AUTHORITY FILE GENERATION \*\***

1. Author authority file
2. Geographic authority file
3. Subject authority file
4. Publisher authority file

\* File in use: C:TEST.DBF

Create authority file <1-4> or type Q to QUIT:

Figure 5. The author authority file

**Author Authority File Report**

AUTHOR	RECORD
AALTO, KENNETH ROLF,	1
ABBOTT, AGATIN TOWNSEND,	2
ABRAMS, MARK J.,	3
ADAMS, JOHN BRIGHT,	4
ADAMS, JOHN BRIGHT,	5
ADAMS, NIGEL BRUCE,	6
ADAMS, ROBERT WILLIAM,	7
ADEKOYA, ADEDAYO ADEDOTUN,	8
AIKEN, CARLOS LYNN VIRGIL,	9
ALBANESE, JAMES R.,	10
ALEXANDER, FRANK,	11
ALLEN, JOHN ELIOT,	12
ALLISON, RICHARD CASE,	13
ALTO, BRUNO RAYMOND,	14
ALWIN, JOHN ARNOLD,	15
AMARA, MARK STEVEN,	16
ANDERSEN, BURTON LEE,	17
ANDERSON, ALFRED LEONARD,	18
ANDERSON, ARTHUR LEONARD,	19
ANDERSON, CHARLES ALFRED,	20
ANDERSON, FRANZ ELMER,	21
ANDERSON, GLENN RICHARD,	22
ANDERSON, NORMAN RODERICK,	23

Figure 6. Bibliography production

**\*\* BIBLIOGRAPHY PRODUCTION \*\***

**Note:** Authority Files Must Be Created  
Before Bibliography Production.

1. Author Bibliography
2. Subject and Geographic  
Keyword Bibliography
3. Error Recovery Restart

Select an option or type Q to QUIT:

AMARA, MARK STEVEN,,1975,Mechanical analyses of stratigraphic layers from the L+  
 ANDERSON, ROY ARNOLD, JR.,,1971,Stability of slopes in clay shales interbedded +  
 BOGUE, RICHARD G.,,1932,A petrographic study of the Mount Hood and Columbia Riv+  
 BOTTOMLEY, R. J.,,1975,Argon-40/Argon-39 dating of basalts from the Columbia Ri+  
 BROOKS, WILLIAM EARL, JR.,,1974,Stratigraphy and structure of the Columbia River+  
 BUNKER, RUSSELL CRAIG,,1980,Catastrophic flooding in the Badger Coulee area, so+  
 CAMP, VICTOR E.,,1976,Petrochemical stratigraphy and structure of the Columbia +  
 COHEN, PHILIP LEON,,1979,Reconnaissance study of the "Russell" basalt aquifer i+  
 CUNNINGHAM, ROBERT LESTER,,1964,Genesis of the soils along a traverse in Asotin+  
 DEAVER, FRANKLIN KENNEDY,,1973,Faunal utilization at archaeological site 45AD2,+  
 DENNIS, TERENCE EDWIN,,1938,The structure of the Horse Heaven Hills of Washingt+  
 DRAKE, ELLEN T.,,1981,Robert Hooke and the foundation of geology--A comparison +  
 FENTON, ROBERT LEO,,1974,The syntactic log as a tool for correlating basalt str+  
 FISK, HAROLD NORMAN,,1935,A microscopic study of basalt flows:,University of Ci+  
 FOLEY, LUCY LOUGHLIN,,1976,Slack water sediments in the Alpowa Creek drainage, +  
 FOLEY, LUCY LOUGHLIN,,1982,Quaternary chronology of the Palouse loess near Wash+  
 FOWLER, CLAUDE STEWART,,1931,Radial columnar structure in Columbia River basalt+  
 FRYXELL, ROALD,,1970,The contribution of interdisciplinary research to geologic+  
 FUKUTA, NOBUHIKO,,1977,Application of shake program on estimation of ground res+  
 GAVENDA, ROBERT THOMAS,,1980,A characterization of the soils and landscape at t+  
 GLASSLEY, WILLIAM EDWARD,,1973,Part I, Geochemistry, metamorphism, and tectonic+  
 GOFF, FRASER EARL,,1977,Vesicle cylinders in vapor-differentiated basalt flows:+



AMARA, MARK STEVEN, 1975, Mechanical analyses of stratigraphic layers from the Lind Coulee archaeological site in central Washington: Washington State University Master of Science thesis, 129 p.

ANDERSON, ROY ARNOLD, JR., 1971, Stability of slopes in clay shales interbedded with Columbia River basalt: University of Idaho Master of Science thesis, 297 p.

BOGUE, RICHARD G., 1932, A petrographic study of the Mount Hood and Columbia River Basalt Formations: University of Oregon Master of Science thesis, 88 p.

BOTTOMLEY, R. J., 1975, Argon-40/Argon-39 dating of basalts from the Columbia River Plateau: University of Toronto Master of Science thesis.

BROOKS, WILLIAM EARL, JR., 1974, Stratigraphy and structure of the Columbia River basalt in the vicinity of Gable Mountain, Benton County: University of Washington Master of Science thesis, 39 p., 2 plates.

Figure 9. Author bibliography (final form with notes)

1. AALTO, KENNETH ROLF, 1970, Glacial marine sedimentation and stratigraphy of the Toby conglomerate (upper Proterozoic), southeastern British Columbia, northwestern Idaho and northeastern Washington: University of Wisconsin Doctor of Philosophy thesis, 149 p.  
Published: Canadian Journal of Earth Sciences, v. 8, no. 7, p. 753-787, 1971.  
Abstract: Dissertation Abstracts International, Section B, v. 31, no. 9, p. 5423B, 1971.
2. ABBOTT, AGATIN TOWNSEND, 1953, The geology of the northwest portion of the Mt. Aix quadrangle, Washington: University of Washington Doctor of Philosophy thesis, 256 p., 6 plates.  
Abstract: Dissertation Abstracts, v. 13, no. 6, p. 1154.  
Geologic map: Figure 4, scale 1:125,000.
3. ABRAMS, MARK J., 1980, Geology of part of the Inchelium quadrangle, Stevens County, Washington: Eastern Washington University Master of Science thesis, 30 p., 1 plate.  
Geologic map: Plate 1, scale 1:24,750.
4. ADAMS, JOHN BRIGHT, 1958, Petrology of the isochemically metamorphosed rocks in the McGregor Mountain area, Chelan County, Washington: University of Washington Master of Science thesis, 49 p., 1 plate.  
Geologic map: Plate 2, scale 1:31,680.
5. ADAMS, JOHN BRIGHT, 1961, Petrology and structure of the Stehekin-Twisp Pass area, northern Cascades, Washington: University of Washington Doctor of Philosophy thesis, 172 p.  
Abstract: Dissertation Abstracts, v. 22, no. 11, p. 3981, 1962.  
Geologic map: Plate 2, scale 1:63,360.
6. ADAMS, NIGEL BRUCE, 1976, The Holden mine, from discovery to production, 1896-1938: University of Washington Doctor of Philosophy thesis, 235 p.  
Abstract: Dissertation Abstracts International, Section A, v. 37, no. 3, p. 1744A-1745A.
7. ADAMS, ROBERT WILLIAM, 1962, Geology of the Cayuse Mountain-Horse Springs Coulee area, Okanogan County, Washington: University of Washington Master of Science thesis, 41 p., 2 plates.  
Geologic map: Plate 1, scale 1:21,120.
8. ADEKOYA, ADEDAYO ADEDOTUN, 1983, Conodont analysis of a limestone lense in the black shale belt of northeast Washington: Washington State University Master of Science thesis, 65 p.  
Abstract: Adekoya, A. A.; Webster, G. D., 1983, Conodont analysis of a limestone lense in the Black Shale belt of northeast Washington [abstract]: Geological Society of America Abstracts with Programs, v. 15, no. 5, p. 293.
9. AIKEN, CARLOS LYNN VIRGIL, 1970, Gravimetric profiles across northern Cascades employing minimum assumptions as to subsurface density distribution: University of Washington Master of Science thesis, 134 p., 5 plates.
10. ALBANESE, JAMES R., 1973, Quantitative paleoecology of selected Cenozoic microfossil assemblages from the Pacific Northwest: Rensselaer Polytechnic Institute, 62 p.
11. ALEXANDER, FRANK, 1956, Stratigraphic and structural geology of the Blewett-Swauk area, Washington: University of Washington Master of Science thesis, 64 p., 3 plates.  
Geologic map: Plate 3, scale 1:71,280.
12. ALLEN, JOHN ELIOT, 1932, Contributions to the structure, stratigraphy and petrology of the Lower Columbia River Gorge: University of Oregon Master of Arts thesis, 137 p., 5 plates.  
Geologic map: Plate VI, scale 1:125,000.
13. ALLISON, RICHARD CASE, 1959, The geology and Eocene megafaunal paleontology of the Quimper Peninsula area, Washington: University of Washington Master of Science thesis, 121 p., 1 plate.  
Geologic map: Plate 7, scale 1:46,080.
14. ALTO, BRUNO RAYMOND, 1955, Geology of a part of the Boylston quadrangle and adjacent areas in central Washington: University of Washington Master of Science thesis, 38 p., 2 plates.  
Geologic map: Plate 5, scale 1:44,352.
15. ALWIN, JOHN ARNOLD, 1970, Clastic dikes of the Touchet Beds (Pleistocene), southwestern Washington: Washington State University Master of Science thesis, 87 p.  
Abstract: Alwin, J. A.; Scott, W. F., 1970, Clastic dikes of the Touchet beds, southeastern Washington [abstract]: Northwest Science, v. 44, no. 1, p. 58.
16. AMARA, MARK STEVEN, 1975, Mechanical analyses of stratigraphic layers from the Lind Coulee archaeological site in central Washington: Washington State University Master of Science thesis, 129 p.
17. ANDERSEN, BURTON LEE, 1938, Petrography and ore genesis of the Holden ore deposit: University of Washington Bachelor of Science thesis, 39 p.
18. ANDERSON, ALFRED LEONARD, 1923, The geology and ore deposits of the Silver Hill district, Spokane County, Washington: University of Idaho Master of Science thesis, 101 p., 1 plate.  
Published: Genesis of the Silver Hill tin deposits: Journal of Geology, v. 36, no. 7, p. 646-664, 1928.  
Abstract: Annotated Bibliography of Economic Geology, v. 1, nos. 1 and 2, p. 105, 1929. Revue de Geologie et Sciences Connexes, v. 9, p. 350, 1928.  
Geologic map: Plate 1, scale 1:12,000.
19. ANDERSON, ARTHUR LEONARD, 1939, The Nickelodeon claims, Kittitas County: University of Washington Bachelor of Science thesis, 29 p.
20. ANDERSON, CHARLES ALFRED, 1965, Surficial geology of the Fall City area, Washington: University of Washington Master of Science thesis, 70 p., 1 plate.  
Geologic map: Plate 1, scale 1:24,000.
21. ANDERSON, FRANZ ELMER, 1967, Stratigraphy of late Pleistocene and Holocene sediments from the Strait of Juan de Fuca: University of Washington Doctor of Philosophy thesis, 168 p.  
Abstracts: Dissertation Abstracts International, Section B, v. 28, no. 5, p. 1985B, 1967. Late Pleistocene History of the Strait of Juan de Fuca [abstract]: Geological Society of America Special Paper 115, p. 5-6. Anderson, F. E.; McManus, D. A., 1966, Stratigraphy of glaciomarine and marine sediments in the western portion of the Strait of Juan de Fuca [abstract]: American Geophysical Union Transactions, v. 47, no. 4, p. 625. Anderson, F. E.; McManus, D. A., 1967, Late Pleistocene and Recent sedimentation in Strait of Juan de Fuca [abstract]: American Association of Petroleum Geologists Bulletin, v. 51, no. 3, Part 1, p. 452.
22. ANDERSON, GLENN RICHARD, 1980, A stratigraphic and tectonic analysis and synthesis of a portion of the non-marine Neogene of the northwestern United States: University of Washington Master of Science thesis, 157 p.
23. ANDERSON, NORMAN RODERICK, 1954, Glacial geology of the Mud Mountain district, King County, Washington: University of Washington Master of Science thesis, 48 p.  
Geologic map: Plate III, scale 1:12,000.
24. ANDERSON, ROY ARNOLD, 1936, Fusulinids of the Granite Falls limestone and their stratigraphic significance: State College of Washington Master of Science thesis, 24 p.  
Published: Washington State College Research Studies, v. 9, no. 3, p. 189-202, Sept. 1941.
25. ANDERSON, ROY ARNOLD, JR., 1971, Stability of slopes in clay shales interbedded with Columbia River basalt: University of Idaho Master of Science thesis, 297 p.  
Published: Anderson, R. A., Jr.; Schuster, R. L., 1970, Stability of slopes in clay shales interbedded with Columbia River basalt. IN Engineering Geology and Soils Engineering Symposium, 8th Annual, Proceedings: Idaho Department of Highways, p. 273-284.

Computers will only do exactly what they're programmed to do, and theoretically they can be programmed to do virtually anything. But, for example, I haven't yet seen a computer program that can alphabetize a set of citations to precisely the order humans see as "correct".

In all cases, dBaseII can get close to the final form. We use Wordstar so we can do the picky, fine-tune editing to get as accurate and consistent as we can.

Another equally important issue is the preparation of the final camera-ready copy. We cannot know, when we first set up our data base file, exactly what our final publication formats are going to be. What type size will we use? What column width? Double columns? Triple columns? Will we bold-face the headings or capitalize them or both? These and all the other publication questions are very difficult to deal with using data base management software alone, but are very easy to deal with using word processing software.

If we couldn't use word-processing, we would have to hand-edit and retype the entire bibliography, defeating the point of using a computer at all.

### THE SUBJECT INDEX

It can be argued (I'll argue it myself) that we really didn't need the power of the computer to do the author index, we only needed a word processor. Looking carefully at this example, what has the computer done for us? It's put the citations into alphabetical order (sort of), and inserted the joint-author cross references. But if we'd entered the citations in alphabetical order in the first place, it wouldn't need to be sorted. And so few theses have double authors (about 1%) that even doing the joint author cross references would be very easy.

Where the computer is invaluable is in doing the subject index.

The final author index included 1150 citations and with all the notes and references took 140 pages. The final subject index, even using the abbreviated citation was over 370 pages, with over 5000 entries: each thesis is listed an average of 4 times in the subject index.

In the subject index, the theses are listed by subject and/or geographic location with appropriate subdivisions. For the sake of brevity, we list just the author, date and title.

To prepare this, again I used option 4 of the BIS main menu (Figure 2), AUTHORITY FILE PRODUCTION (Figure 4). I wanted to do the subject index, so I first had the machine prepare the SUBJECT and GEOGRAPHIC AUTHORITY FILES-- every unique subject and geographic heading keyed to record number, put into alphabetical

order (Figures 10 and 11). I then used option 5 of the BIS main menu, BIBLIOGRAPHY PRODUCTION (Figure 6), and from there option 2, SUBJECT AND GEOGRAPHIC KEYWORD BIBLIOGRAPHY. To prepare that file, the machine combines these two authority files in alphabetical order and uses this file to create the SUBJECT INDEX: it lists each unique heading with the appropriate citations in alphabetic order by author.

Again, we transfer this file to Wordstar (Figure 12) and then the real work of producing the bibliography begins: editing the subject index.

### **SUBJECT INDEXING: DATA BASE VS. BIBLIOGRAPHY**

The subject index is the most difficult and complex part of the bibliography and the part the computer is most valuable for. But there are some inherent, and initially invisible problems in preparing a publishable subject index from a database file.

It is not effective to simply sort a good, searchable on-line database by assigned subject heading, and issue that as a subject index. This is because the form of indexing best suited to an on-line data base is in direct contradiction to the form of indexing best suited to a printed index.

Elizabeth Eddison (1985) calls this "the problem of the twofer", that you're really trying to get two very different products from one data set: both a searchable, sortable data base and a fully edited, camera-ready bibliography. Those two products might sound very similar to us but they are inherently contradictory to the computer.

In the on-line system it's good to use lots (even hundreds) of headings for each citation, with lots of detailed subdivisions. The more you use, the better: it gives your on-line searches more depth and breadth. But if you kept all those headings in the printed bibliography you'd have enormous bulk. (For example, on the thesis bibliography we had 1150 citations. If we'd used 100 headings for each one, the final subject index would have been 10,000 pages long.) In the printed bibliography it's better to use fewer headings.

In the on-line system, consistency is good, but not critical, because of the power of the Boolean searching. So you could, for example, use the terms BASALT, BASALTS, BASALT FAMILY, and IGNEOUS PETROLOGY - BASALT, and as long as you can do truncated or substring searches on 'BASALT', the machine would find them all. It's not a problem. But in the printed bibliography, this would unnecessarily split materials on the same subject. This is a serious problem, and would usually be considered a "mistake" by a user. We have to remember that anything that looks like it was prepared by a computer is judged by a harsher standard than something that looks like it was prepared by hand. This isn't rational, but it is a common human reaction: we can accept errors



Figure 10. Geographic authority file

### Geographic Keyword Authority File Report

GEOGRAPHIC KEYWORD	RECORD
ADAMS CO.	10
ADAMS CO.	13
ADAMS CO.	16
ADAMS CO.	27
ADAMS CO.	73
ADAMS CO.	82
ASOTIN CO.	7
ASOTIN CO.	8
ASOTIN CO.	9
ASOTIN CO.	15
ASOTIN CO.	23
ASOTIN CO.	37
ASOTIN CO.	40
ASOTIN CO.	63
ASOTIN CO.	64
ASOTIN CO.	66
ASOTIN CO.	68
ASOTIN CO.	72
ASOTIN CO.	76
ASOTIN CO.	80
ASOTIN CO.	85
BENTON CO.	5
BENTON CO.	6

Figure 11. Subject authority file

### Subject Keyword Authority File Report

SUBJECT KEYWORD	RECORD
ACCRETED TERRANES	12
ACCRETED TERRANES	59
ACCRETED TERRANES-CONT SLOPE	52
ALUMINUM	39
ARCHAEOLOGICAL SITES	10
ARCHAEOLOGICAL SITES	28
ARCHAEOLOGICAL SITES	29
ARCHAEOLOGICAL SITES	44
ARCHAEOLOGICAL SITES	49
ARCHAEOLOGICAL SITES	53
ARCHAEOLOGY	1
ARCHAEOLOGY	18
ARCHAEOLOGY	20
ARCHAEOLOGY	26
ARCHAEOLOGY	31
ARCHAEOLOGY	51
ARCHAEOLOGY	57
ARCHAEOLOGY	75
AREAL GEOLOGY	5



Figure 12. Subject-geographic index (initial form)

^BACCREDITED TERRANES^B,,,,,  
 DRAKE, ELLEN T.,@,1981|,Robert Hooke and the foundation of geology--A compariso+  
 PACT, JORY ALLEN,@,1980|,Sedimentology and petrology of the Late Cretaceous Na+  
 ^BACCREDITED TERRANES-CONT SLOPE^B,,,,,  
 MCCLAIN, KEVIN JOHN,@,1981|,A geophysical study of accretionary processes on th+  
 ^BADAMS CO.^B,,,,,  
 DEEVER, FRANKLIN KENNEDY,@,1973|,Faunal utilization at archaeological site 45AD+  
 FENTON, ROBERT LEO,@,1974|,The syntactic log as a tool for correlating basalt st+  
 FOLEY, LUCY LOUGHLIN,@,1982|,Quaternary chronology of the Palouse loess near Wa+  
 GROlier, MAURICE J.,@,1965|,Geology of part of the Big Bend area, in the Columb+  
 SIEMS, BARBARA ANN,@,1973|,Surface to subsurface correlation of Columbia River +  
 WARD, ALEXANDER WESLEY, JR.,@,1975|,Petrology and chemistry of the Huntzinger ft+  
 ^BALUMINUM^B,,,,,  
 JACKSON, RONALD LAVERNE,@,1974|,A mineralogical and geochemical study of the fet+  
 ^BARCHAEOLOGICAL SITES^B,,,,,  
 DEEVER, FRANKLIN KENNEDY,@,1973|,Faunal utilization at archaeological site 45AD+  
 GUINN, STANLEY JAMES,@,1963|,A maritime village on the Olympic Peninsula of Was+  
 GUNKEL, ALEXANDER,@,1961|,A comparative cultural analysis of four archeological+  
 LEONHARDY, FRANK CLINTON,@,1970|,Artifact assemblages and archaeological units +  
 MARSHALL, ALAN GOULD,@,1971|,An alluvial chronology of the lower Palouse River +  
 MOODY, ULA LAURA,@,1978|,Microstratigraphy, paleoecology, and tephrochronology +  
 ^BARCHAEOLOGY^B,,,,,

made by people, but we can't accept errors made by computers because computers don't make mistakes. And too, the more headings we use, the harder it is to be consistent in their use and in their form. If there is the smallest difference in form, the computer will consider the term to be a completely different heading (KING CO is different from KING CO. is different from KING COUNTY). In the printed bibliography, consistency is critical.

In the on-line system, the number of times you use a specific heading is immaterial. There's no problem in using the same term (like AREAL GEOLOGY) a lot, even hundreds of times. Again, it just gives more depth and breadth to the on-line searching. Conversely, there's no problem using very specific headings only once (like LAKE WASHINGTON - HYDROCARBON POLLUTION). But in the printed bibliography you don't want an un-subdivided list of 100 or 200 (or more) citations under one heading-- most users won't read past the first half column. And you don't want a lot of very detailed headings with one citation each-- this just gives you scatter. In the printed bibliography, the number of times you use a specific heading is important.

So, for the printed bibliography, it's usually better to use relatively few headings, basically just major subjects subdivided by major areas and vice versa: PETROLOGY - KING CO. and PIERCE CO. - HYDROLOGY. But especially in large bibliographies, (like the 3000-item 1981-1985 comprehensive), it's common to get big concentrations of citations under very specific topics (e.g., MOUNT ST. HELENS, or COLUMBIA BASIN - BASALT). And, once we've spotted a specific topic (like ACCRETED TERRANES or ROTATED BLOCKS) we want to be able to both search the data base for it, using Boolean logic, and to have it reflected in the printed bibliography.

In the on-line system, subdivisions don't matter very much. (Whether you use KING CO. - SEISMIC SURVEYS or both KING CO. and SEISMIC, if you do a Boolean search on both those terms you'd find them either way.) But this is the critical issue in the printed bibliography, because exactly what you put in is exactly what you get out. But in practice, the degree of subdivision that you need in the printed bibliography depends not only on the specific subject but on the quantity of citations under each heading: you need a different level of subdivision whether you have 2 or 20 or 200 or 2000 citations under a heading. But once you realize you need to subdivide, the decision on how to subdivide depends on the subjects of the actual citations. But you can't know, when you're doing the initial indexing, how many citations you'll finally have under each heading, or what other headings would be assigned to them. And too, we intend to eventually put the whole Washington bibliography, 1870-1985 (about 20,000 references), on line and then to download specific categories of citations to prepare specific bibliographies (like the thesis bibliography).

So, how can you index a citation once to serve all these

purposes when you don't know what all the specific purposes will be?

And remember, we're not using a mainframe with infinite memory. We have an IBM XT computer and we use dBaseII with fixed length fields.

(Figure 13: The subject headings originally assigned to that citation and the final headings assigned to it in the thesis subject index.)

I don't know. This is the central problem I've wrestled with from the very beginning. I've tried various solutions, but if there's a simple, perfect answer I haven't found it.

We tried to put in the basic headings (e.g., STEVENS CO. and PETROLOGY) and then have the machine prepare the subdivided headings (e.g., STEVENS CO. - PETROLOGY and PETROLOGY - STEVENS CO.). It didn't work: it took too much memory, the PC couldn't handle it.

I tried to enter all the subdivided headings, but that didn't work because we have fixed length fields so we don't have enough room. (What do you do with a study on a WILDERNESS AREA straddling CHELAN, KING and KITTITAS Counties, that includes GEOPHYSICAL MAPS, GEOLOGIC MAPS, a GRAVITY SURVEY, with a thorough examination of the AREAL GEOLOGY and MINERAL RESOURCES?) I tried to abbreviate the headings to squeeze them all in, but it's hard to be completely consistent. And besides, it's still impossible to know what all the subdivisions should be in every possible case.

I've settled on a compromise. It works, but it's not automatic.

