# Geoscience Information Society

25th Anniversary
1965-1990

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# GEOSCIENCE INFORMATION SOCIETY

# PROCEEDINGS

# 21

# PROCEEDINGS OF THE TWENTY-FIFTH MEETING

# OF THE

# GEOSCIENCE INFORMATION SOCIETY

**OCTOBER 29 - NOVEMBER 1, 1990**
**DALLAS, TEXAS**

# GEOLOGICAL SOCIETIES AND INFORMATION TRANSFER IN THE ELECTRONIC AGE

**Edited by**
**Marie Dvorzak**

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## PAPERS PREPARED FOR THE 25TH ANNIVERSARY GALA DINNER, OCTOBER 30, 1990, DALLAS, TEXAS

# PREFACE

The Geoscience Information Society (GIS) is an independent, nonprofit, professional society which was established in November 1965. The Society was created to improve the exchange of information in the geosciences by the cooperation of an international membership. Currently the membership is composed of more than 250 documentalists, editors, geoscientists, information scientists and librarians. GIS, which celebrated its 25th anniversary at the 1990 annual meeting, is a member society of the American Geological Institute. GIS is also an associate society of the Geological Society of America and holds its annual meeting concurrently with that of GSA.

This Proceedings volume consists of papers presented at the 1990 annual meeting. The papers are organized into four parts: Symposium papers, Technical Session papers, Poster Session papers and papers from the 25th Anniversary Gala Dinner. The Symposium, "Geological Societies and Information Transfer in the Electronic Age", consisted of 7 invited papers. The Technical Session, "Geoscience Information - Current Issues", consisted of eight volunteered papers. There were four volunteered presentations in the Poster Session. At the 25th Anniversary Gala Dinner, there were two invited presentations on the history of the Society.

I wish to thank Susan Dentinger and Daniel Joe of the University of Wisconsin-Madison Library System for their help in preparing this volume for publication. Thanks to Mary Ansari, GIS Past President, for her advice and help in planning the 1990 meeting. Thanks to Louise Zipp, GIS Publications Manager, for her suggestions on the manuscript guidelines and for editing and distributing these Proceedings.

This volume is dedicated to GIS members, past and present, especially to those members who began GIS. Their vision and wisdom provided the Society with strong foundations.

Marie Dvorzak
1990 Program Chair

# PART I

## SYMPOSIUM:

## GEOLOGICAL SOCIETIES AND INFORMATION TRANSFER IN THE ELECTRONIC AGE

## INTRODUCTION

In 1990 the Geoscience Information Society celebrated its twenty-fifth anniversary. It was founded in 1965 to improve the exchange of information in the geosciences. For the theme of the symposium, it seemed very appropriate to focus on counterpart societies in geology and their role in information transfer. Historically societies have been major contributors to the transfer of information in geology by providing a framework for communication in the scientific community. Several factors such as new technologies, changing patterns of scientific communication, commercialization of scientific publishing and economic conditions are altering how societies perform their traditional functions.

The contributors emphasize that new technologies affect societies' methods of generation, production and delivery of geological information. Among the topics discussed, are developments in formats and methods of production, evolving systems of communication and digitization of data. These issues are examined from the perspectives of librarians, geologists and society representatives.

The symposium presentations met with lively response from the audience. To retain the flavor and character of the authors' ideas, few changes were made to the submitted manuscripts.

The lead paper by Richard Spohn and Phil Stoffer describes geological societies, their membership, services, methods of information distribution and publishing. The authors also compare publication patterns in geological societies with those in biology, chemistry and physics.

To provide a context for the symposium, Regina Brown reviews the development of geological societies in western nations. She identifies important milestones in the history of individual associations.

Dan Merriam observes that the communication revolution is dramatically increasing the options for information exchange among scientists. He describes this revolution's impact upon the methods of communications societies are now using.

Digitizing data was the subject of Gary Howell's presentation. Digitization of publications and data, while extending the usefulness and value of the original material, is expensive. Gary Howell offered several strategies that societies might adopt to digitize their materials.

In his paper Raymond Arvidson proposes that advances in communications and data management technologies offer significant new opportunities for the Geological Society of America and similar societies to better serve their communities. Among these opportunities are electronic mail, bulletin boards, digital submission of manuscripts, production of digitized versions of societies' journals and storage of digitized data and documentation.

Paul Ribbe presents a methodology incorporating several criteria to evaluate both the quality and the cost of serial publications in mineralogy, petrology and geochemistry. Using this methodology he reports that, on average, serials published by societies were of higher quality and lesser cost than those published by commercial publishers. He concludes that societies should take a greater leadership role in scholarly publishing.