I index basically with just major headings. I only assign subdivisions when I know they would always be used, e.g., with the Mount St. Helens citations. Then I run the subject-geographic index on dBase and transfer it to Wordstar, but in this first cut, the citations include the citation PLUS all the indexing (Figure 14). Then I scan each heading to see what it is (if it's too specific for a certain bibliography, I just delete it completely), how many citations there are, and what kind of indexing they have. From that, I decide on appropriate subdivisions and move the citations in word processing. In the last step, I strip out everything after the title, and print (Figure 15).

In small bibliographies I'll often copy the full data base and change all the indexing. (Remember: the smaller the index, the less detailed the indexing needs to be.) This makes the editing easier, although it's never automatic. But this method takes a lot of time, too.

Neither is a very good solution because they take so much time. But both methods work: We end up with a consistent index, in

^BACCREDITED TERRANES^B,,,,,

DRAKE, ELLEN T.,@,1981|,Robert Hooke and the foundation of geology--A comparison of Steno and Hooke and the Hooke imprint on the Huttonian theory; The tectonic evolution of the Oregon continental margin--Rotation of segment boundaries and possible space-time++@,Oregon State University Doctor of Philosophy thesis, 177 p.@,CONTINENTAL SHELF/CONTINENTAL SLOPE@,ACCREDITED TERRANES@

PACHT, JORY ALLEN,@,1980|,Sedimentology and petrology of the Late Cretaceous Nanaimo Group in the Nanaimo Basin, Washington and British Columbia--Implications for Late Cretaceous tectonics:@,Ohio State University Doctor of Philosophy thesis, 380 p.@,CASCADE MOUNTAINS (NORTH)@,ACCREDITED TERRANES@

^BACCREDITED TERRANES-CONT SLOPE^B,,,,,

MCCLAIN, KEVIN JOHN,@,1981|,A geophysical study of accretionary processes on the Washington continental margin:@,University of Washington Doctor of Philosophy thesis, 141 p.@,CONTINENTAL SHELF@,ACCREDITED TERRANES-CONT SLOPE@



Figure 14. Subject-geographic index (final form)

#### ACCRETED TERRANES

DRAKE, ELLEN T., 1981, Robert Hooke and the foundation of geology—A comparison of Steno and Hooke and the Hooke imprint on the Huttonian theory; The tectonic evolution of the Oregon continental margin—Rotation of segment boundaries and possible space-time relationships in the central high Cascades.

MCCLAIN, KEVIN JOHN, 1981, A geophysical study of accretionary processes on the Washington continental margin.

PACHT, JORY ALLEN, 1980, Sedimentology and petrology of the Late Cretaceous Nanaimo Group in the Nanaimo Basin, Washington and British Columbia—Implications for Late Cretaceous tectonics.

ADAMS CO. *see also* COLUMBIA BASIN

#### ADAMS CO. - AREAL GEOLOGY

FOLEY, LUCY LOUGHLIN, 1982, Quaternary chronology of the Palouse loess near Washtucna, eastern Washington.

GROLIER, MAURICE J., 1965, Geology of part of the Big Bend area, in the Columbia Plateau, Washington.

#### ADAMS CO. - HYDROLOGY - GROUNDWATER

GROLIER, MAURICE J., 1965, Geology of part of the Big Bend area, in the Columbia Plateau, Washington.

#### ADAMS CO. - IGNEOUS PETROLOGY - BASALT

FENTON, ROBERT LEO, 1974, The syntactic log as a tool for correlating basalt stratigraphy.

SIEMS, BARBARA ANN, 1973, Surface to subsurface correlation of Columbia River basalt using geophysical data in parts of Adams and Franklin Counties, Washington.

WARD, ALEXANDER WESLEY, JR., 1975, Petrology and chemistry of the Huntzinger flow, Columbia River basalt, Washington.

#### ADAMS CO. - MAPS - GEOLOGIC

GROLIER, MAURICE J., 1965, Geology of part of the Big Bend area, in the Columbia Plateau, Washington.

#### ADAMS CO. - PALEONTOLOGY

DEAVER, FRANKLIN KENNEDY, 1973, Faunal utilization at archaeological site 45AD2, Adams County, Washington.

#### ADAMS CO. - SOILS

FOLEY, LUCY LOUGHLIN, 1982, Quaternary chronology of the Palouse loess near Washtucna, eastern Washington.

#### ADAMS CO. - STRATIGRAPHY

FOLEY, LUCY LOUGHLIN, 1982, Quaternary chronology of the Palouse loess near Washtucna, eastern Washington.

#### ALUMINUM

JACKSON, RONALD LAVERNE, 1974, A mineralogical and geochemical study of the ferruginous bauxite deposits in Columbia County, Oregon and Wahkiakum County, Washington.

#### ARCHAEOLOGICAL SITES - COLUMBIA BASIN

AMARA, MARK STEVEN, 1975, Mechanical analyses of stratigraphic layers from the Lind Coulee archaeological site in central Washington.

DEAVER, FRANKLIN KENNEDY, 1973, Faunal utilization at archaeological site 45AD2, Adams County, Washington.

FRYXELL, ROALD, 1970, The contribution of interdisciplinary research to geologic investigation of prehistory.

GREENE, GLEN STONEFIELD, 1975, Prehistoric utilization in the channeled scablands of eastern Washington.

GUNKEL, ALEXANDER, 1961, A comparative cultural analysis of four archaeological sites in the Rocky Reach Reservoir region, Washington.

HAMMATT, HALLETT H., 1976, Late Quaternary stratigraphy and archaeological chronology in the lower Granite Reservoir area, lower Snake River, Washington.

LEONHARDY, FRANK CLINTON, 1970, Artifact assemblages and archaeological units at Granite Point locality 1 (45WT41), southeastern Washington.

MARSHALL, ALAN GOULD, 1971, An alluvial chronology of the lower Palouse River canyon and its relation to local archaeological sites.

MOODY, ULA LAURA, 1978, Microstratigraphy, paleoecology, and tephrochronology of the Lind Coulee site, central Washington.

SWANSON, EARL H., 1956, Archaeological studies in the Vantage region of the Columbia Plateau, northwestern America.

#### ARCHAEOLOGICAL SITES - OLYMPIC PENINSULA

GAVENDA, ROBERT THOMAS, 1980, A characterization of the soils and landscape at the Manis Mastodon site, Sequim, Washington.

GUINN, STANLEY JAMES, 1963, A maritime village on the Olympic Peninsula of Washington.

NEWMAN, THOMAS STELL, 1959, Toleak Point—An archaeological site on the north central Washington coast.

#### ARCHAEOLOGICAL SITES - PUGET LOWLAND

MATTSON, JOHN LYLE, 1971, A contribution to Skagit prehistory.

#### AREAL GEOLOGY

HOOVER, LINN, 1951, A summary of the stratigraphy and structural geology of Oregon and Washington.

SHEDD, SOLON S., 1907, Geography and geology of Washington.

#### AREAL GEOLOGY

*see also* subdivision AREAL GEOLOGY under specific counties and regions:

ADAMS CO.  
ASOTIN CO.  
BENTON CO.  
CASCADE MOUNTAINS  
CHELAN CO.  
CLALLAM CO.  
COLUMBIA BASIN  
COLUMBIA CO.  
COWLITZ CO.  
DOUGLAS CO.  
FERRY CO.  
FRANKLIN CO.  
GARFIELD CO.  
GRANT CO.  
GRAYS HARBOR CO.  
ISLAND CO.  
JEFFERSON CO.  
KING CO.  
KITSAP CO.  
KITITITAS CO.  
Klickitat  
LEWIS CO.  
LINCOLN CO.  
MASON CO.  
OKANOGAN CO.  
OLYMPIC PENINSULA  
PACIFIC CO.  
PEND OREILLE CO.  
PIERCE CO.  
PUGET LOWLAND  
SAN JUAN CO.  
SKAGIT CO.  
SKAMANIA CO.  
SNOHOMISH CO.  
SPOKANE CO.  
STEVENS CO.  
THURSTON CO.  
WAHIAKUM CO.  
WALLA WALLA CO.  
WHATCOM CO.  
WHITMAN CO.  
YAKIMA CO.

ASOTIN CO. *see also* COLUMBIA BASIN



Figure 15. Original indexing of the Phillips citation (Figure 3) compared to the final indexing of that thesis in the subject index.

GEO: STEVENS CO./CROWN CREEK-BOWEN LAKE AREA

SUBJECT: STRUCTURAL GEOLOGY/AREAL GEOLOGY/MAPS - GEOLOGIC/  
CAMBRIAN/STRATIGRAPHY/THESES

Final indexing for the Phillips citation in the thesis bibliography index:

CAMBRIAN - STEVENS CO.  
MAPS - GEOLOGIC - STEVENS CO.  
STEVENS CO. - AREAL GEOLOGY  
STEVENS CO. - MAPS - GEOLOGIC  
STEVENS CO. - STRATIGRAPHY  
STEVENS CO. - STRUCTURAL GEOLOGY  
STRATIGRAPHY - STEVENS CO.  
STRUCTURAL GEOLOGY - STEVENS CO.

camera-ready format. And remember: as time-consuming as these procedures are, they're still much faster and more accurate than doing the bibliography by hand.

### THE MAP INDEX

Like the first edition, the index to original geologic mapping in the theses was prepared manually. I only used the computer to help with some of the checking and editing.

### THE INDEX BY UNIVERSITY

Unlike the first edition, we decided to include a full index of the theses by college or university. (In the first edition we only included a list of the schools, with addresses.) The ability to prepare such a list is the advantage of using a system like dBaseII. Our BIS system does not have an option for doing a special index like this, but we don't need it. Using interactive dBaseII, I had the machine sort all the citations on the Publisher field, thus putting them in order by school. Then I transferred the author, date, title and publisher fields from that sorted file to Wordstar and edited it.

### PUBLICATION

Once all the files are completed on Wordstar, we send them electronically to the State Printer to be typeset directly from the computer.

It's difficult for me to accurately compare the preparation times for the two editions of the thesis bibliography because the methods were so different and because I don't have accurate records of exactly how long the various steps took for the first edition.

But as I recall, the first edition took about 2 1/2 person-years: a year for me to catalog the thesis collection, about 6 months for me to prepare the manuscript, and then approximately one year total time spent by the editor and manuscript typist. (The manuscript also sat in editing for over a year because it kept being bumped for more important projects.)

Using the computer, it took me about the same amount of time (about 6 months) to do the second edition of the thesis bibliography. But then it took only about 4 weeks for the manuscript typist to enter all the appropriate printing codes, and the manuscript was sent electronically to the state printer for automatic typesetting.

In the entire process, the citations were typed by hand only once and then simply repeated by the computer in the appropriate places.

The manuscript is now in press, and should be available soon.

### THE INVISIBLE MANUSCRIPT

No matter how we prepare a bibliography, it will be a big investment of our time and our organization's resources. We don't want that investment cheapened because the print is illegible, the map index too crowded, or the subject index too abbreviated. We need to strive for the "invisible manuscript" (Scithers and Meschkow, 1985), to use all the tricks we know so the format never obstructs the content, so the user can use the bibliography easily. Some of the tricks are simple: using a clear typeface, with enough white space on the page so it can be easily read. Others are more subtle: the sheet size for a map index, or the importance of a simple, consistent editorial style, with all the accuracy you can muster. These things might sound mundane but they're not: accuracy and ease-of-use are important because inaccuracy and difficulty-of-use will degrade the index and undermine its credibility. What's more, these things usually don't cost any additional money or take any additional time-- but will make an enormous difference in the ultimate usefulness of the final bibliography.

### CONCLUSION

There are many complex procedures in the preparation of a large bibliography. The computer can do some of these procedures and can be a valuable tool, allowing us to prepare the bibliography better and faster than by hand. But we need to understand clearly what the machine is really doing, and both the advantages and restrictions of preparing a bibliography on a computer in order to exploit it to our best advantage.

### References:

Eddison, E. B., 1985, Designing an inhouse database--Issues and techniques [workshop]: American Society for Information Science, Pacific Northwest Chapter, 1985 annual meeting, Portland, Oregon, June 21, 1985.

Scithers, G. H.; Meschkow, Sanford, 1985, Invisible manuscript: Writers Digest, August 1985, p. 28-29.

## MICROS AND MINI COMPUTERS IN GEOSCIENCE LIBRARIES

Vivian S. Hall  
Geology Librarian  
University of Kentucky  
Lexington, KY 40506

Micro and mini computers appear to have been widely used for library procedures only since 1980. A search of both the computer and library literature showed only two articles in 1979 and even less prior to that year. At the University of Kentucky, we began using automated procedures for some projects in the library in 1982.

This presentation will discuss four (4) library projects on two different mini computers. The mini for the 4th project is connected to a mainframe. Each has proven to be efficient in both time and materials for the librarian and the patron.

These four (4) projects are:

- 1) Producing the monthly acquisition list.
- 2) Production of the annual serials listing.
- 3) Records and labels for the two hundred (200) partner exchange program.
- 4) An on-line coal database.

### MONTHLY ACQUISITION LIST

The Monthly Acquisition list is input (keyed in) on to a disc on a Radio Shack, TRS 80, Model 12 computer using SCRIPSIT II software. The printer is a Radio Shack, Dot Matrix, DMP 400.

The monthly acquisition list contains the author, date, title, publisher and call number of each new monograph (book); guidebook; selected maps; and the title of new journal(s) which were first received in the month for which the list is made.

Each title is input directly into the computer from the shelf list card. The information is proofed on the cathode ray tube (CRT screen) and any errors seen on the screen are corrected with a touch of the keys on the key pad of the computer.

The cover sheet always contains a geological poem, short article or two or more paragraphs of interest to our patrons. These are keyed into the computer and then the list and cover is printed on the Dot Matrix printer.

A sample cover sheet and one sheet from the September 1985 acquisition list are shown as figures 1 and 2.

The computer paper has perforated edges and these must be removed after the lists are printed; they are then collated, stapled and labeled for distribution.

#### ANNUAL SERIAL/PERIODICAL LISTING

The Pirtle Geology Library serials listing has more than 1300 titles counting title changes, ceased publications, monographic series, map series, and the current journals/periodicals. Prior to putting the list on disc in 1984, a listing was only compiled every three (3) years. The other two years, a supplement was typed up, copied and distributed, due to the lengthy



Truly a man of all seasons, Johann Goethe's interests embraced drama, poetry, painting, philosophy, politics, and various aspects of science. The creator of Faust and the Sorrows of Werther was a member of nearly 30 scientific societies, an active participant in the Plutonist-Neptunist battle over the origin of rocks, foreshadowed portions of Darwin's theory of organic evolution, early recognized the concept of an "Ice Age," established a collection of rocks, minerals, and fossils of over 18,000 items, and it was in his honor that the familiar iron mineral, goethite, was named. The first geologic map of Germany was published in 1821 and the color system adopted was based on Goethe's proposals. Interestingly, modern geologic maps are prepared using essentially the same color code.

(Taken from Language of the Earth, edited by Frank H.T. Rhodes and Richard O. Stone, p. 300.)

The great art masterpieces The Last Supper, Mona Lisa, and Madonna of the Rocks and the true nature of fossils, isostatic adjustment, and a modern concept of the immensity of geologic time might appear to be immiscible, but all are products of the genius of Leonardo Da Vinci. A scientist who rigorously applied the scientific method and placed faith only in his own research, Leonardo was centuries ahead of his time as a geologist. His contribution to geology has been less widely recognized than his accomplishments as a painter, canal builder, sculptor, inventor, and military engineer. In a hitherto unpublished article by Dr. Thomas Clements, Emeritus Professor of Geology at the University of Southern California, Da Vinci receives due recognition for his geological endeavors.

(Taken from Language of the Earth, edited by Frank H.T. Rhodes and Richard O. Stone, p. 310.)

# SELECTED ACQUISITIONS RECEIVED SEPTEMBER, 1985

- 560.8  
Sol3  
no.35  
Biogenic structures: their use in interpreting depositional environments / edited by H. Allen Curran. Tulsa, Okla.: Society of Economic Paleontologists and Mineralogists, 1985. (Society of Economic Paleontologists and Mineralogists, Special publication ; no.35)
- GB  
609.2  
.M84  
1984  
Multidisciplinary Conference on Sinkholes (1st : 1984 : Orlando, Fla.)  
Sinkholes: their geology, engineering, and environmental impact: proceedings... / edited by Barry F. Beck. Rotterdam ; Boston : A. A. Balkema, 1984.
- GB  
1205  
.P75  
1985  
Pringle, Laurence P.  
Rivers and lakes. Alexandria, Va. : Time-Life Books, 1985.
- HD  
9560.5  
.T49  
1984  
Thompson, Robert S.  
Oil property evaluation. Golden, Colo. : Thompson-Wright Associates, c1984.
- QE  
328  
.E50  
1984  
El-Baz, Farouk.  
The geology of Egypt: an annotated bibliography. Leiden : Brill, 1984.
- QE  
390  
.P34  
1980  
Les Paleosurfaces et leur metallogenese / coordination, J.C. Samama; avec la collaboration de M. Arnold...[et al.]. Orleans : Editions du BRGM, [1980] (Publication du 26e Congres geologique international. Memoires de metallogenie ; D3)
- QE  
390.2  
.N53  
F33  
1979  
Facteurs controlant les mineralisations sulfurees de nickel / coordination par M. Besson. Paris : Editions du BRGM, [1979]
- QE  
471.2  
.C6  
1985  
Coastal sedimentary environments / edited by Richard A. Davis, Jr. 2nd rev., expanded ed. New York : Springer Verlag, c1985.
- QE  
475  
.A2  
M4745  
1985  
Metamorphic reactions: kinetics, textures, and deformation / edited by Alan Bruce Thompson and David C. Rubie. New York : Springer-Verlag, c1985. (Advances in physical geochemistry ; v.4)
- QE  
522  
.B6  
1984  
Blong, R.J.  
Volcanic hazards: a sourcebook on the effects of eruptions. Sydney ; Orlando, Fla. : Academic Press, c1984.

Figure 2

task of retyping and correctly alphabetizing to include new titles subscribed to and deleting any withdrawn titles.

In 1984, the listing was input on disc into the Radio Shack, TRS 80, Model 12 computer. This, needless to say, was a monumental task, a total of 150 printed pages. However, once the listing was input, the 35 new titles to be added in 1985 were simply keyed onto the same disc and placed in the proper alphabetical order by journal title. The five titles withdrawn were deleted, i.e. removed from the disc and thus, did not show up on the 1985 listing. The computer according to the program formatting set up in 1984 closed the gaps where these titles had appeared and each page was full of titles as if the deleted titles had never been there.

The saving of time, white out and paper is enormous when compiling a 158 page document. We now put out a new serial/periodical listing annually. SCRIPSIT version 3 for thinline floppy and hard disk use is the software used for this project on the Radio Shack TRS-80.

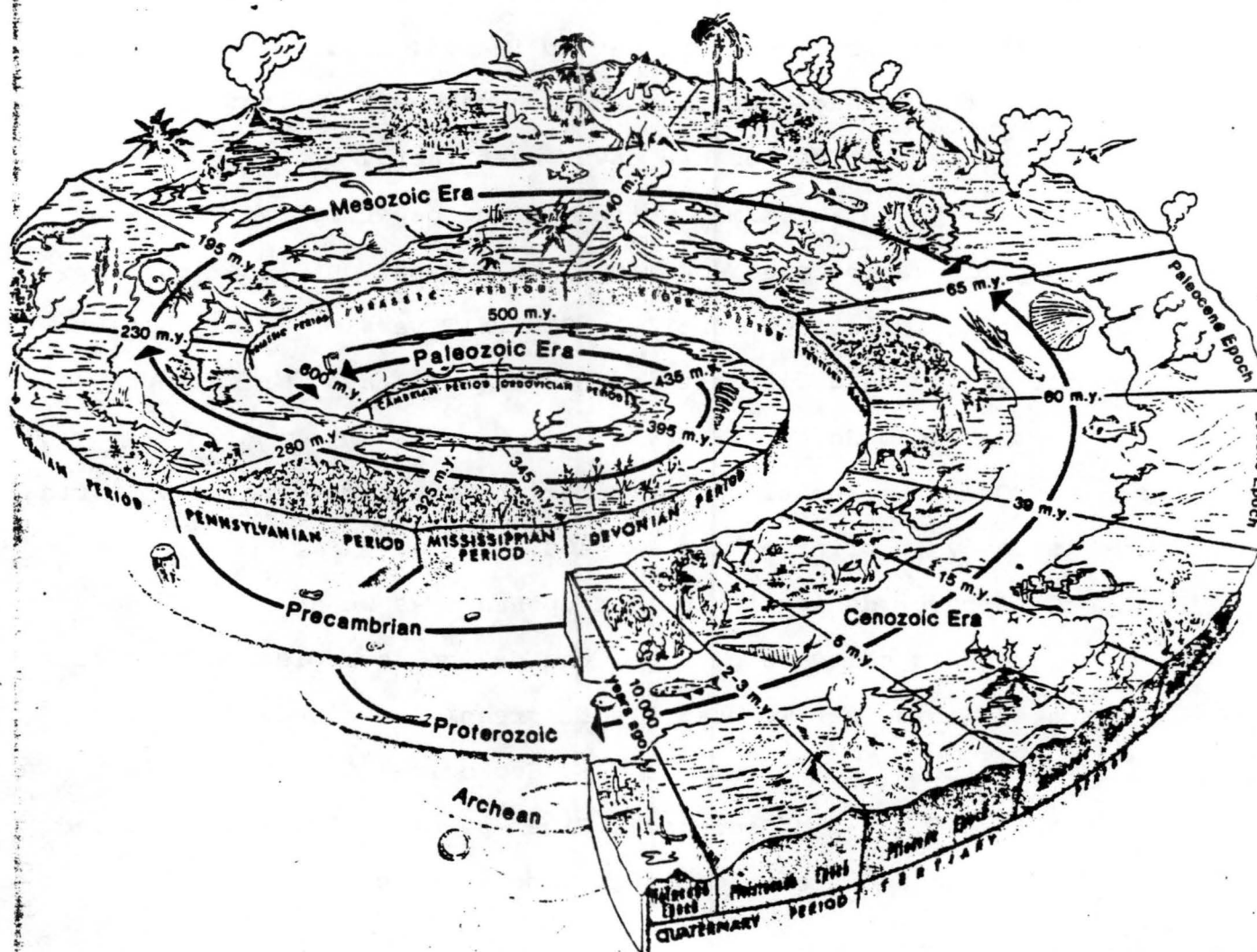
Once the additions and deletions are completed, the listing is ready to print on the DMP 400.

A cover design is decided upon and as we do not yet have a graphics software package, the design is copied on colored paper (this year we used a soft green) see figure 3. This year's cover came from the U.S. Geological Survey pamphlet (USGS Inf. 70-1) "Geological Time" pages 18-19. It is called "Relative and Atomic Geologic Time". Figure 4 shows the first

# SERIALS AND PERIODICALS

SEPTEMBER, 1985

PIRTLE GEOLOGY LIBRARY  
UNIVERSITY OF KENTUCKY



\*  
4.5 billion years ago

After U.S. Geological Survey  
publication GEOLOGIC TIME.  
p.18-19.

RELATIVE AND ATOMIC GEOLOGIC TIME

Figure 3

Abilene Geological Society. Field trip guidebook. 1952, 1954-55, 1957, 1961,	557.64 Ab573
Geological contributions. v.3, 1952 - v.6, 1961,	557.64 Ab573g
Ableson, Phillip H., ed. Researches in geochemistry. v.1-2, 1959-67.	551.9 Ab35
Abstracts of Bulgarian scientific literature. Geology and geography. v.1, 1957-58; v.3-21, 1960-77/78. Continued as Abstracts of Bulgarian scientific literature. Geosciences.	016.55 Ab894
Abstracts of Bulgarian scientific literature. Geosciences. v.22- , 1978/79-	016.55 Ab894
Abstracts of North American geology. (U.S. Geological Survey.) 1966-1971. Ceased publication, Dec. 1971.	R557 Ab894
Academia de Ciencias de Cuba. Instituto de Geologia. Serie geologica. no.13- , 1973-	QE 222 .A250
Academia Republicii Populare Romine. Studii si cercetari de geologie, geofizica, geografie. Seria geologie. v.1, 1956 - v.2, 1957; v.4, 1959 - v.8, 1963; v.10, 1965 - v.11, 1966. Some nos. msg. Continued as Studii si cercetari de geologie, geofizica, geografie. Seria Geologie.	554.98 Ac12
Academia sinica. National research institute of geology. Shanghai. ...Contributions. v.1-5, 1931-36,	555.1 Ac123c
Memoirs. nos.1-16, 1928-37,	555.1 Ac123m
Academy of Natural Science of Philadelphia. Notulae naturae. misc. nos. Ceased publication, no.450, 1974.	506 Ac122n
Special publication. v.1-3, 1922-30,	Cat. as sep.
Academy of Science of New York. Annals. misc. nos.	Cat. as sep.