In the final paper, A. F. "Fred" Spilhaus and Judy Holoviak discuss the numerous factors that influence how societies provide information by or for the scientific community. Anticipated changes in technologies, competition, economics and other factors will affect future practices. The authors, however, conclude that the many new technological innovations will coexist with traditional scientific publishing in the paper format into the next millennium.

Several general conclusions emerge from these presentations. Contemporary problems, such as budgetary limitations, are affecting scholarly communication and will be difficult to resolve. The number of communications options available and the lack of consensus on which options are best create problems for users, producers and distributors of scientific information. It is encouraging that those involved in scholarly communication are now beginning to consider both the problems and possible solutions.

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# GEOLOGICAL SOCIETIES: REFLECTIONS ON CURRENT MEMBERSHIP, SERVICES, AND PUBLISHING PATTERNS

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Abstract--Societies play a major role in the publication of geological materials worldwide. This paper focuses on the current membership of and services offered by geological societies and on the role these societies play in publishing, particularly in the United States and Canada. National societies, regional societies, and related societies are important producers of geological materials in both countries. The present publishing output of these societies and the formats they are using now or are considering for the immediate future are examined.

Publication patterns in other scientific disciplines such as physics, biology, and chemistry are also examined and compared with the known pattern in geology. A survey of titles received at the University of Cincinnati in these four disciplines revealed a similar publishing pattern for geology and biology journals. A different pattern emerged that was similar for both physics and chemistry titles.

The trend internationally shows a greater number of societal publications in the sciences are being produced by commercial publishers. Some classic examples of this trend exist in the geological sciences. The implications of this trend for geoscience librarians and scholars are a continued rise in the cost of publications and the need for careful management of budgets by geoscience librarians in the future.

Societies have historically played and currently continue to play an important role in the publication and distribution of geological information. They also provide an important medium in the exchange of information by allowing geoscientists to systematically, formally, and informally introduce and exchange ideas and data in a setting apart from established business, academic, or governmental institutions. There is considerable diversity in the means by which geological societies operate and support themselves, in the services which they offer to their members and to the public, and in the reasons for their existence.

What is a society? Webster's 3rd Unabridged New International Dictionary (Gove, 1964, p. 2162) defines "SOCIETY" as "a voluntary association of individuals for common ends" and gives one of their examples as "an organized group periodically meeting because of a common profession." This definition seems to fit geoscience related groups since: 1) we hold formal meetings, 2) we conduct field trips, and 3) we meet informally to discuss issues. The purpose of all these contacts is to share our own research or to see what we may glean from the work or experiences of other colleagues in the various areas of the geological sciences and geoscience librarianship.

## Geological Societies

North American geological societies were first founded in the latter part of the last century by generalists who had an interest in geology and by geologists who conducted mineral surveys and exploration for various federal and state governmental agencies. Today, rather than just being a "geologist", an individual will likely adopt a more specialized title such as a micropaleontologist, a glacial geomorphologist, or an organic geochemist. As a specialized geoscience discipline grows in complexity and in number, a new "niche" is created for the society. In addition, societal trends provide the catalyst for the formation of new groups such as those supporting the interests of women or black geologists. In the process of maturing, most societies find the need to communicate information about the society or disseminate formal scientific communication among membership. This, in turn, creates a new publication.

The number and size of geological societies continues to increase. We have been able to locate more than 270 professional geological societies which currently exist in the United States and Canada. These include 76 national societies, 122 regional societies, and 72 related societies. Popular or amateur local societies also make up a large, but little known group of societies in the two countries. Currently, there are more than 600 professional geological societies worldwide.

National societies are geological societies which represent a large number of geologists or which represent specialists within a subdiscipline of geology on a national level. Societies like the Geological Society of America and the Geological Association of Canada contain a broad-based membership. Those such as the Association of Engineering Geologists and the

Mineralogical Association of Canada serve geologists in specialized areas of the discipline. Finally, societies like the Association for Women Geoscientists and the Association of Black Geologists support the needs of special groups.

Regional societies are geological societies representing a region, state or province, or city and are sometimes affiliated with other regional or national societies. The Gulf Coast Association of Geological Societies and SEPM Permian Basin Section are examples of societies which represent a broad geographical region. The New Mexico Geological Society and the Saskatchewan Geological Society provide examples of state and provincial societies, while the Dallas Geological Society and the Miami Geological Society are city-based societies.