Figure 4



sheet of the 1985 serials/periodical listing printed on the Radio Shack Dot Matrix printer DMP 400.

#### EXCHANGE PROGRAM

The third project which has been automated is our "Two Hundred Partner Exchange Program". The Kentucky Geological Survey gives the Pirtle Geology Library two hundred copies of their publications, except maps, guidebooks, and one or two other exceptions, as they are published, so that we may exchange with geological institutions throughout the world. This exchange is a fund saver for our acquisition budget.

Formerly the records for each partner were kept in manilla folders in a four (4) drawer vertical file cabinet. Since we've input these records on a disc in the computer, space has been freed up in this file cabinet.

As we send items to an exchange partner, we input this data into the computer with the date the material was sent. See figures 5 and 6 for records for one domestic and one foreign agency. Each agency has been assigned a number and may be called up by this number.

Again we use the Radio Shack TRS-80 and SCRIPSIT version 3 for thinline floppy and hard disk use for this project, however, for the labels we use PROFILE PLUS software. PROFILE PLUS enables us to pull up one agency to print a label or the entire set of two hundred as needed. The Radio Shack DMP 400 is used to print the labels.

ARKANSAS GEOLOGICAL COMMISSION  
3815 W. ROOSEVELT ROAD  
LITTLE ROCK, AK 72204

KENTUCKY GEOLOGICAL SURVEY PUBLICATIONS

SERIES 11			date sent			date sent			date sent		
BULLETIN	1	06-16-82	INFORMATION CIRC.	1	10-22-79	SPEC. PUB.	1	09-08-80			
BULLETIN	2		INFORMATION CIRC.	2	07-06-81	SPEC. PUB.	2	07-06-81			
BULLETIN	3		INFORMATION CIRC.	3	09-08-80	SPEC. PUB.	3	07-06-83			
BULLETIN	4		INFORMATION CIRC.	4	01-04-82	SPEC. PUB.	4	07-06-83			
BULLETIN	5		INFORMATION CIRC.	5	01-04-82	SPEC. PUB.	5	12-82			
BULLETIN	6		INFORMATION CIRC.	6	06-16-82	SPEC. PUB.	6	07-06-83			
BULLETIN	7		INFORMATION CIRC.	7	12-82	SPEC. PUB.	7	07-06-83			
BULLETIN	8		INFORMATION CIRC.	8	12-82	SPEC. PUB.	8	07-06-83			
BULLETIN	9		INFORMATION CIRC.	9	*	SPEC. PUB.	9	07-02-84			
BULLETIN	10		INFORMATION CIRC.	10	*	SPEC. PUB.	10	*			
BULLETIN	11		INFORMATION CIRC.	11	*	SPEC. PUB.	11	04-15-85			
BULLETIN	12		INFORMATION CIRC.	12	*	SPEC. PUB.	12	10-21-85			
BULLETIN	13		INFORMATION CIRC.	13	*	SPEC. PUB.	13				
BULLETIN	14		INFORMATION CIRC.	14	*	SPEC. PUB.	14				
BULLETIN	15		INFORMATION CIRC.	15	*	SPEC. PUB.	15				
BULLETIN	16		INFORMATION CIRC.	16	*	SPEC. PUB.	16				
BULLETIN	17		INFORMATION CIRC.	17		SPEC. PUB.	17				
BULLETIN	18		INFORMATION CIRC.	18		SPEC. PUB.	18				
BULLETIN	19		INFORMATION CIRC.	19		SPEC. PUB.	19				
BULLETIN	20		INFORMATION CIRC.	20		SPEC. PUB.	20				
BULLETIN	21		INFORMATION CIRC.	21		SPEC. PUB.	21				
BULLETIN	22		INFORMATION CIRC.	22		SPEC. PUB.	22				
BULLETIN	23		INFORMATION CIRC.	23		SPEC. PUB.	23				
BULLETIN	24		INFORMATION CIRC.	24		SPEC. PUB.	24				
BULLETIN	25		INFORMATION CIRC.	25		SPEC. PUB.	25				
COUNTY REPT.	1	10-22-79	REPT. OF INVEST.	1	12-82	THESIS	1	09-08-80			
COUNTY REPT.	2	07-06-83	REPT. OF INVEST.	2	10-21-85	THESIS	2	07-06-83			
COUNTY REPT.	3		REPT. OF INVEST.	3		THESIS	3	04-15-85			
COUNTY REPT.	4		REPT. OF INVEST.	4		THESIS	4				
COUNTY REPT.	5		REPT. OF INVEST.	5		THESIS	5				
COUNTY REPT.	6		REPT. OF INVEST.	6		THESIS	6				
COUNTY REPT.	7		REPT. OF INVEST.	7		THESIS	7				
COUNTY REPT.	8		REPT. OF INVEST.	8		THESIS	8				
COUNTY REPT.	9		REPT. OF INVEST.	9		THESIS	9				
COUNTY REPT.	10		REPT. OF INVEST.	10		THESIS	10				
COUNTY REPT.	11		REPT. OF INVEST.	11		THESIS	11				
COUNTY REPT.	12		REPT. OF INVEST.	12		THESIS	12				
COUNTY REPT.	13		REPT. OF INVEST.	13		THESIS	13				
COUNTY REPT.	14		REPT. OF INVEST.	14		THESIS	14				
COUNTY REPT.	15		REPT. OF INVEST.	15		THESIS	15				
COUNTY REPT.	16		REPT. OF INVEST.	16		THESIS	16				
COUNTY REPT.	17		REPT. OF INVEST.	17		THESIS	17				
COUNTY REPT.	18		REPT. OF INVEST.	18		THESIS	18				
COUNTY REPT.	19		REPT. OF INVEST.	19		THESIS	19				
COUNTY REPT.	20		REPT. OF INVEST.	20		THESIS	20				
COUNTY REPT.	21		REPT. OF INVEST.	21		THESIS	21				
COUNTY REPT.	22		REPT. OF INVEST.	22		THESIS	22				
COUNTY REPT.	23		REPT. OF INVEST.	23		THESIS	23				
COUNTY REPT.	24		REPT. OF INVEST.	24		THESIS	24				
COUNTY REPT.	25		REPT. OF INVEST.	25		THESIS	25				

Figure 5

\* NOT AVAILABLE FOR EXCHANGE DISTRIBUTION. SENT TO KENTUCKY COLLEGES ONLY.

GEOLOGICAL SURVEY OF PAKISTAN  
P.O. BOX 15  
QUITTA  
PAKISTAN

KENTUCKY GEOLOGICAL SURVEY PUBLICATIONS

SERIES 11		date sent		date sent		date sent
BULLETIN	1	06-16-82	INFORMATION CIRC.	1	10-24-79	SPEC. PUB. 1 09-01-80
BULLETIN	2		INFORMATION CIRC.	2	07-06-81	SPEC. PUB. 2 07-06-81
BULLETIN	3		INFORMATION CIRC.	3	09-01-80	SPEC. PUB. 3 07-06-83
BULLETIN	4		INFORMATION CIRC.	4	01-04-82	SPEC. PUB. 4 07-06-83
BULLETIN	5		INFORMATION CIRC.	5	01-04-82	SPEC. PUB. 5 12-82
BULLETIN	6		INFORMATION CIRC.	6	06-16-82	SPEC. PUB. 6 07-06-83
BULLETIN	7		INFORMATION CIRC.	7	12-82	SPEC. PUB. 7 07-06-83
BULLETIN	8		INFORMATION CIRC.	8	12-82	SPEC. PUB. 8 07-06-83
BULLETIN	9		INFORMATION CIRC.	9	*	SPEC. PUB. 9 07-02-84
BULLETIN	10		INFORMATION CIRC.	10	*	SPEC. PUB. 10 *
BULLETIN	11		INFORMATION CIRC.	11	*	SPEC. PUB. 11 04-15-85
BULLETIN	12		INFORMATION CIRC.	12	*	SPEC. PUB. 12 10-21-85
BULLETIN	13		INFORMATION CIRC.	13	*	SPEC. PUB. 13
BULLETIN	14		INFORMATION CIRC.	14	*	SPEC. PUB. 14
BULLETIN	15		INFORMATION CIRC.	15	*	SPEC. PUB. 15
BULLETIN	16		INFORMATION CIRC.	16	*	SPEC. PUB. 16
BULLETIN	17		INFORMATION CIRC.	17		SPEC. PUB. 17
BULLETIN	18		INFORMATION CIRC.	18		SPEC. PUB. 18
BULLETIN	19		INFORMATION CIRC.	19		SPEC. PUB. 19
BULLETIN	20		INFORMATION CIRC.	20		SPEC. PUB. 20
BULLETIN	21		INFORMATION CIRC.	21		SPEC. PUB. 21
BULLETIN	22		INFORMATION CIRC.	22		SPEC. PUB. 22
BULLETIN	23		INFORMATION CIRC.	23		SPEC. PUB. 23
BULLETIN	24		INFORMATION CIRC.	24		SPEC. PUB. 24
BULLETIN	25		INFORMATION CIRC.	25		SPEC. PUB. 25
COUNTY REPT.	1	10-24-79	REPT. OF INVEST.	1	12-82	THESIS 1 09-01-80
COUNTY REPT.	2	07-06-83	REPT. OF INVEST.	2	10-21-85	THESIS 2 07-06-83
COUNTY REPT.	3		REPT. OF INVEST.	3		THESIS 3 04-15-85
COUNTY REPT.	4		REPT. OF INVEST.	4		THESIS 4
COUNTY REPT.	5		REPT. OF INVEST.	5		THESIS 5
COUNTY REPT.	6		REPT. OF INVEST.	6		THESIS 6
COUNTY REPT.	7		REPT. OF INVEST.	7		THESIS 7
COUNTY REPT.	8		REPT. OF INVEST.	8		THESIS 8
COUNTY REPT.	9		REPT. OF INVEST.	9		THESIS 9
COUNTY REPT.	10		REPT. OF INVEST.	10		THESIS 10
COUNTY REPT.	11		REPT. OF INVEST.	11		THESIS 11
COUNTY REPT.	12		REPT. OF INVEST.	12		THESIS 12
COUNTY REPT.	13		REPT. OF INVEST.	13		THESIS 13
COUNTY REPT.	14		REPT. OF INVEST.	14		THESIS 14
COUNTY REPT.	15		REPT. OF INVEST.	15		THESIS 15
COUNTY REPT.	16		REPT. OF INVEST.	16		THESIS 16
COUNTY REPT.	17		REPT. OF INVEST.	17		THESIS 17
COUNTY REPT.	18		REPT. OF INVEST.	18		THESIS 18
COUNTY REPT.	19		REPT. OF INVEST.	19		THESIS 19
COUNTY REPT.	20		REPT. OF INVEST.	20		THESIS 20
COUNTY REPT.	21		REPT. OF INVEST.	21		THESIS 21
COUNTY REPT.	22		REPT. OF INVEST.	22		THESIS 22
COUNTY REPT.	23		REPT. OF INVEST.	23		THESIS 23
COUNTY REPT.	24		REPT. OF INVEST.	24		THESIS 24
COUNTY REPT.	25		REPT. OF INVEST.	25		THESIS 25

Figure 6

\* NOT AVAILABLE FOR EXCHANGE DISTRIBUTION. SENT TO KENTUCKY COLLEGES ONLY.

## DEVELOPING A COAL LITERATURE DATABASE

The fourth and last automated project to be discussed in this paper is "Developing a Coal Literature Database".

This particular library receives many requests from out of state researchers, state and federal agencies as well as corporate and academic researchers requesting information on some aspect of coal. The Kentucky regional universities and community college personnel as well as researchers, students and faculty on campus at the University of Kentucky are constantly needing coal data. When you think of coal in the broadest terms, it is interdisciplinary; i.e., legal, economics, agricultural, engineering, medicine, (black lung), chemistry of coal, geological, and even the social science disciplines are included in the topic of coal.

At any rate because of the high number of requests we began to develop a coal data base. The first step was to seek funding for equipment, supplies and salaries for graduate students to aid in collecting references, and to assign key word and subject/geographical descriptors. These efforts were successful. A geology faculty member gave us \$500, a geology alumnus provided \$25,000 and a University of Kentucky Institute provided \$4,200. Digital Rainbow computers, modems and printers were purchased, training and work began.

The graduate student assistants were trained to collect references and enter each in the proper format on 4 x 6 cards, and to scan abstracts and summaries of articles in order to

assign appropriate descriptors. These descriptors are written on code sheets from which they are input into the computer. See Figure 7.

After 20,000 plus references had been collected, and several hundred had the descriptors assigned, we began to develop the thesaurus. In order to be consistent with standard terms, we used as guides (1) the Department of Energy's, Energy Database, "EDB Subject Thesaurus"; (2) the International Energy Agency (IEA), World Coal Resources and Reserves Data Bank Service's, "Lexicon of Terms Relating to the Assessment and Classification of Coal Resources" edited by Todd, 1982; (3) the terms on the different levels of the American Geological Institute's (AGI) "User Guide to the Bibliography and Index of Geology" edited by Mulvihill, 1982.

The next step was to begin working with the Kentucky Geological Survey programmer to formulate or develop program parameters for the database. The software used was DATATRIEVE on the Dec VAX mainframe computer made by Digital. We had purchased 3 mini computers, 6 modems and 2 printers. The computers are Digital Rainbow 100's and the printers are Digital LA50. They are compact, dot matrix serial printers. The computers are hard wired using one modem for each to the VAX mainframe where there is another modem. A direct telephone line is required also for each computer to the VAX mainframe. The mainframe computer is housed in the Kentucky Geological Survey building which is also on the campus.

The descriptors or search fields needed were author, title, publisher, date, corporate author, conference, symposium,



ACCESSION NO: \_\_\_\_\_

AUTHOR: \_\_\_\_\_ YEAR: \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_ AVAILABLE: KUK \_\_\_\_\_  
 \_\_\_\_\_  
 et al. \_\_\_\_\_

TITLE: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

SOURCE: \_\_\_\_\_  
 \_\_\_\_\_ Vol, \_\_\_\_\_ No, \_\_\_\_\_ Page, \_\_\_\_\_

CONFER: Sponsor, \_\_\_\_\_  
 Title, \_\_\_\_\_  
 no, \_\_\_\_\_ Location, \_\_\_\_\_ year, \_\_\_\_\_

SERIES: \_\_\_\_\_

SPONSOR: Name, \_\_\_\_\_  
 Contract No., \_\_\_\_\_

LANGUAGE: \_\_\_\_\_ COUNTRY: \_\_\_\_\_

REPORT NO.: \_\_\_\_\_ TYPE: \_\_\_\_\_

NOTE: \_\_\_\_\_

DESCRIPTORS:

1) \_\_\_\_\_ 6) \_\_\_\_\_  
 2) \_\_\_\_\_ 7) \_\_\_\_\_  
 3) \_\_\_\_\_ 8) \_\_\_\_\_  
 4) \_\_\_\_\_ 9) \_\_\_\_\_  
 5) \_\_\_\_\_ 10) \_\_\_\_\_

LOCATION:

1) \_\_\_\_\_  
 2) \_\_\_\_\_  
 3) \_\_\_\_\_  
 4) \_\_\_\_\_  
 5) \_\_\_\_\_  
 6) \_\_\_\_\_

CONTROL: \_\_\_\_\_ Initials \_\_\_\_\_ Initials  
 date added, \_\_\_\_\_ recorder \_\_\_\_\_  
 date modified, \_\_\_\_\_ modifier \_\_\_\_\_

INITIALS:

☐ code sheet ☐ descriptors checked ☐ input into terminal ☐ revisor or check

Figure 7

language, geographical area, and format of material, i.e., book, journal, thesis, map, film or fiche. Once the parameters for these access/search variables were programmed and keyed into the database the next step was to set up the parameters for the reference or citation which would be the end product received from a search and to program these in proper order. The following order was programmed: author, date, title, place of publication, publisher, journal title, volume number, issue number and pagination. This would be the way references would show on the CRT screen or on a print-out following a search of the descriptors/fields.

Thus the database may be searched/accessed by any one or more of the descriptors or search fields of: author; date; keywords; geographical area; format of material, theses, fiche, etc; symposium; conference; corporate author; or by adding and/or to one of these descriptors and a descriptive phrase, (boolean logic). A researcher might ask for all references published between 1975 and 1985 on sulfur coal in the Illinois Basin. The computer might respond on the screen; 38 references found for this ten year period. You then ask the computer to display references on the screen, they will appear in alphabetical order by author and if they appear appropriate for the researcher's need he will likely ask for a printout of these 38 references. The LA50 prints the references.

It is anticipated that within the next two years the database will be accessible to researchers anywhere in the United

States via a compatible terminal. Currently searches may be made on site or requests for searches may be received by telephone or by mail. The database is a non-profit operation, therefore searches are relatively inexpensive.

If all of this sounds simple and not very time consuming, this is not correct, it has taken us three(3) years to get this far. Developing the thesaurus was and is a time consuming part of the project; everyone who plans to access it will want a copy of the thesaurus. The specialized programming was time consuming also, communicating the needs of correct bibliographic citations and library terminology to a geologist programmer used to programming raw data takes time, to find a common meeting ground or meeting of the minds. Training graduate student assistants to assign descriptors, input the search fields and the references is time consuming; then the student finishes his/her thesis or dissertation and leaves the campus and you begin training again. As a rule, two people input data, this data has to be proofed or revised prior to dumping into the mainframe for fast accessing. Even though it is input into the mainframe, it is held in a particular hold slot until it is revised and dumped ready for rapid retrieval.

The on-line coal database work will continue as funds permit.

The use of microcomputers for these four projects in the University of Kentucky Geology Library have proven to be both economical and efficient.

#### ADDENDUM

Plans include developing as time permits several small on-line in-house bibliographies for patron use. The Digital Rainbow 100 computers with Database II software will be used for inputting the data for the following small bibliographies: Mount St. Helens; Kentucky Coal; Caves in the Southeastern U.S.; and the University of Kentucky, Department of Geology, Theses and Dissertations. Database II permits up to 24 descriptors per bibliographic reference for retrieval depending upon the parameters set up when inputting the data for the topics. The Digital LA50 printer will be used.

**PART TWO:**  
**Contributed Papers**





## EVALUATION OF A GEOSCIENCE LIBRARY COLLECTION

BY JULIA H. TRIPLEHORN, GEOPHYSICAL INSTITUTE,  
UNIVERSITY OF ALASKA, FAIRBANKS

AND DENNIS STEPHENS, RASMUSON LIBRARY,  
UNIVERSITY OF ALASKA, FAIRBANKS

How can a geoscience library collection be evaluated to identify its strengths and weaknesses?

Has the library kept pace with the changing and expanding directions of its research users?

These were the questions that I considered as the new librarian at the Geophysical Institute - University of Alaska, Fairbanks, Alaska in 1981. Some background information is important here for you to understand the type of library collection that will be discussed in this study. This will include a brief history of the Institute followed by a description of the present collection.

The principal fields of research at the Geophysical Institute are solar-terrestrial science, aeronomy, meteorology, climatology, glaciology and solid earth geophysics. Three key factors have determined the research emphasis: 1/ the high geomagnetic latitude which makes it a favorable location for study of the auroral zone 2/ the high geographic latitude which provides opportunities to study arctic and subarctic climatology, meteorology, glaciology and hydrology 3/ the high rate of tectonic activity which makes this an excellent site for gravity, seismology, volcanology and paleomagnetism.

Research in these areas started with a Rockefeller Foundation Grant in 1929 to the University of Alaska to make visual observation of the aurora.

In 1949, a Congressional Act established the Geophysical Institute and as part of the organization stated that the Institute would have a director, secretary and a librarian. Hence the library has been an integral part of the research program from the beginning.

The library is the information center for all the geophysical research at the institute and at the remote sites. All the directors have been deeply committed to the development of the library and much of its strength is a product of their involvement. The library has 12,000 cataloged books and 750 serial titles with 273 currently received periodicals. There are 182 linear feet of reports

arranged by issuing agency and 405 linear feet of data arranged by type of data and country of origin.

From all this information, you now realize the library under consideration is a small special library in the geoscience area. How could I evaluate this collection?

Historically, evaluations were made in a variety of ways; but none of them gave a full picture of the collection's scope. One way was personal observation, but my personal observations of the library really did not give me any substantive clues on the strengths or weaknesses of the collection as a whole, nor of its particular parts. The faculty and staff seemed happy and content with the library. Few interlibrary loans were requested. There were many enthusiastic comments by visitors when they discovered rare and unusual books. Among the other significant assets were long runs of some periodical sets, many starting with volume 1 and a few going back into the 1800's.

These observations were too subjective and I felt that the evaluation needed to be more systematic and structured in such a way that it could be used as the foundation for future collection development.

Other methods traditionally used in collection evaluation included measuring the shelflist to find the number of books in each subject category and comparing this number with the holdings of other libraries, or checking holdings against a recognized bibliography of appropriate books for the collection. The first method includes among its shortcomings the fact that quantity is not necessarily quality. I seriously considered the second approach, but found few bibliographies in the geoscience area, and these were not current.

Another approach to collection evaluation is user-centered; ask your library users, experts in their fields, to rate appropriate areas in the collections. This is certainly a valid method, but it lacks a systematic and uniform structure that could be used with other libraries for a meaningful comparison. It is also rather subjective.

We could also analyze requests for interlibrary loans, assuming these to be a valid clue to what patrons were not finding in the library. But as previously mentioned, there were too few to be useful.

We could also analyze circulation records to see what is being checked out and therefore, we assume, used. Problems? This doesn't account for in-house use, nor for what the user is not finding on the shelf. It is not a method that can provide useful information to compare with other libraries.

None of these methods provide the librarian with a systematic tool for collection development and management, nor a standardized means on which to base cooperative and coordinated collection development with other libraries in order to maximize scarce resource dollars.

By coincidence, Dennis Stephens, organizer of the Alaska Collection Development Project and his statewide committee were at that time developing collection evaluation tools for their project. The committee was modifying the Research Libraries Group evaluation tool, the Conspectus, with the assistance of its consultant Paul H. Mosher, Director of Research Services at the Stanford University Libraries. The RLG Conspectus is an overview, or summary, arranged by subject, of existing library collection strengths and collecting activities. The RLG libraries are major North American libraries including the likes of Yale, New York Public, and Colorado State. Most of them are quite large, and this was a system devised for their use.

The Alaska Project modified this RLG Conspectus for use in Alaska libraries, which, to abuse understatement, are much smaller. In fact, all the library collections of the state together amount to a medium-sized university library in the lower-48. The purpose of the Alaska Conspectus is to show patterns of collection strengths and collecting commitments by subject orientation in participating libraries, and by extension in the state. We see it as a basis for statewide coordinated collection development planning, interlibrary loan protocol, minimizing unwanted duplication of materials, and on the individual library level, to provide a useful collection management tool.

Our modification notwithstanding we did want to preserve the basic structure of the RLG approach in the interest of potential regional and national standardization and the exchange of information about collections. In fact the Conspectus approach shows promise of becoming a regional and national tool, having been adapted by the Fred Meyer Charitable Trust for a Pacific Northwest information resource assessment program and by the North American Collections Inventory Program, which was recently piloted in Indiana. Here also could be the opportunity to adapt something similar for the geoscience libraries.

A main feature of this evaluation process is judging the functional level of each small subject section in the Library of Congress classification and assigning an alphanumeric indicator for 0 (out of scope) to 5 (comprehensive collection). The latter library would collect, as far as reasonably possible, all significant works of recorded knowledge, in all applicable languages. (Appendix 1)

The criteria for assessing collections are the second important feature of this evaluation process and consider the chronological coverage, principal authors, principal works, primary sources, complete sets, periodical coverage and others. (Appendix 2)

Besides the collection indicators and evaluation criteria, a volume count is included for each subject line being examined. The survey can be done by a team including both the librarian and the appropriate research staff for the subject area. The results are then tabulated using CONDOR software and submitted to the editor of the Alaska Conspectus for inclusion on the statewide conspectus which use the university library's HP 3000.