Related societies are composed of "affiliated" societies and state academies. Affiliated societies are not geological societies per se, but many of their members are geologists. Examples of this type of society include the Society of Petroleum Engineers and the American Institute of Mining and Metallurgical Engineers. State academies are multidisciplinary societies which are generally some of the oldest societies in the United States. Sections of a major discipline, such as geology, splintered off to form a separate subdivision within these larger societies. An example is the Ohio Academy of Science, Geology Section.

Local societies present the popular or amateur side of geological societies. It is more difficult to locate and obtain information about this group of societies, though they likely form the largest group which currently exists in the United States and Canada. These societies provide the interface of the geosciences with the public. They play an important role in geological education by working with elementary and secondary schools to present programs, by sponsoring shows and exhibits, and by holding field collecting expeditions. They also often work with local natural history museums to produce exhibits and popular geological publications. Many are affiliated with university geology departments. Finally, they are a major source of recruits for the profession in that they introduce and involve young people in the discipline.

Cincinnati has several flourishing societies of this type: the Cincinnati Mineral Society, the National Speleological Society's Cincinnati Grotto, and the Dry Dredgers. As an example, the Dry Dredgers are a group of amateur paleontologists composed of more than 300 members. The group exists in a locale which is particularly rich in accessible sites for the collection of Ordovician fossils. They hold monthly meetings, conduct frequent fossil collecting trips, prepare fossil kits to generate income, work with the Mineral Society to sponsor an annual show, play a role in local education, prepare displays for the University of Cincinnati Department of Geology, and give an annual contribution of materials to the University of Cincinnati's geology collection. Although most of the members are not professional geologists, members of the Dry Dredgers play an active role in supporting the "cause" of geology in the Cincinnati area.

## Membership Survey

We would like to briefly discuss aspects of the membership of four major societies: two from Canada and two from the United States. Two are broad-based general geological societies: the Geological Association of Canada (GAC) and the Geological Society of America (GSA). The others serve a specialized area of geology: the Canadian Society of Petroleum Geologists (CSPG) and the American Association of Petroleum Geologists (AAPG).

Divisions and sections are important subgroups of these societies. For example, each of the two general societies, GAC and GSA, support a large number of divisions in specialized areas of geology to attract a wide range of membership interests. Also, each has a sectional structure to encourage collegiality among members in specific geographical regions of their respective countries. Divisions are more likely to work within the main structure of the society, while sections frequently conduct their activities separate from those of the main society.

Membership changes in these four societies has shown an interesting trend during the years 1979-1989. (Table 1.)

Table 1. Membership changes in the four societies examined during the period 1979-1989.

| Year | GAC | GSA | CSPG | AAPG |
|---|---|---|---|---|
| 1979 | 2,559 | 12,459 | 2,886 | 23,826 |
| 1980 | 2,620 | 12,603 | 3,115 | 27,434 |
| 1981 | 2,599 | 12,718 | 3,383 | 31,945 |
| 1982 | 2,963 | 13,386 | 3,726 | 37,318 |
| 1983 | 2,992 | 14,001 | 3,813 | 40,721 |
| 1984 | 2,970 | 15,362 | 3,924 | 43,029 |
| 1985 | 3,037 | 16,767 | 4,077 | 43,803 |
| 1986 | 3,006 | 16,586 | 4,051 | 42,836 |
| 1987 | 2,999 | 16,585 | 3,799 | 40,201 |
| 1988 | 2,999 | 16,427 | 3,800 | 37,563 |
| 1989 | 3,015 | 16,701 | 3,867 | 35,969 |

Between 1979 and 1985 all of the societies were growing. GAC and GSA grew slowly and continuously. AAPG and CSPG grew substantially in tandem with the boom in the oil industry. Note the similar growth patterns existing for the Canadian and U.S. societies of each type. All societies enjoyed a peak membership in the year 1985. Since 1985, membership levels of GSA and GAC have been nearly static, showing little growth or decline. However, AAPG and CSPG have shown a decline in membership, which is likely due to the slump in the oil industry. A breakdown of the membership composition of GAC and GSA show it to be broad-based and distributed among geologists from a wide variety of occupational sectors including education, government, mining, consulting, and petroleum. On the other hand, approximately 75% of AAPG and CSPG members are employed in the petroleum industry and in consulting.

An interesting comparison of membership can be noted with a survey of AAPG and GSA membership for 1986 reported by Stoffer (1988, p. 140). For GSA the education category increased from 22% to 29% of membership, while the petroleum category dropped from 12% to 7%. For AAPG the percentage of student and consultant members dropped considerably, while percentage of members working for petroleum companies increased from 34-48% of total membership. From these changes it can be assumed that fewer geology students are being trained to work in the petroleum industry where the job outlook is poor and that fewer consultants are needed to support the reduced exploration for oil and gas in North America.