I would like to describe the methodology of the collection evaluation as it was applied at the Geophysical Institute. The first step was the preparation of the work sheets for the evaluation team. Xerox copies were made of the Library of Congress classification tables in the area to be considered. The card catalog cards were then measured in each subject line under examination, with 1 inch equalling approximately 100 cards and hence 100 volumes. The resulting volume estimate was noted on the classification schedule under each of the major subdivisions. The RLG, Pacific Northwest, and Alaska Conspectuses use worksheet forms with the classification schedules written out. These worksheets, however, did not give me the special detail I needed on Arctic, Alaskan, or some subject topics in which the Institute has an interest. Each library using this scheme needs to analyze the classification schedule to make sure it meets its specific needs, while still keeping in mind the issue of uniformity for exchange of collection information with other libraries.

The second step was the selection of the evaluation team. Our team consisted of Dennis Stephens, collection development officer at the University library, myself as Institute librarian, and a research faculty member in each area to be evaluated. This research person needed to be acquainted with the material in his own discipline, both historically and current. It is particularly important that the research person not be an argumentative sort, and that the ground rules include an understanding that the work session not turn into a harangue against, and defense of, the LC Classification system. It should be emphasized that the researcher's participation is most useful to give the study credibility, and to enlist the users' support for the results and the consequent collecting activity.

The third step was the actual evaluation of the collection. One person was designated as the record keeper while the others looked over his/her shoulder. The record keeper was provided with the L. C. Classification schedule which has



the number of books in each particular subject section. It also provided a valuable indicator of how many books were circulating from a given section and thus not available for examination at the time of the evaluation. It is, of course, preferable to do the shelf survey at a low-circulation period or check the circulation records as a supplement to the shelf study.

The record keeper marks the specific sections for consideration and what the spectrum of its contents should be according to the L. C. Classification. The researcher usually leads the discussion with an evaluation of the merits of the books using the established criteria. The other team members contributed by comparing these merits. Periodicals and other formats should be included when the entire collection is evaluated. Most periodical jobbers can supply their periodical list with the LC Classification to aid you in this. The presence of foreign language materials can be shown in the alphanumeric rating thus giving the evaluation more depth. The entire Geology collection in QE, 1200 volumes, was evaluated in 1-1/2 hours.

The fourth step is the information compilation. These notes were then compiled and key areas of strengths and weaknesses became immediately obvious. The notes on the need for updating series, weeding and other items were recorded on the L. C. sheets for future reference. This is a completed work sheet. (Table 1)

Following this, the Alaska Conspectus sheets were prepared. (Table 2)

Please note that the numerical form of the evaluation provides a measure of the relative degree of strength and weakness of each area ; that it is the evaluation is not only qualitative, but quantitative.

The fifth and final step is the analysis of the results. The librarian and the library committee can match up these and compare then to the goals for collection development. In my library, I used this process to identify weak areas and immediately xeroxed pages from Subject Guide to Books in Print for review by the staff member who was on the evaluation team. With his or her guidance, I was able to order books in these areas. Some of the subject areas needed expansion, as seismology, and this has to be a long range development project.

The following advantages were found in this methodology:

1. Suitable for a small special library
2. Inexpensive
3. Minimal time needed
4. Qualitative/quantitative results
5. Evaluators became acquainted with the collection

6. Results could be part of a larger collection development plan and the library's collection development policy statement

## CONCLUSION

Geoscience library collections can be evaluated using a standard methodology to identify subject strengths and weaknesses. This quantitative/qualitative survey can be useful in relating the collection to library objectives and in setting priorities. Collection development can be targeted to areas needing more current information, more comprehensive coverage, or more basic information to round out a subject section. This methodology could be utilized by other geoscience libraries and results combined to form a conspectus or overview showing the functional levels of various geoscience collections.

COLLECTION LEVEL INDICATORS

Developed by the Alaska Statewide  
Collection Development Steering Committee\*

0. Out of scope: The library does not collect in this area.
- 1a. Minimal, with uneven coverage: Unsystematic representation of subject.
- 1b. Minimal, but chosen well: Few selections made, but basic authors, core works, and ideological balance are represented. Can support fundamental inquiries.
- 2a. Basic information level: A collection of up-to-date general materials that serve to introduce and define a subject and to indicate the varieties of information available elsewhere. It may include dictionaries, encyclopedias, historical surveys, bibliographies, and periodicals in the minimum number that will serve the purpose. A basic information collection can support school instruction and routine public inquiries, but is not sufficiently intensive to support higher-level academic courses or independent study or the wide-ranging recreational reading demands of a highly educated general public.
- 2b. Augmented information level: As above, except more major periodicals, selected editions of important works, wider selection of reference materials.
- 3a. Basic study level: Includes the most important primary and secondary literature, a selection of basic representative journals/periodicals, and the fundamental reference and bibliographical tools pertaining to the subject. Adequate for curriculum support for basic undergraduate instruction. Adequate for independent study and for the lifelong learning needs of the general public, with coverage at all appropriate reading levels.
- 3b. Intermediate study level: As above, except a wider range of basic monographs, wider selection of the more important writers and secondary materials, stronger journal/periodical support. Collection adequate to support college-level term paper writing.
- 3c. Advanced study level: As above, except adequate for honors undergraduate or most graduate instruction or sustained independent study; adequate to maintain knowledge of a subject required for limited or general purposes but not strong enough for original research in a subject. It includes complete collections of the works of secondary writers, a selection of representative journals/periodicals, and all the reference tools and fundamental bibliographic apparatus pertaining to the subject.
4. Research level: A collection that includes the major published source materials required for dissertations and independent research, including materials containing research reporting, new findings, scientific experimental results, and other information useful to researchers. It is intended to include all important reference works and a wide selection of specialized monographs, as well as a very extensive collection of journals and major indexing and abstracting services in the field. Older material is retained for historical research.
5. Comprehensive level: A collection in which a library endeavors, so far as is reasonably possible, to include all significant works of recorded knowledge (publications, manuscripts, other forms), in all applicable languages, for a necessarily defined and limited field. This level of collecting intensity is one that maintains a "special collection;" the aim, if not the achievement, is exhaustiveness. Older material is retained for historical research.

2.3 LANGUAGE CODES

- The following language codes may be added to the number when the codes usefully qualify the values reported. Language codes should be omitted when they are superfluous. (For example, it goes without saying that a research-level collection in French history will be primarily in French; the "Y" is understood and may be omitted.) Language codes should be applied consistently throughout the worksheet, line by line. The "Comments" section should not be used to indicate general language levels. The use of language codes for collections at level 3 or higher is encouraged so that potential assignments for primary collecting responsibilities can more easily be determined.

LANGUAGE COVERAGE CODES

- E - English language material predominates; little or no foreign language material in the collection.
- F - Selected foreign language material included, in addition to the English language material.
- W - Wide selection of foreign language material in all applicable languages.
- Y - Material is primarily in one foreign language.

CRITERIA FOR ASSESSING COLLECTIONS

1. Chronological coverage: Are older and newer materials consistently represented? Should they be?
2. Language coverage: How extensive is appropriate or significant foreign language coverage of the subject in the collection?
3. Principal authors: Are the standard, chief, or more important authorities and authors included?
4. Principal works: Are the classic, standard, essential and important works in the collection?
5. Primary sources: Are critically edited original texts and documents included? How extensively?
6. Criticism/commentary/interpretation: How complete is secondary monographic or critical treatment?
7. Complete sets: Are sets and series well represented in the collection? Are they complete?
8. Periodical coverage: How extensive is periodical coverage of the subject? Are the chief titles included?
9. Number of volumes: Count of shelf-list, or approximation based on 10 vols per foot of shelf occupancy.
10. Circulation data: Circulation records may need to be checked to add to assessments above. In addition, circulation or use data may be helpful in assigning future collecting intensity levels at 1-3 collection intensity levels.

\*Adapted from RLG Collection Development Manual, 2d ed.

Table 1

## PHYSICAL

## GEOGRAPHY

		NO. OF BOOK EST.	
G 1-922	GENERAL	110	2 B
70.4-70.6	REMOTE SENSING	20	3 C
575-599	POLAR	10	1 A
600 - 839	ARCTIC	20	1 A
845 - 922	ANTARCTIC	45	1 A



Table 2

## RLG CONSPECTUS WORKSHEET

PHYSICAL GEOGRAPHY AND EARTH SCIENCES

INSTITUTION:

LC CLASS	SUBJECT GROUP	COLLECTION LEVELS AND LANGUAGE COVERAGE		COMMENTS
		ECS	CCI	
	GEOLOGY			
QE500-511	GEO108 Dynamic and structural geology - General	2a	3c	200 vol.
QE515-516	GEO109 Geochemistry	1b	1b	30 vol.
QE521-529	GEO110 Volcanoes	2	4	20 vol.
QE531-545	GEO111 Seismology	3c	4	150 vol.

## GEOSCIENCE INDEXING AT PETROLEUM ABSTRACTS

Mark A. Finnegan

Geoscience literature received by Petroleum Abstracts Information System is indexed by scientists with field experience. The indexing consists of relating concepts produced by the author to a controlled vocabulary (the Exploration and Production (E & P) Thesaurus, the Geographic Thesaurus and from lists of Supplementary Descriptors.) The primary emphasis of selection of the literature is petroleum-related, but not petroleum-restricted. Geoscience literature indexed comprises the following subjects: Geology, Geochemistry, Geophysics, and Mineral Commodities. The depth of indexing attributed to each article does in fact depend on the amount of petroleum-related subject matter in the article. The maximum number of descriptors which is indexed for a particular article is 90, which does not include those descriptors autoposted by the computers. Once the indexing is completed, the abstract is then cut to approximately 150 words. The scientist who indexes at Petroleum Abstracts is not expected to know or remember every detail or concept ever published. But he or she is expected to be able to go to an atlas, dictionary, or any other reference material available and apply the concepts to a controlled vocabulary.

Successful searching of the Petroleum Abstracts Information System can be accomplished with an understanding of (1) the indexing strategy, and (2) the importance and necessity of utilizing the thesauri controlled vocabulary. It may be more time-consuming, but it will certainly be more accurate in the retrieval of the information.

### Introduction

"The Modern age has a false sense of superiority because of the great mass of data at its disposal. But the valid criterion for distinction is rather the extent to which man knows how to form and master the material at his command." (Goethe, 1810)

"A data base is only as good as the indexing that went into the entries... The quality of computer retrieval will be limited by the knowledge and care of the indexers." (E. Roedder, 1981)

In 1810, Johann Wolfgang von Goethe couldn't possibly have foreseen the future of computerized storage and retrieval of the vast amounts of information and data at our disposal, but he certainly understood the necessity of properly handling that information so that when needed it might be located. On the other hand, in 1981, when Edwin Roedder made his compilation on fluid inclusions, for which many of his references came from accessing data bases, he certainly

understood the importance of indexing as a means of locating information on a specific subject. Indexing is a highly complex art and requires professionals not only with experience in the subjects being indexed, but also with a familiarity of the indexing strategy used for a particular information retrieval system. This paper describes the indexing strategy used by geoscientists at the Petroleum Abstracts Information System.

### History of the System

The Petroleum Abstracts Information System (PA), initiated in January, 1961, is operated by the Information Services Division of the University of Tulsa as a non-profit organization and is funded primarily by the petroleum industry through subscriptions to the services (Graves and Bailey, 1976, p. 1). Approximately 650 serial publications provide the base from which this information system operates. Articles from journals, state and national periodicals, published symposia, guidebooks, patent disclosures, etc. are selected for inclusion in the System on the basis of pertinence to the exploration, production, and development activities of the petroleum industry (Mattinson, 1982, p. 1). This service was designed to supplement a similar service offered by the American Petroleum Institute (API), covering petroleum refining and petrochemicals.

During its early years of operation (1961-1964), all citations were assigned from one to six code numbers, based upon an elaborate subject classification system categorizing the content of each document (Martinez and Helander, 1968, p. 279). These early abstracts were retrieved by means of a manual card catalog. By 1964, considerable interest was shown in developing a more sophisticated retrieval system and, on the recommendation of the Subscriber Advisory Committee (composed of representatives of the major petroleum companies participating in the service), a more comprehensive retrieval system was set up, based on the assignment of multiple key words or descriptors. Vocabulary control is a basic factor in determining the efficiency of such a retrieval system. Synonymous and ambiguous words must be eliminated if retrieval is to be accurate. Consequently, one of the first steps in the development of the new system was the formation of a basic, controlled vocabulary, or thesaurus. The indexing system, based on the controlled vocabulary Exploration and Production (E&P) Thesaurus, was put into effect in January, 1965 (Martinez and Helander, 1968, p. 279-280). The Geographic Thesaurus soon followed and is now in its fifth edition as of January 1985. The E&P Thesaurus is now in its seventh edition as of January 1985.

The entire operating procedure at PA is shown in Figure 1. The literature is purchased by PA. Once the literature arrives at PA, it is selected, checked for duplication, abstracted, indexed, edited, and then processed. The turnaround time of the literature from the time it is received at PA until it is published in the Petroleum Abstracts Bulletin is 4 to 6 weeks for the priority designated journals (Figure 2), and somewhat longer for the others. The Petroleum Abstracts Bulletin is published weekly.

### Indexing Equipment

The equipment used by geoscientists is essential for accurate and comprehensive indexing of geoscience literature. This equipment includes the geoscientists. Geoscientists come in a variety of shapes and sizes, but can usually be identified by the rocks in their offices. These geoscientists

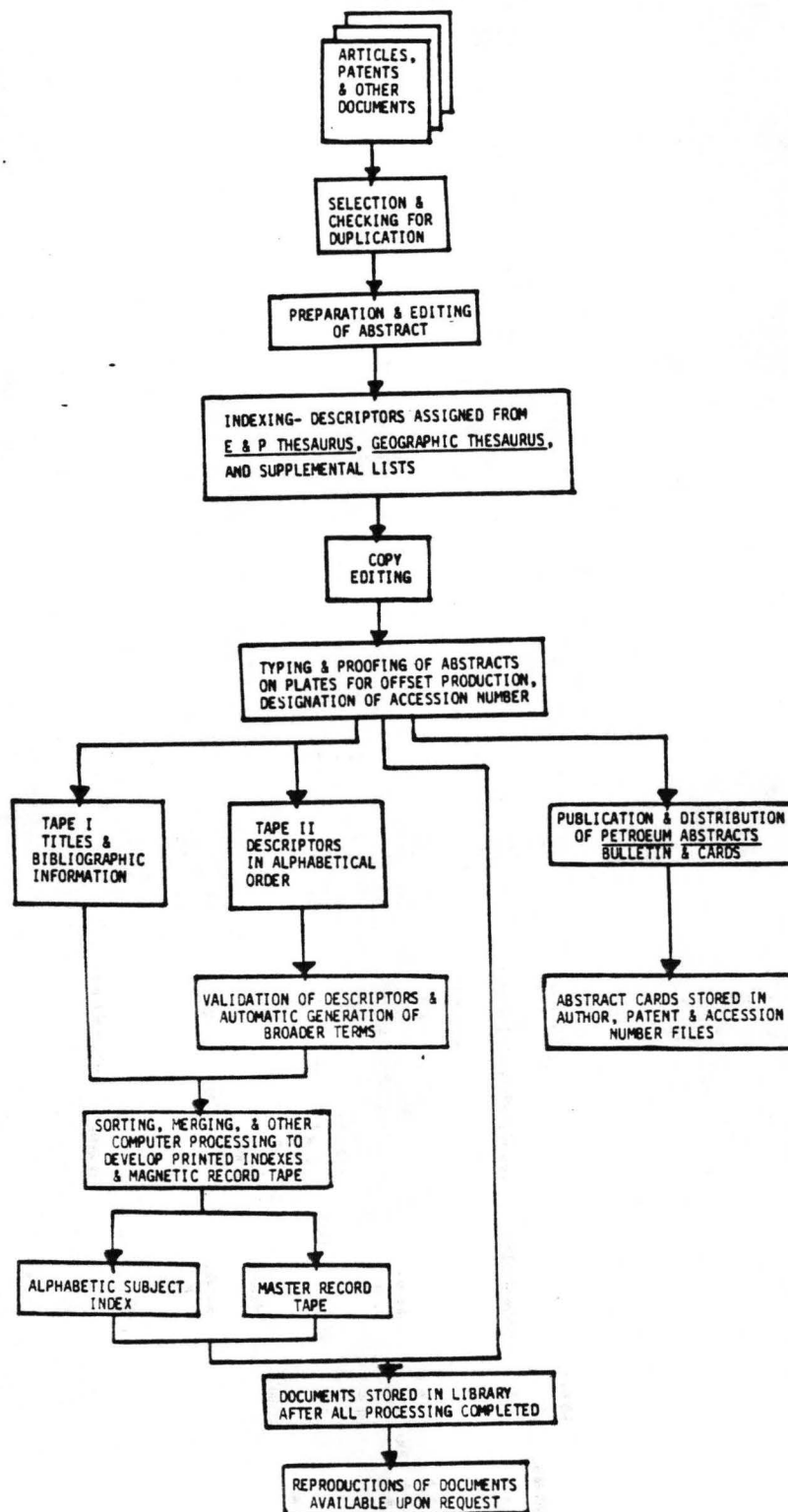


FIGURE 1. FLOW DIAGRAM OF THE PETROLEUM ABSTRACTS INFORMATION SYSTEM (Revised from McLeod, Graves, & Martinez; 1969)

PETROLEUM ABSTRACTS GEOSCIENCE PRIORITY JOURNALS

JANUARY 1985

AAPG BULL.  
BULL. CAN. PETROL. GEOL.  
CAN. J. EARTH SCI.  
COMPT. REND., SER. 2  
GEOCHIM. COSMOCHIM. ACTA  
GEOPHYS. J.  
GEOPHYS. PROSPECTING  
GEOPHYSICS  
J. GEOPHYS.  
J. GEOPHYS. RES.  
J. PETROL. GEOL.  
J. SEDIMENT. PETROL.  
NATURE  
OIL GAS J.  
SCIENCE  
SEDIMENT. GEOL.  
SEDIMENTOLOGY

FIGURE 2. Priority Designated Journals  
(Turnaround time is 4-6 weeks)



include a geochemist, a geophysicist, a paleontologist, a palynologist, and other assorted geologists.

The second most important piece of equipment used at PA is the Thesaurus. Indexing based on a controlled vocabulary cannot be accomplished by memory (Admire, 1968, p. 34). The geoscientists must constantly be referring to the thesauri while indexing. Concepts of the thesauri may be memorized, but the computer will not accept concepts. Figure 3 is an example from the E&P Thesaurus.

#### SALT DOME

```
NT  PIERCEMENT SALT DOME
BT  DOME
    ANTICLINE
    FOLD (GEOLOGY)
    GEOLOGIC STRUCTURE
SA  CAP ROCK
SA  SALT STRUCTURE
SA  STRUCTURAL GEOLOGY
```

NT - Narrower Term  
BT - Broad Term (Autoposted)  
SA - See also (not autoposted)

FIGURE 3. E & P THESAURUS

The hierarchy can be observed in the broader term (BT) and narrower term (NT) relationships. The broader terms are automatically autoposted by the computer from lower level index terms used by the geoscientists. The see also (SA) terms are those related to the index terms, but not in such a way as to be autoposted. For a more detailed description of the E&P Thesaurus see Martinez and Helander, 1968; and Martinez and Bailey, 1978. Figure 4 is an example from the Geographic Thesaurus.

```
PERMIAN BASIN
  (Added February 1965)
UF  PERMIAN BASIN AREA
NT  CENTRAL BASIN PLATFORM
NT  DELAWARE BASIN
NT  MIDLAND BASIN
BT  WESTERN U.S.
    UNITED STATES
    NORTH AMERICA
SA  NEW MEXICO
SA  TEXAS

PERMIAN BASIN AREA
  USE PERMIAN BASIN
```

FIGURE 4. Geographic Thesaurus

An example of the supplementary descriptors list to the Geographic Thesaurus is shown in Figure 5. This Supplementary Descriptors List is comprised of geological structures (anticlines, synclines, salt domes, faults, etc.) stratigraphic terms (European series; groups and formations, but not members) counties, and oil and gas fields. The Geographic Supplementary Descriptors List is referred to in indexing as often as the Geographic Thesaurus.

RATTLESNAKE FM  
\*\* PLIOCENE PLEISTOCENE--OREGON

RATTLESNAKE HAMMOCK FM  
\*\* CRETACEOUS--FLORIDA

RATTLESNAKE HILLS GAS FLD  
\* RATTLESNAKE HILLS GAS FIELD  
BT BENTON CO, WASH

RATTLESNAKE MT SYNCLINE  
BT McINTOSH CO, OKLA

RATTLESNAKE OIL FIELD  
BT WASHAKIE CO, WYO

FIGURE 5. Example from the Supplemental Descriptors List to the Geographic Thesaurus.

Other supplementary Descriptors Lists include the Chemicals List and the Companies List.

Another piece of equipment used at PA is a permuted Key Word Out of Context (KWOC) List (Martinez, 1973). The KWOC List should never be used without the use of the E&P Thesaurus. The KWOC List is merely a tool to use when indexing or searching a subject for which the indexer or searcher is unfamiliar.

Reference material is of the utmost importance when it comes to indexing geoscience literature. Maps are essential to geoscientists. There are many articles which may not describe the region studied very well, such as a Rattlesnake Valley or some well identified only as well number such and such with no reference to regional geography, or an index map is provided, but with no coordinates or towns in the area. Other reference material includes stratigraphic charts, lexicons, dictionaries (geologic, foreign, and of course, English), and just about anything else we can get our hands on.

### Selection Policy

The selection of geoscience articles for inclusion into the PA information system is done by the same geoscientists that are doing the indexing. Whether or not an article is selected for the system is determined by the subject of that article. If the article has questionable use for the petroleum industry, it is generally not selected. This decision sometimes cannot be made until after an abstract is translated into English. The quality of the article is another factor involved in the selection process. An article may have a fantastic title, but when one reads deeper into the article, one may find that the title is not as good as at first thought. This is not as rare as one might expect, unfortunately. Geoscientists at PA are not only expected to be able to index the articles, but must also be able to weed out articles inappropriate for use in PA. The selection policy at PA is not objective, we do not select subjects relating to the volcanism of Mt. St. Helen's, the composition of moon rocks, etc. (Mattinson, 1982, p. 1). One can, however, find a wealth of information on subjects such as biostratigraphy, paleoecology, sedimentology of ancient sedimentary rock (not necessarily recent sediments unless compared to ancient rock), petrographic techniques used for sedimentary rocks, geophysical and geochemical techniques applied to the exploration of petroleum and minerals, geotechnical properties of sediments (primarily permafrost and offshore regions where development and production structures are likely to be used in the extraction of petroleum or minerals).

### Geoscience Indexing Strategy

The indexing strategy used at PA has been developed over a period of about 20 years. It is important to understand that an indexing strategy cannot be set up over night. It must, of course, consist of a basic philosophy which depends on the particular information system for which it is being used. After the basic philosophy is set up, it must be adhered to stringently in order to maintain a consistency in the overall indexing strategy. The basic philosophy used by geoscience indexers at PA is similar to that at GeoRef, in that indexing is done by geoscientists for geoscientists (Salahi, 1974, p. 29). PA is a specialized information system which is concerned primarily with the petroleum aspect of the geosciences. The indexing strategy has been adapted to fit that specialized need. The heirarchy of the thesauri is a major factor in the strategy of indexing used in any information system. Manual indexing furnishes the basic input for production of the information retrieval materials and services. As a computer program provides autoposting of descriptors from the heirarchies of both thesauri, only the most specific term for any concept is posted manually. All broader terms are added automatically to the indexing (Mattinson, 1982, p. 2).

When it comes to indexing geographic concepts, this can be one of the most trying times for a geoscientist. An article may concern a specific geographic feature such as a salt dome, county, oil field, etc. The author may not have mentioned the fact that this particular feature may also be in a larger, more regional geographic feature such as a basin, plateau, mountain range, etc. It is up to the geoscientist doing the indexing to index not only the specific

geographic feature, but also the more regional feature as well. This is where reference maps and the background experience of the geoscientists are an invaluable asset to geoscience indexing. At PA, Geoscientists are encouraged to seek the assistance of their fellow geoscientists who might have more knowledge of a particular geographic area. This also applies to subject expertise. This indepth coverage of geography will ease the burden of retrieval. Geoscientists at PA are also encouraged to understand search techniques, which will aid in their indexing strategy.

The degree of specificity in the indexing is determined by a variety of factors. The economic aspect of an article, i.e. tabulated data concerning oil reserves, production statistics, well data, etc. would certainly warrant more attention than the predictions being made for "undiscovered reserves". The quality of the article has a definite effect on the depth of indexing. Language can be a definite barrier to the indexing, if all one has to index from is a 150 word English abstract. Some translating is done at PA, but only to the extent in which an English abstract is made available for inclusion in the Petroleum Abstracts Bulletin. It is PA's philosophy that the full text should be available for reproduction at the library. Therefore, one would expect to find more detailed indexing from full text articles as opposed to an abstract only.

Scientific merit is another determining factor in the depth of indexing. One example of this is the fact that the modern technology or science in one country may be obsolete in another, and since it is applied to petroleum, it must be included in PA, the depth of indexing may not be as detailed as if it were truly state of the art.

When considering the degree of specificity in the indexing strategy, one must understand that PA is a specialized data base and therefore consists of subjective indexing. Objectivity is important for any scientific information system, and the indexing should never attempt to describe something the author has not discussed. On the other hand, if an author does describe, for example, the source rock potential of a specific formation, it is paramount for the indexing to include not only the formation name and the fact that there is source rock potential, but also the geography, age, lithology, chemical data, procedures used, etc. The indexer's geoscience background is another determining factor in objectivity. For example, the arrival of literature at PA is not a consistent uniform flow. There are times when literature inundates PA (annual meetings, special issues, guidebooks, etc.). In circumstances such as these, it is necessary for all the geoscientists to assist in the indexing of literature which may or may not be on a subject for which they are familiar. A geochemist or paleontologist may end up indexing geophysical articles. This not only is highly subjective, but also takes a good deal longer to index. I must point out here, that quality-control is a top priority at PA. Once the indexing is completed, it is then checked (not only for consistency with the overall indexing philosophy, but also for the accuracy of indexing) by geoscientists familiar with the overall strategy at PA and the subject being indexed. This is extremely time-consuming and tedious, but it is necessary for accurate retrieval. Geography can also play an important part in subjectivity. If an article discusses a geographic area that is known to produce oil and gas, or with known mineral deposits; the indexing would be expected to be more detailed than if the geographic area were in a part of Siberia where it is highly doubtful that any Western companies might be invited. Such an article



would probably not be found in PA. If the geology can be related to a nearby region which is accessible by the West, then, of course, it would be selected and indexed.

The category (Figure 6) to which a geoscience article is assigned would be (1) Geology, (2) Geochemistry, (3) Geophysics, (4) Alternate Fuels and Energy sources (geothermal, tar sands, oil shale, and methane from coal), or (5) Mineral Commodities. The first four categories are indexed on the standard

GEOLOGY  
GEOCHEMISTRY  
GEOPHYSICS  
DRILLING  
WELL LOGGING  
WELL COMPLETION & SERVICING  
PRODUCTION OF OIL & GAS  
RESERVOIR ENGINEERING & RECOVERY METHODS  
PIPELINING, SHIPPING & STORAGE  
ECOLOGY & POLLUTION  
ALTERNATE FUELS & ENERGY SOURCES  
SUPPLEMENTAL TECHNOLOGY  
MINERAL COMMODITIES

**FIGURE 6.** Categories in the Petroleum Abstracts Information System.

indexing sheet (Figure 7) with spaces for forty-five descriptors with an optional second sheet if more index words are required, as is often the case when numerous geographic locations in an article must be identified. The maximum number of descriptors which may be manually indexed for a particular article is 90 (due to space limitation on processing tapes), which does not include those descriptors autoposted by the computer. The descriptors are given different codes or weightings to indicate their relative importance, insofar as the article is concerned. One primary descriptor is assigned which best describes the overall concept of the article (usually a geographic descriptor). There can be a maximum of five permuted major descriptors for which the permutation is also autoposted. This can be observed in Figures 9 and 10 for which the asterisks (\*) indicate the primary descriptor (first index word) and the permuted major descriptors along with their autopostings. There can be, in addition to the five permuted descriptors, six non-permuted major descriptors. These non-permuted are included in the Alphabetic Subject Index (ASI) (Figure 8) which is published bi-monthly and annually. Figures 9 and 10 are examples of articles in the geology category including the descriptors. As can be observed, the petroleum-related article in Figure 9 has received much more attention than the field trip in Figure 10.



TELETYPE  
TU-119-1-F

PATENT COUNTRY	AND NUMBER	DATE	INVENTOR	ASSIGNOR	TITLE
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000	1958-10-28	H. J. ...	...	...
U.S.	2,811,000				

ABSTRACT NO.

<b>CATEGORY</b>	
-----------------	--

126

SOUTH DAKOTA

ALUM CREEK FIELD,FALL RIVER COUNTY,SOUTH DAKOTA

382,474

*ALUM CREEK OIL FIELD	*COMBINATION TRAP
*COTTONWOOD CREEK (SD) ANTC	*FIELD HISTORY
*LEO SANDS	.DUNE DEPOSIT
.PENNSYLVANIAN	.RESERVOIR CHARACTERISTIC
.SANDSTONE RESERVOIR	.STRATIGRAPHY
.STRUCTURAL GEOLOGY	

\*.....PERMUTED MAJOR DESCRIPTORS (5 total)  
(.).....NON-PERMUTED MAJOR DESCRIPTORS(6 total)  
SOUTH DAKOTA.....PRIMARY DESCRIPTOR  
382,474.....ACCESSION NUMBER

FIGURE 8. ALPHABETIC SUBJECT INDEX ENTRY FOR FIGURE 9.

AN - 382474  
 TI - ALUM CREEK FIELD, FALL RIVER COUNTY, SOUTH DAKOTA  
 AU - CARDINAL, D F; SHERER, M  
 OS - APACHE CORP  
 SO - 35TH ANNU WYO GEOL ASS PERM & PENNSYLVANIAN GEOL OF WYO FIELD CONF  
 (CASPER, WYO, 84.09.23-26) GUIDEBOOK PP 169-182, 1984  
 LA - ENGLISH  
 DT - (AT) MEETING PAPER TEXT  
 CC - GEOLOGY  
 IT - \*SOUTH DAKOTA; \*ALUM CREEK OIL FIELD; \*COMBINATION TRAP; \*COTTONWOOD  
 CREEK (SD) ANTC; \*FALL RIVER CO, S DAK; \*FIELD HISTORY; \*GEOLOGIC  
 STRUCTURE; \*HISTORY; \*LEO SANDS; \*NORTH AMERICA; \*TRAP (GEOLOGY); \*UNITED  
 STATES; \*WESTERN US; ACREAGE; ANALYTICAL METHOD; ANTICLINAL TRAP;  
 ANTICLINE; ASSAY; BASIN DEPOSIT; BOOK; CARBONATE ROCK; CEMENTATION  
 (GEOLOGY); CHARACTERISTIC; CHART; CHEMISTRY; COAST CHANGE; COLUMNAR  
 SECTION; COMPOSITION; CORE (ROCK); CORE ANALYSIS; CRETACEOUS; CROSS  
 SECTION; CRUDE ASSAY; DATA; DEFORMATION; DENSITY; DEPOSIT (GEOLOGY);  
 DEPOSITIONAL ENVIRONMENT; DIAGENESIS; DISCOVERY WELL; DISTURBED BELT;  
 DOLOMITE (ROCK); DUNE DEPOSIT; EARTH AGE; ECONOMIC FACTOR; ELECTRIC  
 LOGGING; ELECTRICAL PROPERTY; ENVIRONMENT; EOLIAN DEPOSIT; EUSTATIC SEA  
 LEVEL CHANGE; EVAPORITE; EVAPORITIC ENVIRONMENT; FLOW PROPERTY; FOLD  
 (GEOLOGY); FOLDED BELT; FOLDING (GEOLOGY); FORMATION (GEOLOGY); FORMATION  
 THICKNESS; GAS ANALYSIS; GAS CAP; GAS CAP DRIVE; GAS DRIVE; GAS LIQUID  
 RATIO; GAS OIL CONTACT; GAS OIL RATIO; GAS RESERVOIR; GAS SHOW; GEOLOGIC  
 CROSS SECTION; GEOLOGY; GUIDEBOOK; HYDROCARBON POTENTIAL; HYDROCHEMISTRY;  
 INDEX MAP; INJECTION WELL; INTERFACE; INTERPRETATION; ISOPACH MAP; LAGOON  
 DEPOSIT; LAND AND LEASING; LIMESTONE; LIQUID VISCOSITY; LITHOLOGY; MAP;  
 MARINE DEPOSIT; MARINE ENVIRONMENT; MARKER BED; MESOZOIC; NATURAL EARTH  
 PHENOMENON; NONMARINE DEPOSIT; NONMARINE ENVIRONMENT; OIL AND GAS FIELDS;  
 OIL COLUMN; OIL DENSITY; OIL FIELD; OIL RESERVOIR; OIL SHOW; OIL WATER  
 CONTACT; PALEOZOIC; PENNSYLVANIAN; PERFORATED COMPLETION; PERMEABILITY;  
 PERMEABILITY (ROCK); PETROGRAPHY; PHOTOGRAPH; PHOTOMICROGRAPH; PHYSICAL  
 PROPERTY; POROSITY; POROSITY (ROCK); POST DEPOSITIONAL PROCESS; POUR  
 POINT; POWDER RIVER BASIN; PRESSURE; PRODUCING FORMATION; PRODUCING WELL;  
 RECOVERY MECHANISM; RESERVOIR; RESERVOIR CHARACTERISTIC; RESERVOIR FLUID;  
 RESERVOIR PRESSURE; RESERVOIR TEMPERATURE; RESISTIVITY; RESISTIVITY  
 LOGGING; ROCK; ROCK ANALYSIS; ROCK DEFORMATION; ROCK SAMPLE; SAMPLE;  
 SANDSTONE; SANDSTONE RESERVOIR; SATURATION; SEDIMENTARY ROCK; SHALE;  
 SHALLOW WATER DEPOSIT; STRATIGRAPHIC CROSS SECTN; STRATIGRAPHIC MAP;  
 STRATIGRAPHIC TRAP; STRATIGRAPHY; STRUCTURAL BELT; STRUCTURAL GEOLOGY;  
 STRUCTURAL TRAP; STRUCTURE MAP; SUBSURFACE PRESSURE; SUBSURFACE  
 TEMPERATURE; SULFUR CONTENT; SUNDANCE FM; SUPRATIDAL DEPOSIT;  
 TEMPERATURE; TESTING; THICKNESS; TIDAL FLAT DEPOSIT; TRANSITION  
 TEMPERATURE; VISCOSITY; WATER; WATER (SUBSURFACE); WATER ANALYSIS; WATF  
 RESISTIVITY; WATER SATURATION; WELL; WELL COMPLETION; WELL LOG  
 INTERPRETATION; WELL LOGGING; WELL LOGGING DATA

FIGURE 9. Example of Indexing for Article  
 in the Geology Category.  
 \* - Asterisks indicate primary  
 and permuted major descriptors  
 and their autopostings.

AN - 382417  
 TI - FIELD TRIP GUIDE TO DEPOSITION AND DIAGENESIS OF THE MONTEREY FORMATION,  
 SANTA BARBARA AND SANTA MARIA AREAS, CALIFORNIA  
 AU - ISAACS, C M  
 OS - US GEOLOGICAL SURVEY  
 SO - US GEOLOGICAL SURV OPEN-FILE REP NO 84-98, 1 PL MICROFICHE (66 PP), 1984  
 LA - ENGLISH  
 DT - (GR) GOVERNMENT REPORT  
 CC - GEOLOGY  
 IT - \*CALIFORNIA; \*CENOZOIC; \*DIAGENESIS; \*EARTH AGE; \*MIOCENE; \*MONTEREY  
 SHALE; \*NORTH AMERICA; \*POST DEPOSITIONAL PROCESS; \*SANTA BARBARA BASIN;  
 \*SANTA MARIA BASIN; \*TERTIARY PERIOD; \*UNITED STATES; \*WESTERN US;  
 ACCUMULATION RATE; BASEMENT ROCK; BASIN; BATHYAL ENVIRONMENT;  
 BIOSTRATIGRAPHY; CHART; CLASTIC DEPOSIT; COAST; COAST RANGE AREA;  
 COLUMNAR SECTION; CONCEPTUAL MODEL; CORE (ROCK); CORRELATION; CROSS  
 SECTION; DEPOSIT (GEOLOGY); DEPOSITION (GEOLOGY); DEPOSITIONAL  
 ENVIRONMENT; DIATOMITE; ENVIRONMENT; FORCE; FORMATION THICKNESS; GEOLOGIC  
 CROSS SECTION; GEOLOGIC INTERPRETATION; GEOLOGIC MAP; GEOLOGIC MODEL;  
 GEOLOGIC STRUCTURE; GEOLOGY; GUIDEBOOK; INDEX MAP; INTERPRETATION;  
 LITHOLOGY; MAP; MARINE DEPOSIT; MARINE ENVIRONMENT; MARINE ORGANISM;  
 MINE; MODEL; MUDSTONE; NERITIC ENVIRONMENT; OUTCROP; PELAGIC DEPOSIT;  
 PETROLIFEROUS BASIN; PETROLOGY; PHYSICAL PROPERTY; PHYSICAL SEPARATION;  
 POINT SAL FM; POROSITY; POROSITY (ROCK); PRECIPITATION; RATE; ROCK; ROCK  
 SAMPLE; SANDSTONE; SANTA BARBARA CO, CALIF; SANTA YNEZ MT;  
 SEDIMENTARY ROCK; SEDIMENTATION; SHALE; SILICA; SILICA ROCK; SILICEOUS  
 SHALE; SILICIFICATION; SILTSTONE; SOLUTION (GEOLOGY); STRATIGRAPHIC  
 CHART; STRATIGRAPHIC CORRELATION; STRATIGRAPHY; STRESS; STRUCTURAL CROSS  
 SECTION; STRUCTURAL GEOLOGY; SUBSURFACE; SUBSURFACE TEMPERATURE; TECTONIC  
 MAP; TEMPERATURE; TENSION; THICKNESS; TRANSVERSE RANGE AREA; UNCONFORMITY

FIGURE 10. Example of Indexing for Article  
 in the Geology Category.  
 \* - Asterisks indicate primary  
 and permuted major descriptors  
 and their autopostings.





Mineral Commodities articles are usually restricted to those on exploration or mineralization and not on mining or environmental aspects. An example of the indexing is shown in Figure 13.

The document type classification system at PA (Figure 14) is a dynamic classification system which has been developed over a period of 20 years. Meetings are classified under three separate document types: (1) Meeting paper text, (2) meeting paper abstract, and (3) meeting paper. A meeting paper text is a paper given at a meeting for which the full text is available and so would comprise full indexing with an abstract (Figure 9). A meeting paper abstract, however, is a paper given at a meeting for which only the abstract is available. In this case, only a primary descriptor (as specific as possible) is assigned with no abstract (Figure 15). One exception for meeting paper abstracts is for the annual AAPG meeting, in which case, the abstracts are included along with full indexing (Figure 16). A meeting paper is a list of titles (run in the appendix of the Petroleum Abstracts Bulletin) selected from a single meeting in which the indexing is comprehensive for the entire list of titles selected. The title of the meeting is used as if it were the title of an article. A brief abstract is included. Meeting papers might include meetings of marginal interest to PA, foreign meetings which might be delayed in arriving at PA, etc. Figure 17 is an example of a meeting paper, showing the indexing, abstract, and appendix.

Some document types which might be so broad in coverage as to prohibit any indexing includes books and review/survey. These document types often require a specific type of indexing which is referred to at PA as "broad brush" indexing. Government report documents include not only the U.S. government, but also state and foreign governments. Geoscience patents are generally found in the geophysics and mineral commodities categories. (Figure 18). Maps must include at least a marginal text or they will not be selected at PA. Items of a purely news or promotional nature are usually not selected (Martinez, 1973, p. 60). Theses are selected from Dissertation Abstracts and Masters Abstracts only and include full indexing with an abstract. The philosophy at PA for omitting other theses is that it is felt that one should have access to the full text of the article in order to prevent sporadic coverage of theses (Personal communication, Roy W. Graves). The document type designated Oil & Gas Fields Bibliography (OGFB) is actually a subfile of nearly 4600 bibliographic citations on the exploration and production information of oil and gas fields worldwide. These citations date from about 1920 through 1964. About two-thirds of the file covers North America. The indexing of the OGFB citations has been limited to geographic locations, oil and/or gas field name, producing formations and sedimentary basins. No other subject descriptors have been assigned, other than OIL FIELD, GAS FIELD, OIL AND GAS FIELDS, CONTINENT, and CONTINENTAL SHELF. Three new descriptors were created specifically for the OGFB to aid in the indexing and retrieval of articles that discuss oil and gas fields in a general area without naming specific fields: (1) OGF (country), (2) OGF (state), and (3) OGF (county). All OGFB citations have been classified in the Supplemental Technology Category. Figure 19 is an example of the indexing of a geoscience OGFB citation.

AN - 385911  
 TI - PALEOMAGNETIC AND PETROLOGIC EVIDENCE BEARING ON THE AGE AND ORIGIN OF  
 URANIUM DEPOSITS IN THE PERMIAN CUTLER FORMATION, LISBON VALLEY, UTAH  
 AU - REYNOLDS, R L; HUDSON, M R; FISHMAN, N S; CAMPBELL, J A  
 OS - US GEOLOGICAL SURVEY  
 SO - GEOL SOC AMER BULL V 96, NO 6, PP 719-730, JUNE 1985  
 LA - ENGLISH  
 CC - MINERAL COMMODITIES  
 IT - \*URANIUM DEPOSIT; \*CUTLER FM; \*DEPOSIT (GEOLOGY); \*MINERAL DEPOSIT;  
 \*MINERALIZATION; ALTERATION; ANALYTICAL METHOD; CHEMISTRY; EARTH AGE;  
 ENCLOSING ROCK; GEOCHEMISTRY; GEOLOGIC AGE DETERMINATION; GEOLOGY;  
 GEOMAGNETISM; HYDROTHERMAL ALTERATION; MAGNETIC PROPERTY; MAGNETISM;  
 NORTH AMERICA; PALEOMAGNETISM; PALEOZOIC; PERMIAN; PETROLOGY; PHYSICAL  
 PROPERTY; RADIOACTIVE AGE DETERMINAT; REMANENT MAGNETISM; ROCK;  
 SANDSTONE; SEDIMENTARY ROCK; STRATIFORM MINERAL DEPOSIT; TESTING; UNITED  
 STATES; URANIUM LEAD DATING; UTAH; WESTERN US

FIGURE 13. Indexing For A Mineral Commodities Article.

MEETING PAPER TEXT  
 GOVERNMENT REPORT  
 MAP  
 NEWS  
 PATENT  
 REVIEW OR SURVEY  
 THESIS  
 BOOK  
 MEETING PAPER ABSTRACT  
 OIL & GAS FIELDS BIBLIOGRAPHY

FIGURE 14. Document Type Classification System.

AN - 382467  
 TI - GEOLOGY OF THE POINT ARGUELLO DISCOVERY  
 AU - CRAIN, W E; MERO, W E; PATTERSON, D  
 OS - CHEVRON USA INC; PHILLIPS PETROLEUM CO  
 SO - AAPG-SEPM-SEG PACIFIC SECT MTG (ANCHORAGE, 85.05.22-24) PAP 1985; ABSTR, AAPG BULL V 69, NO 4, P 659, APRIL 1985 (AO)  
 LA - ENGLISH  
 DT - (A) MEETING PAPER ABSTRACT  
 CC - GEOLOGY  
 IT - \*POINT ARGUELLO OIL FIELD; \*CALIFORNIA; \*NORTH AMERICA; \*SANTA BARBARA CO, CALIF; \*UNITED STATES; \*WESTERN US

AN - 382464  
 TI - AGE AND CORRELATION OF THE OTUK FORMATION, NORTH-CENTRAL BROOKS RANGE, ALASKA  
 AU - BODNAR, D A; MULL, C G  
 OS - STANDARD OIL CO (OHIO); ALASKA DIV GEOL GEOPH SUR  
 SO - AAPG-SEPM-SEG PACIFIC SECT MTG (ANCHORAGE, 85.05.22-24) PAP 1985; ABSTR, AAPG BULL V 69, NO 4, P 657, APRIL 1985 (AO)  
 LA - ENGLISH  
 DT - (A) MEETING PAPER ABSTRACT  
 CC - GEOLOGY  
 IT - \*OTUK FM

FIGURE 15. Meeting Paper Abstract

AN - 380109  
 TI - RECOGNITION OF A THIN STRATIGRAPHIC TRAP BY SEISMIC REFLECTION CHARACTER ANALYSIS  
 AU - SLATT, R M; LIGHTY, K; ROBINSON, J  
 OS - ARCO OIL & GAS CO; CITIES SERV OIL & GAS CORP  
 SO - ANNU AAPG-SEPM-EMD-DPA CONV (NEW ORLEANS, 85.03.24-27) PAP 1985; ABSTR, AAPG BULL V 69, NO 2, P 307, FEB 1985 (AO)  
 LA - ENGLISH  
 DT - (A) MEETING PAPER ABSTRACT  
 CC - GEOPHYSICS  
 IT - \*ALBERTA; \*CANADA; \*CARDIUM FM; \*EXPLORATION; \*FORMATION (GEOLOGY); \*GEOLOGY; \*GEOPHYSICAL EXPLORATION; \*NORTH AMERICA; \*PRODUCING FORMATION; \*SEISMIC EXPLORATION; \*SEISMIC REFLECTION METHOD; \*SEISMIC STRATIGRAPHY; \*STRATA; \*STRATIGRAPHY; \*THIN STRATA; AMPLITUDE; ANALYTICAL METHOD; BASIN; BASIN SHELF; CHARACTERISTIC; CHART; COASTAL SAND; CONCEPTUAL MODEL; CORRELATION; CRETACEOUS; CROSS SECTION; DATA; DATA PROCESSING; DEPOSIT (GEOLOGY); DEPOSITIONAL ENVIRONMENT; DIMENSIONAL MODEL; EARTH AGE; ELASTIC WAVE; ELASTIC WAVE LOGGING; ENCLOSING ROCK; ENVIRONMENT; FACIES; FORMATION THICKNESS; GEOLOGIC STRUCTURE; GEOPHYSICAL DATA; GEOPHYSICAL INTERPRETATION; GEOPHYSICAL MODEL; INTERPRETATION; LITTORAL DEPOSIT; LITTORAL ENVIRONMENT; MAPPING; MARINE DEPOSIT; MARINE ENVIRONMENT; MASSIVE STRATA; MESOZOIC; MODEL; NATURAL EARTH PHENOMENON; NERITIC ENVIRONMENT; OIL AND GAS ENTRAPMENT; OIL RESERVOIR; ONE DIMENSIONAL MODEL; PHYSICAL PROPERTY; RECORD; RECORD CHARACTER; REFLECTING BED; REFLECTION (SEISMIC); RESERVOIR; RIDGE (GEOLOGY); ROCK; SAND BODY; SANDSTONE; SANDSTONE RESERVOIR; SEDIMENTARY ROCK; SEISMIC DATA; SEISMIC DATA PROCESSING; SEISMIC INTERPRETATION; SEISMIC MAPPING; SEISMIC MODEL; SEISMIC RECORD; SEISMIC SECTION; SEISMIC WAVE; SEISMIC WAVE PROPAGATION; SHALE; SHELF DEPOSIT; SONIC LOGGING; STRATIGRAPHIC TRAP; TESTING; THICKNESS; TRACE ANALYSIS (ELECTRIC); TRAP (GEOLOGY); WAVE; WAVE AMPLITUDE; WAVE PATTERN; WAVE PHENOMENON; WAVE PROPAGATION; WELL LOGGING; WELL LOGGING DATA

FIGURE 16. Meeting Paper Abstract with Full Indexing

- 380318

TI - 3RD INTERNATIONAL NORSK PETROLEUMSFORENING OIL AND THE ENVIRONMENT  
CONFERENCE (BERGEN, NORW, 5/14-16/84) PROCEEDINGS

SO - (BOOK) NORWEGIAN PETROLEUM SOCIETY, BERGEN, NORW; 230 PP, 1984

LA - ENGLISH

IT - \*MEETING PAPER; \*ADMINISTRATION; \*BUSINESS OPERATION; \*EMPLOYEE  
RELATIONS; \*ENVIRONMENT; \*ENVIRONMENTAL IMPACT; \*OFFSHORE STRUCTURE;  
\*PETROLEUM INDUSTRY; \*SOCIOECONOMIC EFFECT; CONTAMINATION; CONTROL;  
DRILLING (WELL); ECOLOGY; ECONOMIC FACTOR; EUROPE; FISHING (MARINE);  
HUMAN FACTOR; LEGAL CONSIDERATION; MARINE ECOLOGY; NORWAY; OFFSHORE  
DRILLING; OFFSHORE EQUIPMENT; OFFSHORE PRODUCING; OFFSHORE TECHNOLOGY;  
OIL WASTE FATE; POLLUTION CONTROL; PRODUCING; REGULATION; TRAINING  
PROGRAM; WATER POLLUTION

MH - \*MEETING PAPER

CC - SUPPLEMENTAL TECHNOLOGY

AB - THE PETROLEUM RESERVES ON THE NORWEGIAN CONTINENTAL SHELF HAVE GIVEN  
NORWAY THE OPPORTUNITY FOR CONTINUED ECONOMIC AND SOCIAL DEVELOPMENT.  
THE POSSIBLE EFFECTS OF THE PETROLEUM INDUSTRY ON NORWAY'S ECONOMY AND  
WAY OF LIFE ARE DISCUSSED IN THIS CONFERENCE. TITLES AND AUTHORS OF  
PAPERS OF INTEREST TO THE PETROLEUM INDUSTRY ARE LISTED AT THE BACK OF  
THIS ISSUE OF PETROLEUM ABSTRACTS (V. 25, NO. 19, 5/11/85) AS APPENDIX  
A.

PY - B4

#### APPENDIX A

(P.A. 360,318)

#### 3RD INTERNATIONAL NORSK PETROLEUMSFORENING OIL AND THE ENVIRONMENT CONFERENCE (Bergen, Norw., 5/14-16/84) PROCEEDINGS-- [Book] Norwegian Petroleum Society, Bergen, Norw.; 230 pp, 1984

THE ENVIRONMENTAL IMPACT OF OIL ACTIVITIES-- R.Surlen (Norwegian Min Environ);  
16 pp

OIL FOR ECONOMIC AND SOCIAL DEVELOPMENT: SPECIAL PROBLEMS AND PRIORITIES FOR  
THE PETROLEUM PRODUCING DEVELOPING COUNTRIES-- L.R.Kohler; 13 pp

REGIONAL IMPACTS OF OIL ACTIVITIES-- B.S.Aamo; 22 pp

SOCIAL IMPACTS OF OIL ACTIVITIES-- A.G.Wilkie (Nova Scotia Tech Univ); 33 pp

OIL FOR ECONOMIC AND SOCIAL DEVELOPMENT: A COMPARATIVE STUDY OF CANADA, NORWAY  
AND THE UK-- G.A.Mackay (Mackay Consultants Ltd); 13 pp

MAN AND THE COMPLEX OFFSHORE PLATFORM-- T.U.Qvale; 14 pp

OFFSHORE COMMUTING AND FAMILY ADAPTATION IN THE LOCAL COMMUNITY-- J.Solheim;  
11 pp

THE IMPACT OF OIL ON THE BIOLOGICAL RESOURCES OF THE SEA-- L.Foyn; 13 pp

GOING NORTH - THE NEED FOR ECOLOGICAL STUDIES IN THE BARENTS AND SPITSBERGEN  
AREAS-- E.Sakshaug; 9 pp

RECENT DISCOVERIES AND FUTURE PRIORITIES IN OFFSHORE RELATED ECOLOGICAL  
RESEARCH-- A.Jensen (Norwegian Inst Technol); 16 pp

TEN YEARS OF OFFSHORE CONTINGENCY PLANNING-- C.Hambro; 7 pp

THE CHALLENGES OF INTEGRATING OIL PRODUCTION IN SPARSELY POPULATED AREAS--  
D.W.I.Marshall; 16 pp

DENMARKS PIPELINE-PROJECTS - EXPERIENCE FROM THE CROSS COUNTRY PIPELINES--  
B.Bojsen (Dansk Olie & Naturgas A/S); 10 pp

TRANS ALASKA PIPELINE SYSTEM: A SIXTEEN YEAR INDUSTRIAL/ECONOMIC VENTURE IN  
THE ALASKAN ARCTIC-- R.B.Hastie (ARCO Pipe Line Co); 15 pp

OFFSHORE ACTIVITIES AND FISHERIES - PEACEFUL CO-EXISTENCE?-- G.Buchan; 7 pp

OFFSHORE ACTIVITIES AND FISHERIES-- B.Hersoug; 15 pp

**FIGURE 17.** Example of a Meeting Paper  
Showing the Indexing, Abstract,  
and Appendix.

AN - 387403  
 TI - METHOD AND DEVICE FOR DETECTION OF THE PRESENCE OF METAL OR MINERAL IN A GEOLOGIC MASS  
 AU - GULDSTROM, L  
 SO - CAN 1,188,734, C 85.06.11, F 82.06.16, PR SWED 81.10.16 (APPL 8,106,118) (13 CLAIMS)  
 LA - ENGLISH  
 PN - CA1188734  
 CC - MINERAL COMMODITIES  
 DT - (P) PATENT  
 IT - \*ELECTRICAL EXPLORATION EQ; \*EXPLORATION; \*GEOPHYSICAL EQUIPMENT; \*INSTRUMENT; \*MINERAL EXPLORATION; \*POTENTIAL INSTRUMENT; COBALT; COPPER; DETECTOR; ELECTRICAL EQUIPMENT; ELECTRICAL EXPLORATION; ELECTRODE; ELEMENT (CHEMICAL); FIELD EQUIPMENT; GEOPHYSICAL EXPLORATION; GOLD; NICKEL; POTENTIAL EXPLORATION; POTENTIAL FIELD; SILVER; TEST PROBE; TIN; URANIUM; ZINC

FIGURE 18. Patent.

-1-

AN - 4579  
 TI - DOUGLAS CREEK ARCH - A GOOD HABITAT  
 AU - KOPPER, P K  
 SO - OIL GAS J V 60, NO 52, PP 104-109, 62.12.24  
 LA - ENGLISH  
 DT - (OG) OIL & GAS FIELDS FILE  
 CC - SUPPLEMENTAL TECHNOLOGY  
 IT - \*COLORADO; \*NORTH AMERICA; \*OIL AND GAS FIELDS; \*UNITED STATES; \*WESTERN US; CASTLEGATE SANDSTONE; DAKOTA GR; DOUGLAS CREEK ARCH; DOUGLAS CREEK GAS FIELD; GAS FIELD; MANCOS SHALE; MORRISON FM; OGF (STATE); OIL FIELD; RANGELY OIL FIELD; RIO BLANCO CO, COLO; WEBER SANDSTONE

-2-

AN - 4578  
 TI - HISTORY OF EXPLORATION AND DEVELOPMENT FOR OIL AND GAS IN NORTHWESTERN COLORADO  
 AU - BRAINERD, A E; CARPEN, T R  
 SO - ROCKY MOUNTAIN ASS GEOL FIELD CONF (STEAMBOAT SPRINGS, COLO, 62.09.12-15) GUIDEBOOK, PP 23-28, 1962  
 LA - ENGLISH  
 DT - (OG) OIL & GAS FIELDS FILE  
 CC - SUPPLEMENTAL TECHNOLOGY  
 IT - \*COLORADO; \*NORTH AMERICA; \*OIL AND GAS FIELDS; \*UNITED STATES; \*WESTERN US; GAS FIELD; OGF (STATE); OIL FIELD

FIGURE 19. Oil & Gas Fields "Bibliography".



There are a few problems encountered by the geoscientists doing the indexing at PA, and although they're not too serious, they should be noted. One problem which can account for a good deal of hair-pulling is when assigning one descriptor to a meeting paper abstract. The difficulty arises when the geoscientist is confronted with an abstract on several widely-spaced geographic areas, several formations correlated over a wide geographic area, etc. A policy has arisen at PA that meeting paper abstracts are included in PA simply to enable searching on the title, author and source, and so the descriptor chosen should be a concept or term not covered in the title, unless the meeting paper abstract describes one specific concept; i.e. a specific formation, basin, oil/gas field, etc. (personal communication Jan Mattinson). Another problem arises when a mental block is formed by a geoscientist with a particular background experience against a different geoscience subject. This can be overcome by employing a staff of professionals with enough of a variety of background experience to complement each other. This is, however, determined by financial circumstances.

Microfiche can be another problem. Since the U.S. Geological Survey has started publishing all their open-file reports on microfiche, this seems to be a problem that can be dealt with only with a microfiche reader/printer. Microfiche may be great for library space, but it's a real problem when indexing or reading. Other problems encountered at PA include: assigning limited descriptors to mineral commodities articles, poorly written or poorly translated articles/abstracts, and finding a geographic location with no index map, map coordinates, or any other reference to nearby geographic or political features.

### CONCLUSION

There is a great deal of alarm over the phrase "free-text searching". Successful searching of any scientific information system can be accomplished only with a proper understanding of the indexing strategy. If an information system is designed around a specific indexing strategy, that strategy must also be applied in the retrieval of information. Free-text searching may be applied as a wonderful supplement to the indexing strategy but not in place of it. If a searcher attempts free-text searching with little or no understanding of the indexing strategy, or the subject matter, then the search will be hit-and-miss, while the searcher will not even be aware of the information missed. Free-text searching assumes that the author has included all of the synonymous terms for each and every concept of any importance within the article. One must never assume.

A feasibility study of automatic indexing and information retrieval found that only 40% of the total assigned descriptors was contained on the title and text of the abstract at PA (Graves and Helander, 1970). This would imply that if free-text or proximity searching were attempted, a large percentage would probably be missed. For example, if a search were run on the accumulation rate of pelagic sediments, and free-text searching was the only search strategy used, then any article in which the author used sedimentation rate, accumulating

rate, or depositional rate instead of accumulation rate would be missed. If, however, the searcher were to use accumulation rate as an index word from a controlled vocabulary, all synonymous terms, having been indexed by one term, would be retrieved in the search. It is also advisable to seek the assistance of a geoscientist familiar with the subject being searched. I would like to finish with this quote:

"Indexing is an art that can be read about,  
but it cannot be learned until it is actively  
experienced"

E. B. Jackson, R. E. Cogswell,  
and T. Foster (1976, p. 16)

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## IMPROVING SUBJECT ACCESS IN GEOSCIENCE LIBRARY CATALOGS

John G. Mulvihill  
GeoRef Information System  
4220 King Street, Alexandria, VA 22302

Jean T. Eaglesfield  
Lindgren Library  
Room 54-200, MIT, Cambridge, MA 02139

Abstract: The subject access in most library catalogs is provided by Library of Congress Subject Headings. A literature review indicates dissatisfaction with these Subject Headings. For geological literature, one approach to improving subject access would be to augment the LC Subject Headings with index terms and analytics from a bibliographic database, GeoRef. Examples of such data are provided. Also included is a report of a small survey of geology libraries concerning the above. The survey confirms the dissatisfaction with LC Subject Headings, but is inconclusive on the use of GeoRef data. A selected topical bibliography is included.

Subject headings in library catalogs do not attract interest from the world in general. However, at those moments in one's life when one wants to find a book on a given topic fast, the subject heading system is crucial. During the 1984 meeting of the Geoscience Information Society, there was much discussion about the inadequacy of the Library of Congress Subject Headings. GIS members lamented the small proportion of people with earth science backgrounds among those who assign and create subject headings at the Library of Congress; terms that are not kept up to date; neglect of the stratigraphic nomenclature; and a treatment of regional subjects, for example, the geology of Massachusetts, which is not adequate for earth science collections.

This paper, which originated at that discussion, gives background on the great subject heading debate by looking at the literature in the library field to find out if disciplines other than geology have complaints about the LC Subject Headings. In addition, as investigators we wanted to look at the possibility of augmenting LC Subject Headings with subject terms taken from a database, GeoRef. So we looked at what GeoRef might provide and we surveyed selected geoscience libraries about types of catalogs and subject headings used, and their interest in augmenting the LC headings.

### A Literature Survey

We did a survey of the literature on subject access, particularly on the topics of the adequacy of LC Subject Headings and augmentation of these Headings.

### LC Subject Headings

Library literature contains a number of articles that complain about LC Subject Headings. These complaints include the slow pace with which new subject headings are assigned; subject headings that are too general; and a lack of consistency between the subject heading and the classification that is assigned.<sup>1</sup>

If LC Subject Headings have such inadequacies, why use them? Because long gone is the day when earth science libraries have enough staff to do their cataloging alone. Now most libraries copy cataloging somehow. And most libraries follow generally accepted standards for cataloging including use of the subject headings of the Library of Congress.

A subject heading is created by the Library of Congress only

when there are enough books on the subject so that it would be looked up in a library catalog by John Q. Public.<sup>2</sup> On the other hand, discipline-based indexing systems such as GeoRef uses began by mapping out a subject as a whole and developing a controlled vocabulary list.

We wish to stress here that the problems with the LCSH system already mentioned are only half the story. The other half relates to the cross reference structure of the LCSH system. Cross references provided by the system could compensate for some archaic terminology, for example, "Offshore Oil Drilling SEE Petroleum in Submerged Lands." However these cross references are often not available since many libraries have stopped maintaining them in their catalogs, to cut costs.

Maintaining the cross references in a library catalog will be easier soon when the 10th edition of the LC subject authority file which is at GPO is published in the spring. This edition is going online at the Library of Congress and will be available from LC on tape.

Recommendations for reform in the library literature are (1) to adopt an online subject authority file as soon as possible<sup>3</sup> and (2) to lobby the Library of Congress to add more staff to better keep up with subject heading changes.<sup>4</sup>

#### Augmenting the Catalog for Subject Access

Why not embellish or augment the subject access in the catalog? There are mixed reactions to this possibility in the library literature. One is that it would not be cost-effective.<sup>5</sup> Pauline Cochrane's Subject Access Project, 1976-77, was an attempt to show otherwise. The Project took the records for about

2400 books in eight areas of the humanities and social sciences that were in the UTLAS database of the University of Toronto to which they added words and phrases taken from the tables of contents and indexes of the books. This was done at an average cost of \$5 and fourteen minutes per book. The database that resulted, called BOOKS, was made available on the SDC Search Service for six months in 1977. It was searched by over 100 users including LC's Congressional Reference Service.

Users retrieved two to three times as many relevant items in the BOOKS database than they found through LC's MARC database. Urban planning was the closest of these subjects to the geosciences. Users appreciated the more precise indexing in the BOOKS file and commented on the vague and inadequate treatment of urban planning in the LC Subject Headings system.<sup>6,7</sup>

Efforts from three other disciplines offer interesting examples of both success and difficulties in confronting the LC Subject Headings. In the late 1970s the Art and Architecture Thesaurus began by merging a number of subject heading and indexing systems, in addition to LC Subject Headings. Besides trying to remain compatible with the LC Subject Headings system, the project wanted to use the tree structure of the MESH system of the National Library of Medicine as a model. After merging the various lists, the experts filled in gaps. Then they attempted to add the LC Subject Headings. There unfortunately was no automated way to do this<sup>8</sup>. The AAT is now a unit of the J. Paul Getty Trust and the building of the thesaurus is still going on.

In the Boston area, Paperchase originated from a physician's attempts to improve access to his reprint collection. Paperchase

is a user friendly online catalog of the books and journal articles in the Beth Israel Hospital library. This library receives monthly computer tapes of citations to its holdings from the National Library of Medicine's Medlars data base. This means that details of the books, not just general subject headings covering the book as a whole; and citations for articles for the journals it subscribes to are in the Beth Israel online catalog<sup>9</sup>. The Paperchase software has recently been made available for use in other libraries.

And in the field of oriental studies, a concerted effort has been made to publish in main-line library journals such as the Cataloging and Classification Quarterly articles lamenting inadequacies of the LCSH system in covering period (historical) subdivisions.

#### Augmentation with Data from GeoRef

One source of additional subject terms specific to geology could be a geology database such as GeoRef.

We did a comparison of the MARC records and GeoRef citations for 17 monographs chosen from the April 1985 Bibliography and Index of Geology to include books and conference proceedings published in the United States and elsewhere. This comparison showed that most of the bibliographic information on the monographs was duplicated between the MARC and GeoRef records. It also showed that the GeoRef citations contained three kinds of information not normally found in the MARC records: (1) locally assigned subject terms, (2) affiliations of primary authors, and (3) analytics of the chapters and papers covered in the monographs. Since subject access is the focus of this paper, the



TABLE 1. Subject access points in the MARC and GeoRef records for two monographs

- (1) Gass, I. G., et al. Ophiolites and Oceanic Lithosphere. Oxford; Boston: Blackwell Scientific Publications, 1984. 413 p.

<u>Data type</u>	<u>MARC ()=MARC tag</u>	<u>GeoRef ()=UNISIST tag</u>
LC call number	QE462.06 (050)	not included
GeoRef category	not included	Igneous and metamorphic rocks
Title	Ophiolites and Oceanic Lithosphere (245)	same (A09)
Subject terms	ophiolites; submarine geology (650)	ophiolite; lithosphere, oceanic crust; magma chambers; fracture zones; mantle; lava; isotopes; metamorphism; obduction; igneous rocks; ultramafics; ultramafic family (Z50)
Analytic titles	not included	titles of 33 chapters in the monograph (A10)
Analytic subject	not included	an average of 27 subject terms per paper for a total of 891--of which over 400 are unique terms. These include locations such as East Pacific Rise and DSDP Site 395; minerals such as Harzburgite and Wehrlite; specific analytical methods; etc. (Z50)

- (2) Stone, W. J., Selected Papers on Water Quality and Pollution in New Mexico. Socorro, NM: New Mexico Bureau of Mines & Mineral Resources, 1984. 300 p.

<u>Data type</u>	<u>MARC ()=MARC tag</u>	<u>GeoRef ()=UNISIST tag</u>
LC call number	GB705.N6 H94 (050)	not included
GeoRef category	not included	Engineering and environmental geology
Title	Selected Papers on Water Quality and Pollution in New Mexico (245)	same (A09)
Subject terms	water quality, New Mexico, congresses; water, underground, pollution, New Mexico, congresses (650)	symposia; New Mexico; hydrology; environmental geology; hydrogeology; surveys; pollution; United States; ground water; surfacewater; water quality; hydrochemistry; sediments (Z50)
Analytic titles	not included	titles of 25 papers in the symposium (A10)
Analytic subjects	not included	an average of 26.6 subject terms per paper for a total of 540 terms of which over 200 are unique. These include locations such as Taos County, Red River and Albuquerque and pollutants such as pesticides, thorium, and lead (Z50)

affiliations and non-subject-related parts of the analytics are not discussed here.

The MARC records from OCLC for the 17 monographs contain an average of two Subject Headings or 3.7 unique subject terms per record (some Subject Headings consist of multiple concepts, separated by commas):

1. granite
2. ophiolites; submarine geology
3. metamorphism (geology), Asia; geology, Asia
4. earthquake engineering, congresses; seismometry,  
congresses; earthquakes, congresses
5. water pollution, analysis, congresses; water quality  
bioassay, congresses; environmental monitoring  
congresses
6. water quality, New Mexico, congresses; water,  
underground, pollution, New Mexico, congresses
7. Severn River (Wales and England), barrage, congresses
8. rocks, analysis, tables; geophysics, tables
9. marine pollution, Georges Bank; metals, environmental  
aspects, Georges Bank
10. estuarine oceanography, Alaska, southeastern region;  
chemical oceanography, Alaska, southeastern region;  
Boca de Quadra Fjord System (Alaska); Smeaton Bay  
(Alaska)
11. geomorphology; coasts
12. Spain, description and travel
13. frozen ground, Alaska, Colville River, delta,  
congresses
14. soils, American Samoa, maps

15. arctic regions, strategic aspects, addresses,  
essays, lectures
16. batholiths, Maine; granite, Maine
17. groundwater flow, congresses; porous materials  
congresses; transport theory, congresses

By comparison, the citations from GeoRef for the 17 monographs contain an average of 15 subject terms per record. For the first two citations, these are:

1. igneous rocks; granites; genesis; monographs;  
gneisses; petrology; metamorphic rocks
2. igneous rocks; ultramafics; ophiolites; ultramafic  
family; lithosphere; oceanic crust; magma chambers;  
fracture zones; mantle; lava; isotopes; metamorphism;  
obduction

These subject terms in GeoRef, as in the MARC records, tend to be general, since they are applicable to the book as a whole. For most monographs in GeoRef, more specific subject terms are also available. These are in analytic citations related to the monographs. GeoRef includes analytics for monographs which have separately authored chapters or papers, unless the subject of the monograph is peripheral to geology. For example, GeoRef includes analytic records for nine of the 17 monographs in the sample. In these analytic records, subject terms and the titles of the chapters and papers are available. This combination of subject terms and title words could provide in depth subject access (see Table 1).

#### Fitting the Data into MARC Records

The additional data available in GeoRef citations could be

accommodated in MARC format records. The subject terms could fit into Fields 650 and 651, provided LC would assign a code for the GeoRef Thesaurus to identify it as a source of subject terms. In lieu of this code, the terms could fit in Fields 690 and 691, which are for local subject added entries. However, before either pair of MARC subject fields could be used, the GeoRef subject terms would have to carry codes to distinguish between geographic and topical terms, a distinction they do not presently carry. Also, a decision would be needed on what to do with the uncontrolled subject terms in GeoRef, which are not in the GeoRef Thesaurus.

The MARC format could also accept the analytic records. Each analytic could be entered as a separate MARC record, linked to its parent monographic record through a host item entry in MARC Field 773

Table 1 is a comparison between subject access points in MARC and GeoRef records for two monographs. If there were sufficient interest among the libraries, various mechanisms could be explored for augmenting the MARC records with such data from GeoRef. One such method is that used for Paperchase, described below, by which the data is supplied regularly to an individual library and added to its online catalog. Another method would involve addition of the data at the level of the bibliographic utility, as is now being done at OCLC with MESH Subject Headings.

#### A Survey of Geoscience Libraries

For this paper, we conducted a small study of geoscience libraries through questionnaires sent to 86 people selected from the 1985 GIS Membership Directory. The survey went to heads of

TABLE 2. Survey of libraries

	<u>Corporate</u>	<u>Academic Branch</u>	<u>Academic Central</u>	<u>State/ Provincial</u>	<u>National/ Federal</u>	<u>Research Institutes</u>	<u>TOTAL</u>
Number surveyed	22	29	11	13	5	6	86
Number who responded	18	25	7	7	4	4	64
Rate of return	81%	86%	64%	53%	80%	66%	72%
Catalog via utility	7	24	4	0	2	2	39 (61%)
Use LCSH	7	24	7	6	0	3	45 (70%)
Originally cat w/in unit	9	4	7	6	3	2	31 (48%)
LCSH not adequate	16	20	2	5	3	0	46 (72%)
Users complain of LCSH	6	4	1	1	0	0	12 (19%)
Users have not complained	6	12	5	4	1	1	29 (45%)
Already augment LC records	5	7	1	3	1	1	18 (28%)
Yes, would augment with GeoRef data	2	6	0	1	3	1	13 (20%)
Perhaps would augment	5	7	1	0	1	2	16 (25%)
Cost a factor in augmenting	3	4	2	2	0	0	11 (17%)
Depends on central catalog dept.	0	4	0	0	0	0	4 ( 6%)
No, would not augment	8	8	4	4	0	1	25 (38%)



units in six types of libraries: corporate, academic branch, academic central, state/provincial, national/federal geoscience, and research institute not affiliated with universities. Most questions were open-ended and non-directive, to elicit comments.

The purpose was to find out if indeed there is dissatisfaction with LC Subject Headings in geology and to see if there is an interest in augmenting MARC records with GeoRef data. The survey was not intended to be exhaustive but was rather a sampling. There was a 72% rate of return overall with the highest rates coming from the corporate and academic branch libraries. The responses are summarized in Table 2.

#### Characteristics of the Libraries

Is there a picture that emerges of each group? National libraries are interested in multilingual indexes and in improving subject access. State and provincial libraries are small and concerned about cost. Corporate libraries are more automated and likely to do their own cataloging. Of the 32 academic libraries which responded, 25 were branches, and all but one of these branches had cataloging done by a central catalog department. Six branches pointed out that they were going online soon, and three of them remarked that no special project could be done until their catalog departments had finished the transition. The special research institutes, like corporate libraries, seem to have flexibility in changing and augmenting subject headings.

It is striking how much use is made of bibliographic utilities. Overall 60% use them (39% corporate, 87% academic, 50% national and research institute, and no State.

## Responses on LC Subject Headings

Is there dissatisfaction with LC Subject Headings? seventy percent of the respondents said LC Subject Headings are unsatisfactory for their libraries. Their comments are similar to those at the 1984 GIS meeting. Problems include LC's use of inverted headings, e.g., Mexico, Gulf of; failure to use formation names; old fashioned terminology; and preference for subject over geographic area--the last the most common complaint in this survey.

Have their users complained about LC Subject Headings. Eighteen percent said that users had complained, while 44% said they had not. Some commented that users didnt know how to use the card catalog. Some questioned our focus on subject headings, commenting that catalog searching is done principally for authors, that users find books more from browsing than by using a subject catalog, and that subject searching is more for journal articles than for books.

## Responses on Adding GeoRef Data

The response to our question of adopting a system of augmenting MARC records with GeoRef data was mixed. Twenty percent said an unqualified "Yes," 25% said "Perhaps," 17% said cost would be a factor, and 37% said "No". We feel that further examination of this question is needed, based on a selected augmentation mechanism with stated costs and effort involved. As it was, some respondents assumed that considerable cost and/or effort on their parts would be required. Others stated that effort might be better spent on influencing LC to improve. One was concerned that augmenting would slow down the cataloging

process. Those with card catalogs only could not easily make use of the added data and those who already augment according to their own systems might not need it.

### The Need for Action by GIS

The literature shows that in the online environment, the user will search more by subject<sup>10</sup>. With such poor subject catalogs as now exist, the online age for many geoscience libraries will probably be very frustrating. Problems loom ahead, especially for those geoscience libraries which must accept the LCSH system as it is and the subject headings currently available from utilities.

What are the options for the geoscience library community? First we could lobby LC to improve the quality and quantity of its Subject Headings in geology. Second, we could lobby the utilities to put the LCSH subject authority file online when available in the spring of 1986. Third, if there is enough interest, we could work for a practical mechanism to augment MARC records with data from GeoRef for use in online catalogs.

GIS is the logical focus for action to improve subject access for geology in library catalogs.

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1. Kirtland, Monika and Cochrane, Pauline, 1982, Critical Views of LCSH--Library of Congress Subject Headings, a Bibliographic and Bibliometric Essay. Cataloging and Classification Quarterly, v.1, p.71-94.
2. Boll, John J., 1982, From Subject Headings to Descriptors: The Hidden Trend in Library of Congress Subject Headings.

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3. Holley, Robert P. and Killheffer, Robert E., 1982, Is There an Answer to the Subject Access Crisis? Cataloging and Classification Quarterly, v.1(2/3), p.125-133.
  4. Cochrane, Pauline A., with Aveney, Brian and Hildreth, Charles, 1984, Modern Subject Access in the Online Age. American Libraries, July/August, p.527-529.
  5. Mandel, Carol A., 1985, Enriching the Library Catalog Record for Subject Access Library Resources and Technical Services, v. 29(Jan/March), p.5-15.
  6. Atherton, Pauline. Books Are for Use: Final Report of the Subject Access Project. Syracuse, N.Y.: School of Information Studies, 1978.
  7. Settel, Barbara and Cochrane, Pauline A., 1982, Augmenting Subject Descriptions for Books in Online Catalogs. Database, v. 5(4), p.29-37.
  8. Petersen, Toni, 1983, The AAT: A Model for the Restructuring of LCSH. The Journal of Academic Librarianship, v.9(4), p. 207-210.
  9. Horowitz, Gary L., and Bleich, Howard L., Paperchase: A Computer Program to Search the Medical Literature, 1981, The New England Journal of Medicine, v.305, p.924-930.
  10. Markey, Karen, Subject-Searching Experiences and Needs of Online Catalog Users: Implications for Library Classification, 1985. Library Resources and Technical Services, v.29(1), p. 35-51.

SUBJECT HEADINGS: A SELECTED AND ANNOTATED BIBLIOGRAPHY

Complied by Jean Eaglesfield

1. SUBJECT ACCESS: AN OVERVIEW

Pauline Cochrane's continuing education course in American Libraries presents theory, overview of the current problems, and a discussion among several leaders and experts.

Cochrane, Pauline Atherton, Modern Subject access in the online age. American Libraries, v.15, February, 1984, p.80-83; March, 1984, p.145-150; April, 1984, p.250-255; May, 1984, p.336-339; June, 1984, p.438-442; July/August, 1984, p.527-529.

2. LIBRARY OF CONGRESS SUBJECT HEADINGS: EXPLAINING THE SYSTEM

Angell, Richard S., 1972. Library of Congress subject headings--review and forecast, in Subject Retrieval in the Seventies, ed. by Hans Wellisch and Thomas D. Wilson. Greenwood Publishing Co. and University of Maryland School of Library and Information Services, Westport, Ct., p. 143-161.

Written by a member of the Library of Congress staff, this gives historical background, describes the system and the types of institutions that have used this, the reference structure and what aspects that are in most need of revision.

Boll, John J., 1982, From subject headings to descriptors: hidden trend in Library of Congress subject headings. Cataloging and Classification Quarterly, v.1, p.3-27.  
Good comparison between an indexing system and the LCSH system.

3. CRITICISMS OF THE LIBRARY OF CONGRESS SUBJECT HEADINGS SYSTEM

Holley, Robert P., 1983.

Constraints of the 3 x 5 card. Cataloging and Classification Quarterly, v.4, p.29-35

Points out the need to move from nineteenth century standards on which our present system of subject access is based to a more modern system which would be better for the online environment.

Holley, Robert P. and Killheffer, Robert E., 1982.

Is there an answer to the subject access crisis?  
Cataloging and Classification Quarterly, v.1, p.125-133.

Summarizes weaknesses of LCSH and argues forcefully to have LC's subject authority file available online for all to use.

Kirtland, Monika and Cochrane, Pauline, 1982.

Critical views of LCSH--Library of Congress subject headings, a bibliographic and bibliometric essay.  
Cataloging and Classification Quarterly, v.1, p.71-94.



Summarizes all the faults of the LCSH system that have been expressed in the library literature and includes bibliography.

Wellisch, Hans (Hanan), 1972, Subject retrieval in the seventies--methods, problems and prospects. in Subject Retrieval in the Seventies: Proceedings of an International Symposium University of Maryland, May 14-15, 1971, ed. by H. Wellisch and T.D. Wilson. Greenwood Publishing Co. and University of Maryland School of Library and Information Services, p.2-27.

Vehemently criticize LCSH and argues for a system based on strict rules and that would incorporate more detailed subject headings.

#### 4. FACING THE ONLINE AGE WITH LCSH

Lipow, Anne Grodzins, 1983, Practical considerations of the current capabilities of subject access in online public catalogs. Library Resources and Technical Services, v.27 p.81-87.

Describes users' reactions to online catalogs; argues for user-friendly systems.

Markey, Karen, 1985, Subject-searching experiences and needs of online catalog users: implications for library classification. Library Resources and Technical Services, v.29, p.35-51.

There is much more subject searching in online catalogs than expected; users have problems with subject searching; users want expanded subject searching.

Markey, Keren, 1983, Thus spake the OPAC user. Library Resources and Technical Services, v.2, p.3810385.

Users of online public access catalogs (OPACs) do more subject searching than do users of the traditional card catalog and also want more detailed information such as indexes and tables of contents for the books that they find in the catalog.

#### 5. REPORTS FROM OTHER FIELDS

Horowitz, Gary and Bleich, Howard L., 1981, Paperchase: a computer program to search the medical literature. New England Journal of Medicine, v.305, p.924-930.

Summarizes Paperchase, a user-friendly online catalog which indexes contents of books and journals that are in a particular hospital library.

Petersen, Toni, 1983, The AAT: a model for the restructuring of LCSH. Journal of Academic Librarianship, v. 9, p.207-210.

Describes the Art and Architecture Thesaurus, a hierarchical thesaurus based on LCSH and modeled on MESH.

Su, Meng-Fen, 1983, On cataloging and classifying Chinese history. Cataloging and Classification Quarterly, v.4, p.51-71.

Discusses the inadequate period divisions of Chinese history in LCSH and the lack of consistency between LCSH and the Library of Congress Classification Code.

#### 6. WHERE DO WE GO FROM HERE

Cochrane, Pauline, 1984, Modern Subject access in the online age. American Libraries, v.15, p.336-339 and 527-529.

Summarizes suggestions to the Library of Congress that are currently voiced by various authors, analyzes LC's response and shows that there is no simple solution.

Mandel, Carol A., 1985, Enriching the Library catalog records for subject access. Library Resources and Technical Services, v.29, p.5-33.

Should we do book indexing in the same database as the library catalog? Doesn't know because this has not been adequately tested.

Mischo, William, 1982, Library of Congress subject headings: a review of the problems, and prospects for improved subject access. Cataloging and Classification Quarterly, v.1, p.105-124.

Summarizes limitations of the present system and criticizes current proposals for reform including proposals to augment cataloging at the local level.



## PROFESSIONAL PUBLISHING AS A SOURCE OF GEOSCIENCE INFORMATION

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Abstract: Professional societies provide current and valuable information in geoscience, with publications which include abstracts, bulletins, preprints, and guidebooks. Because the primary audience for the publications is the members, information may be difficult for the non-member to find and obtain.

Methods of selection for publication usually depend on volunteer or elected guest editors to select from submitted items. Little overlap occurs, as each organization has a clearly defined publication plan for its membership.

Five professional societies in the geosciences were surveyed to determine criteria for publication, methods of obtaining submittals, and availability of the published information to those outside the membership of the society.

Professional publishing is the transfer of information among working geoscientists, either through membership in professional societies or through society membership in larger groups, such as the American Geological Institute. The information published may be first presented at a conference, such as today's Geoscience Information Society Conference, and may result from discoveries in the field, laboratory or library. Publication type is most often in a professional journal but may also be in proceedings, monograph or guidebook form.

This paper concentrates on publications from representative professional societies and associations: Geological Society of America (GSA), American Association of Petroleum Geologists (AAPG), American Geological Institute (AGI), Rocky Mountain Association of Geologists (RMAG), and Denver Regional Exploration Geologists Society (DREGS). Scope of the various publications, reviewing policy, subject emphasis, and length of time for publication are discussed.

### Geological Society of America

The Geological Society of America publishes GSA Bulletin, Geology, Memoirs, and Special Papers. The general scope is the whole field of geology, and the audience is the general geologist. Papers are submitted from all over the world, even from the Soviet Union, Eastern

Europe, and China. Submittals are not actively sought, except occasionally from a meeting. Articles may be slightly weighted toward the academic, but coal and other economic topics are also covered. Of the articles which are submitted, less than 50 percent are accepted for publication. However, controversial topics are accepted, because the first plate tectonics paper was published in the Bulletin.

After a paper is submitted to the Bulletin, it is sent to two reviewers who are peers. All reviewers are volunteers, who are considered authorities in the field, and are reimbursed only for postage and telephone expenses. The reviews usually take about two months, and almost all papers require revision. The revised paper then goes to one of the two Bulletin editors, alternately, who have the final decision on what is published. The Bulletin reflects the editors to some degree, but is relatively widely based.

After the decision to publish is final, the revised paper goes to the Managing Editor, who ensures correct grammar, good illustrations, and proper reference format. If the paper is not double spaced, for instance, it will be returned until it is. The lag time from date of acceptance to publication is about four months.

Discussions about previous papers are always accepted, so readers can disagree or add to the paper. The authors can then reply, and both discussion and reply are generally printed without editing.

The strength of the GSA Bulletin is its appeal to the general geologist, especially the young beginning geologist who does not have an area of specialization. Sometimes the Bulletin is supplementary reading for freshman geology classes.

GSA also publishes the journal, Geology, which includes short articles, usually about four pages. Although originally intended to be short notes of new, exciting, up-to-date ideas, the articles are usually similar to those in the Bulletin but more concise, and they often lack substantiating data. Articles are reviewed, book reviews are included, and the editor is a volunteer.

Memoirs and Special Papers are handled by the Books Editor, who is a professor with a full-time position elsewhere. GSA is flooded with manuscripts as ideas for Memoirs, especially from professors at small universities, where publishing opportunities are minimal. In addition, GSA will publish maps and is one of the few places outside government agencies where maps can be published.

Manuscripts are also reviewed by leaders in the geoscience field. Selection is based on whether vital new information is included, not just sales potential. Lag time from acceptance to publication varies according to the length and type of publication but generally ranges from six months to one year.

Since the primary audience for all GSA publications is the membership, prices are kept as low as possible. Page charges are voluntary, but GSA asks for any contribution to help defray



publication costs. Publications are well advertised and easily available to those outside the society.

### American Association of Petroleum Geologists

The American Association of Petroleum Geologists publishes AAPG Bulletin, AAPG Explorer, Memoirs, and Special Publications. The scope includes petroleum geology and related disciplines, focused on exploration. The audience is the practicing petroleum professional, most of whom are petroleum geologists working for oil companies. Academic and government geologists are a lesser part of the audience, and geologists for independents are also included. Submitted papers and books are primarily on petroleum geology. Therefore, depositional environment is a typical AAPG subject, but grain-size distribution is not. Although members of the Energy Minerals Division of AAPG can submit papers, very few are submitted, and those are usually on coal, tar sands, or remote sensing.

The AAPG Bulletin accepts about 60 percent of the articles submitted for publication, and outstanding papers from meetings and conferences are solicited. In a typical Bulletin, 5 percent of the articles have been requested. Each paper is reviewed by at least five reviewers, three of whom are peer reviewers, plus the elected Editor and the Managing Editor. The Editorial Board is considered an honor, and almost everyone accepts the offer to be Associate Editor. For reviews, either associate editors or geologists outside the board are used as needed to evaluate the work. The usual turnaround time for reviews is 30 days. The elected Editor decides for inclusion or exclusion and can overrule the other editors.

After a manuscript is accepted for publication, the revised paper goes to the Managing Editor, who ensures bulletin style. Voluntary page charges are requested for the bulletin, but AAPG sends an invoice after the paper has been published. Publication does not depend on page charges. AAPG charges extra for color or fold-out materials, because they are unusual and costly, and those charges are mandatory.

Book reviews are solicited by staff editors, and books are selected through advertisement or sample copy sent to AAPG. The fairly lengthy reviews are completed within one month, the same time as the articles are reviewed.

From submittal of manuscript to publication of article in the Bulletin is less than a year if all goes well. Manuscripts are often returned to the author for more work, and even revisions can be finally rejected.

The strengths of AAPG Bulletin are the latest scientific information, and good petroleum geology. The information is substantive reference material which is well researched.

The AAPG Explorer is mostly news, with staff editors writing the more lengthy articles as assigned. All articles are written for the nonspecialist who is the intended audience. Many of the articles are

prepared from interviews, and technical reports are rewritten for the nonspecialist. Long, detailed articles are quasi-technical. The lead time is two months, with three weeks of that for printing. Special issues, which include Seismic, Gulf Coast, and Computer issues, take from four to six months lead time. Articles for AAPG Explorer are not reviewed outside the editorial offices of AAPG.

Geobyte, the newest AAPG journal, already has 2000 subscribers before publication of the first issue in early November. Geobyte will combine contributed papers, interviews, and popular trends, with the focus on uses of computers in geosciences.

AAPG Memoirs and Special Publications include submitted or requested manuscripts, usually on subsurface fluids or sedimentary rocks. Submitted items are usually symposium proceedings. The AAPG Publications Committee, consisting of leaders in the field, identify weak links in the literature and go after a book per year. Every publication goes through peer review, because an idea is not enough. The Elected Editor, Science Editor, and committee vote on monographs to be published. An author may submit a proposal, and if the author is well known, AAPG may encourage continuing. However, AAPG withholds final approval until receipt of the manuscript. Twice in 17 years the final manuscript was unsatisfactory, but a good proposal results in publication about 98 percent of the time.

Lead time for a monograph is usually five months from submittal to publication. More detailed works take six months, and symposium proceedings require ten months. Printing and binding Memoirs take eight to nine weeks, but if a publication is needed quickly, it can be soft-bound in ten days. No page charges are suggested for Memoirs or Special Publications, and color does not require special charges.

The Comprehensive Index of Publications of the American Association of Petroleum Geologists has usually been published about four years after the period covered, because AAPG used outside computing services to sort the entries. Since 1981 AAPG has used its own computer, so the entries for 1981-85 are already 90 percent keyed. Publication of the latest index is currently projected for 1986.

Basin analysis according to basin type will be the focus of a new series of publications. Evolution, geochemistry, and tectonics of each basin type will be covered in several years, with the first volume published by the end of 1986. Another series will be on structures, such as normal faults or listric faults. Because the volumes are specific, geologists will only need to buy those which are pertinent to local needs.

AAPG selects manuscripts to benefit the practicing geologist, and ordering practices are definitely geared toward AAPG members. The series of books on narrow topics will keep prices down, but more books will result, and we will need them all. Items are easily available from AAPG, but credit is not currently available. However, credit may be possible in the future.

## American Geological Institute

American Geological Institute is composed of 17 other professional societies, including Geoscience Information Society. AGI publishes Geotimes and Earth Science, plus monographs such as Glossary of Geology. Earth scientists submit manuscripts, and the AGI staff write articles, also. The senior editor has a Master's degree in geology, and other geoscientists are on the AGI staff. Every department of AGI has an Advisory Committee of six to eight geoscientists who publish in the earth sciences, and the Advisory Committee suggests subjects which should be published.

Geotimes reports and interprets news in the earth sciences for earth scientists. The purpose is to make generalists out of specialists, because a deep sea drilling specialist should also know about volcanoes. The news section is written entirely at AGI, and most other articles are solicited. Each issue usually contains one article submitted without notice, but long-time writers for Geotimes often solicit manuscripts from other authors. All authors are geoscientists.

Articles are not reviewed outside AGI, unless reviewed by the author's organization, such as the U.S. Geological Survey. Material written at AGI must be submitted to the person interviewed to ensure technical accuracy, and all articles are reviewed by the AGI Executive Director before publication.

The usual lead time is six weeks for solicited items. For special issues, such as the review issue in February, 32 articles on the year's events were solicited. Manuscripts are due November 15, and 75 percent will be on time, with the rest a week or two later. The lead time of three months is necessary, because so many articles are solicited.

Strengths of Geotimes include the news and calendar features. The calendar is run a full year ahead, and geoscientists notify AGI to have meetings included. An AGI geoscientist writes the news feature, which is being expanded. The book section generates 30 to 40 requests per month to forward book orders to publishers, some of which are rather obscure. The yearly listing of geoscience societies may be expanded to include more lists because of its popularity. The classified advertisements section is the largest in geoscience, and it includes academic, research, and industry positions.

Earth Science is written and edited for the educated curious reader. The typical subscribers are high school science teachers, hobbyists, libraries, and people who would also subscribe to journals such as Rocks and Minerals. Circulation is growing rapidly, although the journal has not been promoted actively. As with Geotimes, Earth Science is a mixture of submitted and AGI-produced articles.

AGI publications emphasize news, broadly-based informative articles, and special features which are geared toward the entire geoscience community. Because most of the publications are journals, they are easily available. The monographs, such as Glossary of



Geology, are widely publicized and easily acquired from the full-time office staff.

### Rocky Mountain Association of Geologists

Rocky Mountain Association of Geologists publishes Mountain Geologist, The Outcrop, and field trip guidebooks. Although based in Denver, Colorado, the scope for Mountain Geologist includes western North America. The audience is primarily RMAG members in the Rocky Mountains, but individual subscribers and libraries across the United States also receive the publications.

Mountain Geologist publishes both submitted and requested papers. Submitted papers comprise about two-thirds and requested papers, one-third of those published. Requested papers often come from AAPG regional meetings and sometimes from one of the weekly presentations in Denver. All papers are reviewed, and reviewing by peers takes about six to eight weeks. The Editor and Assistant Editors are volunteers who generally serve a total of three years, beginning as Assistant Editor.

Lead time depends on the paper and number of revisions needed, from three months to over one year. Average time is six months. Most of the time is consumed by authors revising the manuscript.

The Outcrop contains news and abstracts of the weekly talks given at the RMAG meetings. The news orientation includes advertisements of new publications and other services.

Field trip guidebooks, or symposia, result from extended planning over an 18-month to 2-year period. A Planning Committee selects the subject for a guidebook, and the RMAG Executive Board approves the choice. A call for papers is issued nearly a year before the field trip, which occurs in the fall. The volunteer Editor then fills out the guidebook by requesting geologists to write papers on subjects which should be covered. Papers are oriented toward the local area and contain pertinent, current information which is generally practical.

RMAG provides continuity through its volunteer Publications Manager, who continues for a number of years. Guidebook editors usually serve only once, but Assistant Editors may continue for several years. These editors prepare the articles in consistent format for publication. The Publications Manager then arranges for printing and binding.

Guidebook printing is geared toward completion by the field trip, so copies can be given out at the field trip. Print runs which were formerly 4000 have been sharply cut back, because storage, insurance, and inventory tax costs have increased substantially. Inventory is a problem, so current print runs are less than 2000, the number which can probably be sold within four to five years.

The strengths of RMAG publications lie in the local and regional

focus of all the publications. Both economic and academic information are published in Mountain Geologist and the guidebooks, and local writers are often featured.

RMAG maintains a paid staff to mail publications, handle orders and payments. However, most local geoscience societies rely on volunteers, so RMAG is able to serve members and non-members better than many Rocky Mountain associations.

#### Denver Regional Exploration Geologists Society

The Denver Regional Exploration Geologists Society, a group of local minerals geologists, publishes an annual guidebook. Articles include submittals and requests on mineral deposits in Colorado. As with RMAG, the Editor is a volunteer. The guidebook, such as Gunnison Gold Belt and Powderhorn Carbonatite Field Trip Guidebook 1983, contains valuable local information, which is the strength of the publication.

Availability of the guidebooks is through the DREGS officers. The society is listed in the annual AGI listing of geoscience societies, so copies can be obtained. However, the field trip time varies, so orders also vary. Because all staff is volunteer, orders may not be filled immediately, and print runs are quite small.

#### Availability of Professional Publications to Geoscience Librarians

Geoscience librarians can obtain the journals listed through subscription, and the paid staffs of the societies keep the journals generally on schedule and mailed to the subscribers. Memoirs and Special Publications are often advertised in journals and through direct mail, so they are also available.

Guidebooks are more difficult to obtain, especially if the first announcement of publication slips by. RMAG's decreased print runs are probably true of many professional associations, so guidebooks will be quickly out of print. The local societies such as DREGS have the least resources and print few copies of their valuable publications, so those will be less available. Watching carefully for advertisements or announcements is essential, asking local members for information, and systematically tracking publication dates are essential, because there may not be another chance.

#### SOURCES

Geological Society of America  
Jean Thyfault, Managing Editor, GSA Bulletin



American Association of Petroleum Geologists  
June Chronos, Editor, AAPG Bulletin  
Ron Hart, Science Editor, AAPG

American Geological Institute  
Sharon Marsh, Editor, Geotimes

Rocky Mountain Association of Geologists  
Stephanie Urban, Editor, Mountain Geologist  
Ray Marvin, Publications Manager

Denver Regional Exploration Geologists Society  
John Lindemann

OBTAINING FINANCIAL SUPPORT FROM INDUSTRY FOR A  
STATE-SUPPORTED GEOSCIENCE/MINING LIBRARY:  
MINES LIBRARY'S SMALL SCALE FUND-RAISING EFFORTS

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Abstract

In addition to the faculty and students of the Mackay School of Mines, the University of Nevada Reno's Mines Library serves a large constituency of off-campus users from local mining and geological exploration firms. Many of these firms point to Mines Library's research facilities as one of the primary motivations for locating their offices in the Reno area. Mines Library averages 35% of its annual circulation to off-campus users.

Until the mid-1970s the library did not formally solicit cash contributions from the mining and exploration industries. As demands for service from the mineral industry grew, the librarian established an annual fund-raising drive specifically aimed at this sector. It took several years for the campaign to gain momentum. Initially, fund raising accounted for as little as \$600 - \$2,000 of additional revenue per annum. Recently, however, the proceeds have grown to a more respectable \$10,000 - \$15,000 a year, enabling the library to purchase many publications and some equipment beyond that funded by the state.

The paper outlines fund-raising techniques employed over the years. Various problems and pitfalls associated with the program are examined. The paper concludes with a discussion of the advantages and disadvantages of undertaking such an alternate funding program.

Brief History of Mines Library's Fund-Raising Efforts

The Mackay School of Mines (MSM) Library, a branch library of the University of Nevada Reno (UNR) Library System, serves the information needs of the students and faculty of the Mackay School of Mines and the Nevada Bureau of Mines & Geology (NBM&G). In addition to serving the earth science and mining information needs of the UNR campus, Mines Library is very heavily used by area mining and geologic exploration firms and consultants. In fiscal year 1984/85 34% of the library's circulation, excluding reserves, was to off-campus users from industry and governmental agencies. In 1983/84, when times were somewhat better in the mining and exploration industries, over 38% of the library's circulation was to off-campus clientele. Many exploration and mining companies point to Mines Library's research facilities as one of the motivating factors for locating their offices in the Reno area.

Mines Library is funded by the state primarily for its service to MSM and NBM&G. Until 1976 the wear and tear on its collection and the demands placed on its reference services by industry were absorbed by

the library with little or no additional funding from the state and almost no gift monies. In 1976 Mines Library's visitor register indicated that 1680 off-campus users signed in upon using the library (this was a very conservative indicator of off-campus use, because many off-campus users are reluctant/unwilling to sign the register). This heavy off-campus use was detracting from the library's major mission of serving MSM students and faculty and was placing heavy pressure on an already inadequate collection. Initially the librarian explored the possibility of charging off-campus users for library cards, but since there was no precedent for this in the UNR Library System, and because it was going to be cumbersome, expensive, and inequitable system to administer, a decision was made to try to supplement state funding with alternate sources of funding. It was also decided that the program would take the form of an annual fund-raising drive aimed at the library's numerous users from the mineral industry.

The first campaign consisted of a fund-raising appeal letter from the librarian plus a brochure explaining the library's financial needs and how to contribute to the library. The initial appeal emphasized the need to raise money for some equipment and furnishings and was mailed to approximately 30 mining and exploration firms and consultants. The 1977 Mackay Miner (the annual publication of MSM's Student Chapter of the American Institute of Mining, Metallurgical, and Petroleum Engineers) article on the library listed only seven donors as a result of that first effort. Campaign proceeds for the first year were approximately \$600. The effort was not off to an auspicious beginning, but at least it was a beginning.

The first years of fund raising were largely devoted to educating the public concerning the library's financial needs and its position organizationally within the University. It had to be stressed repeatedly that Mines Library is not a part of MSM, but that it is a branch library of the UNR Library System and receives its budget from the UNR Library System. Most of our users from industry were under the mistaken impression that the library automatically received a portion of their donations to MSM. It was, and still is, a sensitive issue that has to be handled very carefully.

In the beginning fund-raising letters stressed the need for additional money for library books, maps, equipment, furnishings, and even student wages. More recently, the emphasis has been on books. This emphasis has touched a more responsive cord with our donors, who seem to feel that the state should pay for the library's equipment, furnishings, and wages but can appreciate that the state cannot meet all of its book and map needs. In response to this perception, a Mines Library Endowment was established in December 1983 with proceeds from the 1983 fund-raising effort; earnings from the endowment are used to purchase publications for the library.

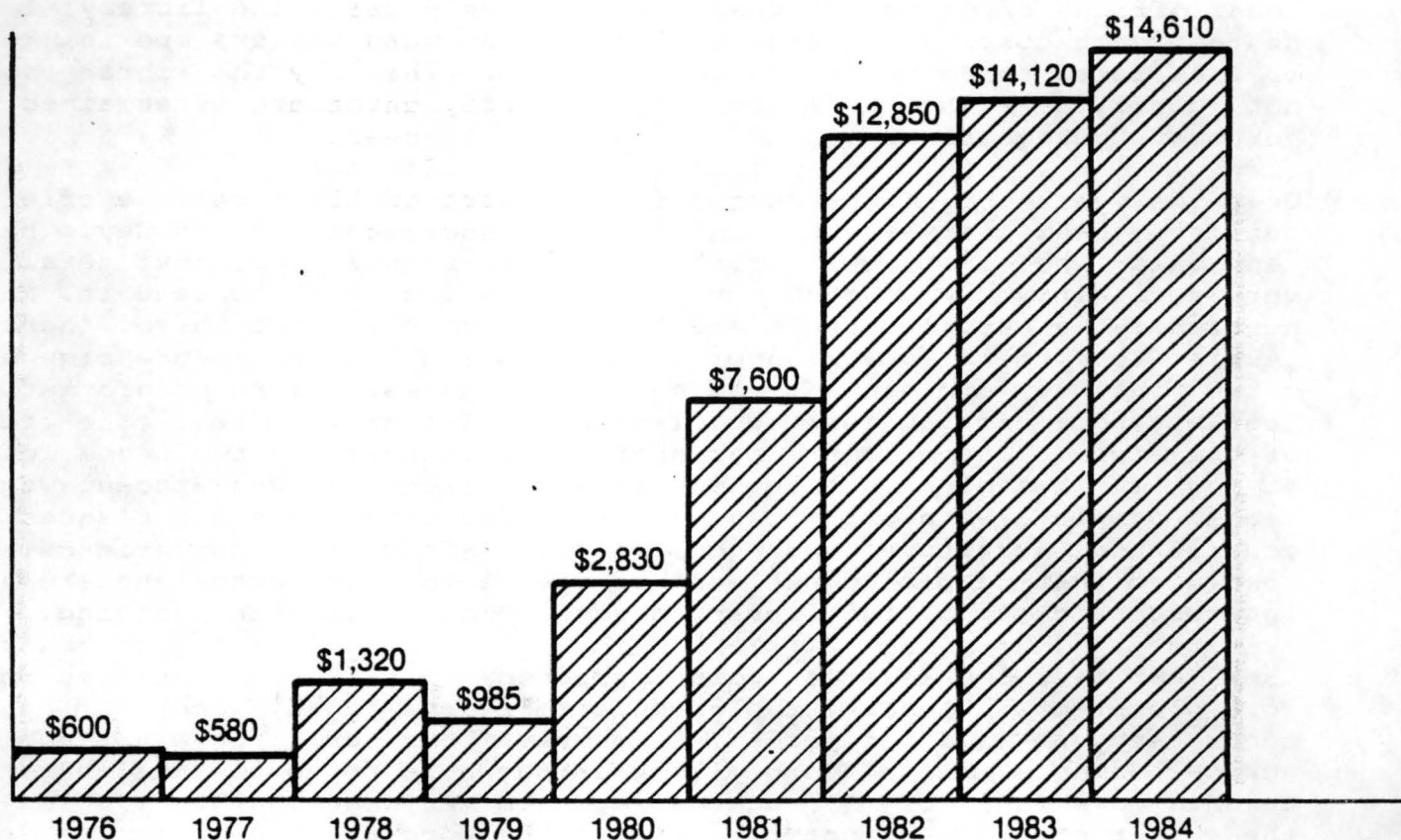
Historically, the library's fund-raising efforts have been fairly low key, with major emphasis on sending out one financial appeal annually, usually in November/December. The one time that the letter was sent out at a time other than November/December (it was sent out in

February), the response was somewhat disappointing, so I am convinced that for tax purposes before January 1 is the best time to approach our off-campus users. In December 1984 over 150 appeals were mailed out, and 51 contributions were received, amounting to \$14,600.

The bar graph below shows the progress of the program over an eight year period. The success of the program in the 1980s can be attributed to a number of factors, including the relative prosperity of the industry in the early '80s, the development of a habit of giving in the mineral industry users of the library, and the establishment of an endowment to insure the continuing existence of a quality Mines collection.

This brief history of Mines Library's alternate fund raising will serve as a background for other topics to be covered in this paper. Subjects to be discussed include ways of educating clientele concerning the library's financial needs, donor incentives, maintenance of donor records, various problems and pitfalls associated with the funding program, and advantages and disadvantages of undertaking such an alternate funding program.

## PROCEEDS FROM MINES LIBRARY'S FUND RAISING, 1976-1984





### Educating Clientele Concerning the Library's Financial Needs

The following vehicles have been used by Mines Library to educate its users from industry concerning its monetary needs: letters, brochures, personal and group contacts, and publicity.

**Fund-Raising Letters:** From the very beginning the annual appeal from the librarian to the library's users from the mineral industry has been the mainstay of the fund-raising program. The mailing consists of a letter from the librarian outlining the library's needs and is often accompanied by a copy of the current Mackay Miner article on the year's activities in the library/an information sheet on the library describing its collections and services/a brochure outlining the library's financial needs. This year's package will include the librarian's letter plus a new brochure describing the recently established Mines Library Endowment.

Because most companies have several employees using the library, making it costly to mail appeals to individual employees, letters to local companies are addressed to the person in charge. Usually the administrator is not a heavy library user, so this sometimes presents an identity problem for the library. If no response is received from a company that uses the library heavily, often I alert one of its regular users to the fact that his/her head administrator has not responded to the library's appeal for help; this almost always brings positive results. It is the policy of Mines Library to approach the local offices of companies that are actively using the library; I do not approach company headquarters unless the headquarters are in Reno or I am asked to do so by the local office. This way the library does not conflict with MSM's funding efforts, which are often aimed at corporate headquarters.

Over the years the most successful fund-raising letters have briefly outlined the library's needs for more book and map money, have mentioned what last year's contributions were used for, have detailed very explicitly how to make out the check and where to send it, have mentioned that contributions are tax deductible, and have thanked people for their past support. Letters are limited to one page and often include enclosures, such as brochures, library information leaflets, or informational articles on the library, to tell the rest of the story. One of the least successful letters was two pages long, giving a list of furniture, equipment, collection, and student wages needs, complete with price tags and an offer to place donor plaques on contributed furniture and equipment. After that experience, I concluded that people do not want to read a lengthy letter and are not interested in supporting library needs beyond collection building.

Last year over 150 appeals were prepared in a very short time on a word processor. Usually, two form letters are used, one for past donors and one aimed at potential donors. Thus far, I have not put my acknowledgments on a word processor but hope to do so this year. I tend to make many of my acknowledgments very personalized, which is the main reason I have not put them on the word processor yet.

**Brochures:** Thus far, this fund-raising technique has not been used to



its optimum. In 1976, when alternate fund raising was first undertaken, a brochure was used to explain the library's financial needs and how to contribute to the library. That brochure was replaced recently with a brochure on the Mines Library Endowment. The new brochure will be sent out this year with the annual appeal and is made available as a hand-out in the library. Also, the brochure is sometimes included with responses to reference questions or other requested information sent out through the mail; this approach has resulted in relatively few donations.

**Group and Personal Contacts:** In fund raising there seems to be no substitute for the personal touch. For the past two years the librarian/assistant librarian have attended a Geological Society of Nevada (GSN) meeting in November or December to announce the kick off of the annual drive. In 1984 GSN joined the library's Silver Circle of Donors, which gives special recognition to contributors of \$5,000 or more in cash to the library. Also, over the years I have attended various functions of the Women's Auxiliary to the American Institute of Mining, Metallurgical, and Petroleum Engineers (WAAIMEs) to explain the library's needs. The WAAIMEs have been regular contributors to the library.

Personal contacts have been used when a company or professional organization fails to respond to the annual letter. I sometimes contact faculty, graduate students, and heavy users from industry, who are affiliated with these companies or groups, to see if they can use their influence to obtain a donation; this usually brings good results. Sometimes I call an unresponsive company or organization to determine if they received the fund-raising letter. Thus far, these are the only kinds of follow-up that have been employed. If time permitted, no doubt a follow-up letter would produce some good results.

**Publicity:** At the time of the annual drive, the drive's kick off is publicized in the "library news" section of the library's accessions list, which is mailed out to over 100 off-campus users. Also, articles on the campaign are regular features in the Nevada Mining Association Bulletin. Additionally, the campaign is reported on in the library's annual article in the Mackay Miner.

#### Donor Incentives

Mines Library has employed the following donor incentives: donor lists and plaques, book plates, publicity of large donations, give-aways, and publicity of educational matching grants programs.

**Donor Lists:** Initially, donors were listed in the library's annual article in the Mackay Miner. The first listings were very short - only seven donors were reported in 1977, 11 in 1978, and 13 in 1979. As the donor list grew, it became too space consuming to be published in the Mackay Miner. Now donors are listed in the "library news" section of the accessions list and on the "Rainbow of Donors" display board. In deference to the wishes of the UNR Library Director, only donor names, not donation amounts, are listed in the accessions list.

The "Rainbow" display board, listing the library's donors for the past year, is located near the entrance to the library. Again, in deference to the Director, actual dollars amounts are not listed on the display but are coded as follows: red star = \$5, green star = \$10, blue star = \$25, silver star = \$50, gold star = \$100, silver & blue star = \$500, and gold & blue star = \$1000.

**Donor Plaques:** In 1983 when one of our regular contributors had given a cumulative total of \$5,000 to the library, the event was celebrated with the dedication of a Silver Circle of Donors plaque. The Silver Circle plaque gives special recognition to contributors of \$5,000 or more to the library. In two years three more names have been added to the plaque. Each time a name is added, it is well publicized in the "library news" section of the accessions list, the Mackay Miner and other campus publications, and in the fund-raising mail-out. The Silver Circle plaque has proven so successful that last summer a Gold Circle plaque was dedicated when one of our donors had given a cumulative total of \$10,000; now two names are inscribed on that plaque.

**Book Plates:** Because of staffing constraints, book plates have been used very sparingly as an incentive. The library has one endowment for \$10,000+ in an individual's name and one sizable memorial fund for which book plates are used. Otherwise, book plates are not used unless specifically requested. Because Mines Library is the recipient of a very large number of donations of books and other publications, it would be extremely time-consuming if the library adhered to a policy of attaching book plates to all gift books and all books purchased with gift monies.

**Publicity:** It is essential to publicize large donations. Usually, gifts of \$1,000 or more are publicized in the form of a short article in the "library news" section of the accessions lists, the Mackay Miner, the UNR Library System Library Memo, and campus informational publications. In the past, press releases have been prepared, but the local newspaper usually does not run the articles because of its policy to publish information on a donation only if it is a very large gift from a prominent local citizen. Sometimes the articles have appeared in small-town Nevada newspapers. The importance of publicity cannot be overemphasized. Occasionally, a donor does not want his/her contribution publicized, but as a rule the publicity is much appreciated and often expected.

**Give-Aways:** Recently donations of \$300 or more from a company or \$100 or more from an individual have been recognized with some kind of freebie, such as a complimentary copy of the Library System's microfiche serials list or a copy of the Mines Library's thesis list. In addition, all of our donors are placed on the mailing list to receive the library's quarterly accessions list, which features a library news update emphasizing news of donations of money and library materials.

**Educational Matching-Gift Programs Offered by Large Companies:** Several of our clientele have taken advantage of their companies'

matching gift educational support programs whereby their personal contributions to the library are matched or sometimes even doubled or tripled by their corporation. This avenue needs to be publicized more by the library, because many employees are unaware of their companies' matching grant programs.

#### Maintenance of Donor Records

One of the most difficult undertakings is the maintenance of a current mailing list. Because exploration and mining firms and consultants come and go and change names so frequently, usually last year's mailing list is almost useless. Now that I have donor and potential donor lists on a word processor, the task of maintaining the lists is much easier.

Addresses of new companies and individuals are obtained from the (1) circulation cards, (2) CLSI (CL Systems, Inc.) printout of off-campus users, (3) business cards left in the library's business card display, and (4) library's visitor register. Since I have aimed the library's fund raising at its regular users, circulation cards have been my most reliable source of names and addresses for the mailing list, because they provide me with a feel for how many items an off-campus user is checking out over a period of time. Also, I receive from the Main Library's Circulation Department a CLSI printout of some, but not all, of the off-campus users of Mines Library. The printout lists patron's barcode number, name, address, phone number, affiliation and latest check-out date. Even though Mines is not yet online with the CLSI circulation system (CLSI has been used by the Main Library since 1978) Mines' off-campus users must register for a library card through the Main Library's CLSI patron registration, unless they already have a county library card (area public library cards are accepted by the UNR Library System). Many of our off-campus users avoid signing the visitor register, whereas others sign it very faithfully each time they use the library. The library's display of business cards is very popular and is a fairly good source for compiling a mailing list. Often, however, people who leave cards are not regular users. Because some heavy users rarely or never check anything out, several sources have to be consulted to compile mailing lists.

I maintain a card file of donor records, giving donor name, address, phone number, contact person for an organization or company, and dates and amounts of contributions. Because I administer two other branch libraries, I have not had time to put the donor file on the word processor. Also, maintained on a yearly basis are running lists of amounts of donations; these lists are divided by (1) contributions to the Mines Library Endowment, and (2) non-endowment contributions. The lists give date of contribution, name of contributor, and amount of contribution and are not on computer as yet. Additionally, files are kept containing copies of each acknowledgment plus a copy of each check and any correspondence from the contributor.

Since accountability for gift funds is a major concern, it has been necessary to save indefinitely all copies of order cards for titles ordered on certain gift accounts. These cards can be easily



distinguished because the name of the gift account is given on the allocation line. For the sake of expediency, I do this rather than maintaining lists of titles ordered on each fund. For some large gift accounts, I have arranged with the Order Department to receive periodic printouts of titles ordered on those accounts. Also, for large gift accounts I receive fund status printouts once a month. These printouts provide the best accountability.

#### Problems and Pitfalls

Mines Library's fund raising has not been without its problems and pitfalls. Since it is the library's policy to list its donors on the "Rainbow of Donors" board near the library entrance and in the library news section of the accessions list, inevitably, if there is an omission, someone's feelings get hurt, and I hear about it. Because I administer three branch libraries in three separate buildings, I am more prone to this kind of error than in the beginning of the program when I had only one library to keep track of. Most contributors are very understanding when the circumstances are explained and are pleased to know that their name will appear in the next listing.

Frequently, when people give money, they tend to expect more in terms of service. Sometimes, because of these obligations, we feel between a "rock and a hard spot" in trying to maintain service to faculty and students and cope with demands from off-campus. For example, a couple of years ago we were considering cutting off telephone reference service to out-of-state callers. Because some of our contributors are from out of state, we felt that we could curtail, but not completely eliminate, this reference service. In order to cope with this kind of problem, I have tried to make it abundantly clear in goal/mission and collection development statements that this library's primary service obligations are to MSM students and faculty.

The library has been careful not to accept gifts with restrictions. Contributions to the Mines Library Endowment go toward collection development. In fact, most of our contributions are used to strengthen the collection. Occasionally, unrestricted non-endowment gift money is used to purchase equipment or pay wages for a special project.

In 1980 the UNR Foundation and Office of Development was set up to coordinate, cultivate, solicit, and process all private funds and gifts donated to UNR. Since that time the library has been obligated to coordinate its fund raising with the Foundation. This means that each year I send a copy of the fund-raising letter, plus the mailing list, to the Foundation. Thus far, donations are still sent directly to the library. After donations are acknowledged, checks and copies of acknowledgments are turned over to the Foundation. Sometimes contributors send their donations directly to the Foundation, which is supposed to notify the library of the gift. As long as the Foundation permits contributions to be sent directly to the library, donors feel they have a direct link with the library. Recently, the Foundation has cut down on the amount of paperwork required to be submitted with each contribution, which has streamlined library record

keeping immensely. Thus far, coordination with the Foundation has not been too cumbersome, but I foresee more and more restrictions being placed by the Foundation on "grass roots" fund raising in the future.

In all the years I have been sending out funding appeals, only one company has formally complained about being approached by the library. That particular company had recently given the Foundation a sizable contribution and did not appreciate being approached by another arm of the University. As more and more University departments turn to alternate funding, I anticipate that more protests will be lodged, which could have the end result of making the Foundation totally and directly in control of all campus fund raising.

There are always potential problems of conflicting with the UNR Library System's or MSM's fund raising. In order to keep MSM informed of the library's funding activities, last year a copy of my fund-raising letter was sent to MSM Dean's Office as well as to the UNR Foundation. UNR Library is actively engaged in fund raising, mainly through its Friends of the University Library group. In the near future, I plan to take some steps to coordinate with the Friends and make Mines Library donors honorary Friends of the University Library.

A successful funding program must be viewed by the library administration as an addition to, rather than substitute for, appropriated funding. A continuing annoyance is that everyone wants your mailing list, but I have learned that no one gives you theirs. Consequently, I give mine only to the UNR Foundation and Library Director's office if I can help it. Also, bear in mind that a successful fund-raising program has the potential for causing jealousy and even animosity and "turf battles" among departments/units competing for the same dollars.

#### Advantages and Disadvantages of Mines Library's Funding Program

Sometimes fund raising seems more trouble than it is worth. These days, however, with financial conditions the way they are on most campuses, there might not be a choice. Disadvantages associated with Mines Library's program will be listed first.

##### Disadvantages:

1. An ever-increasing amount of the 12-15 hours per week I have to devote to Mines Library is consumed with fund raising and its attendant activities. Is it really worth it for the \$10,000 - \$15,000 of supplemental funding generated annually? After all, I was not trained or hired to be a professional fund raiser. In fact, I have not undertaken an active alternate funding program in my other two libraries because they do not have as much use by profit-making enterprises, and I simply do not have the time to devote any more time to fund raising unless it has the potential of having a high pay-off.

2. Other disadvantages were outlined in the previous section on Problems and Pitfalls.



**Advantages:**

1. Financial flexibility is the main advantage derived from the program. Because of outside funding, Mines Library is able to purchase publications throughout most of the year, whereas my other two branches often have no ordering going on for as much as six months of the year because their allocated book funds are depleted. Additionally, with unrestricted, non-endowment gifts, Mines Library is able to purchase equipment and fund special projects, such as map preservation, that would not have been possible otherwise. In this respect Mines is better off than any of the seven branch libraries in the System with the exception of the Medical Library.

2. Through the annual campaign, many of our off-campus users have come to appreciate the library's financial plight and feel that through their contributions they are participating in the library's collection building efforts; this has generated a tremendous amount of good will toward the library. Many of our contributors take a great deal of pride in the library.

All in all, I feel that these advantages outweigh the listed disadvantages. If I had more time to devote to the program in the form of sending follow-up letters and making more follow-up phone calls, attending more meetings of professional geoscience and mining organizations to explain the library's needs, and forming a Friends of Mines Library group, I am sure that the program would have an even higher pay-off. Of course, hard times in the exploration and mining industries cannot help but have a negative impact on this year's campaign.

# GEOSCIENCE INFORMATION SOCIETY

--Proceedings of the Annual Meeting--  
(available on standing order -- see reverse)

v. 2	Toward the Development of a Geoscience Information System (1971 meeting; R.W. Graves, editor)	published 1972	\$1
v. 3	No volume title (1972 meeting; H.K. Phinney, editor)	published 1973	3
v. 4	Geoscience Information (1973 meeting; M.W. Wheeler, editor)	published 1974	6
v. 5	OUT OF PRINT -- see reverse		
v. 6	Retrieval of Geoscience Information (1975 meeting; V.S. Hall, editor)	published 1976	8
v. 7	Geoscience Information (1976 meeting; J.G. Mulvihill, editor)	published 1977	8
v. 8	Geoscience Information Retrieval Update (1977 meeting; R.D. Walker, editor)	published 1978	8
v. 9	Geoscience Information: Publication - Processing - Management (1978 meeting; J.H. Bichteler, editor)	published 1979	8
v.10	Collection Development in Geoscience Libraries (1979 meeting; R. Walcott, editor)	published 1980	15
v.11	Keeping Current with Geoscience Information (1980 meeting; N. Pruett, editor)	published 1981	20
v.12	The Future of the Journal (1981 meeting; M.W. Scott, editor)	published 1983	20
v.13	Geologic Hazards Data (1982 meeting; R.A. Brown, editor)	published 1984	20
v.14	Roles and Responsibilities in Geoscience Information (1983 meeting; U.H. Rowell, editor)	published 1984	20
v.15	Maps in the Geoscience Community (1984 meeting; C.M. Kidd, editor)	published 1985	20
v.16	Micros, Minis and Geoscience Information (1985 meeting; A.E. Bourgeois, editor)	published 1987	35
v.17	The User and Geoscience Information (1986 meeting; R.A. Bier, Jr., editor)	published 1987	35

For ordering information and other publications, see reverse.

## December 1987

Geologic Fieldtrip Guidebooks: Guidelines for Authors and Publishers (1985)

NOTE: Volume 5 is available from Books on Demand  
300 N. Zeeb Road  
Order number: 2025408 Ann Arbor, Michigan 48106 USA