## Societal Services and Publishing

The next section of this paper presents the results of research by the authors on the services offered by and the publications produced by geological societies in the United States and Canada. Data for this section was obtained from two surveys of geological societies conducted by the authors. A survey questionnaire was sent by Spohn to 58 national societies in the United States and Canada in the fall of 1990. Responses were received from 42 societies. Data for regional societies was provided from 75 responses received from a survey of regional societies in the United States conducted by Stoffer in mid 1987.

### Services

Geological societies offer a variety of services to their members. (Figure 1) Field trips, a key activity of the discipline, are offered by nearly every national and regional society to allow members to view first hand the geology of a given region or the geological features of interest to a particular subgroup of geologists. Awards and scholarships, another major category offered by many societies, serve to honor the accomplishments of members and others and to encourage

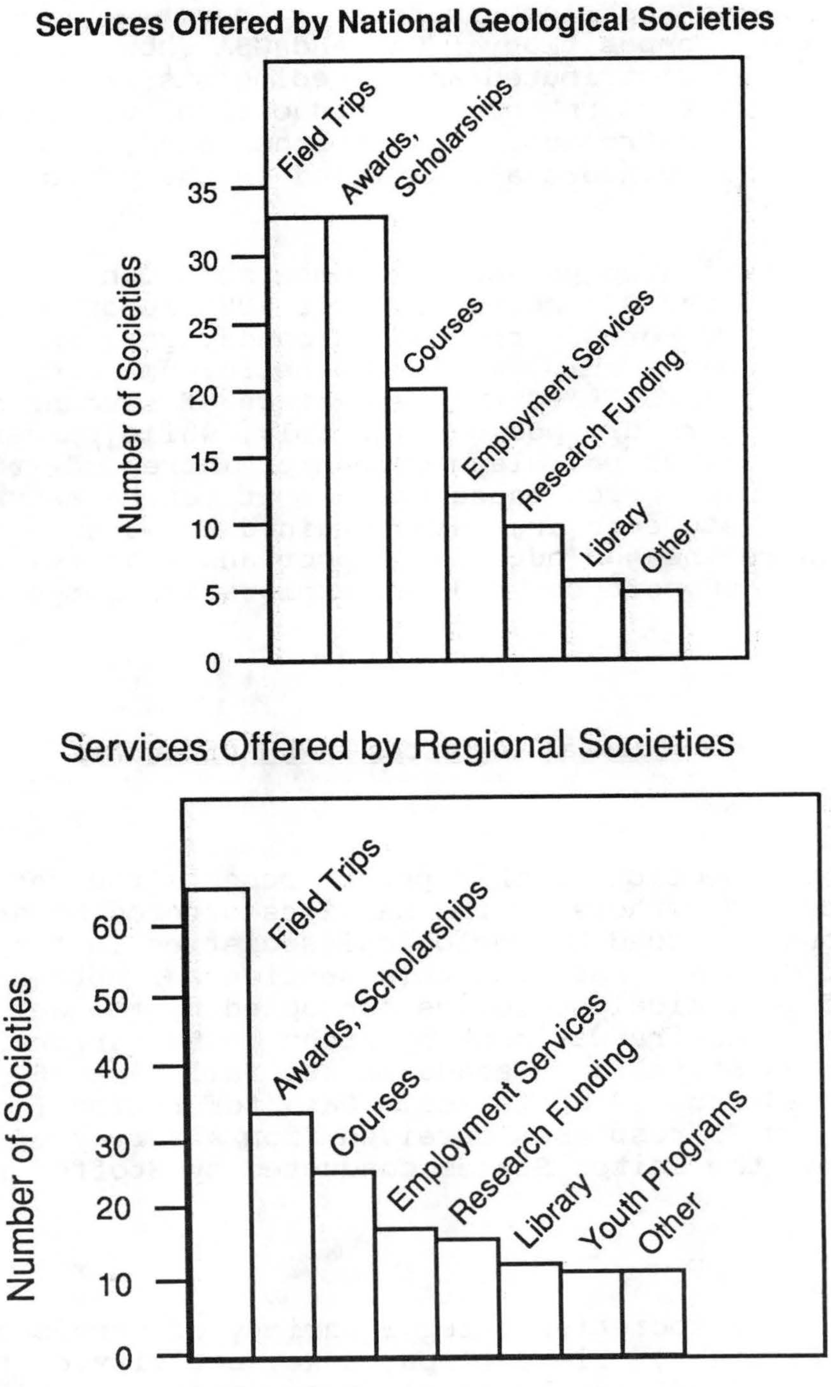


Figure 1: Services offered by national geological societies and regional geological societies.

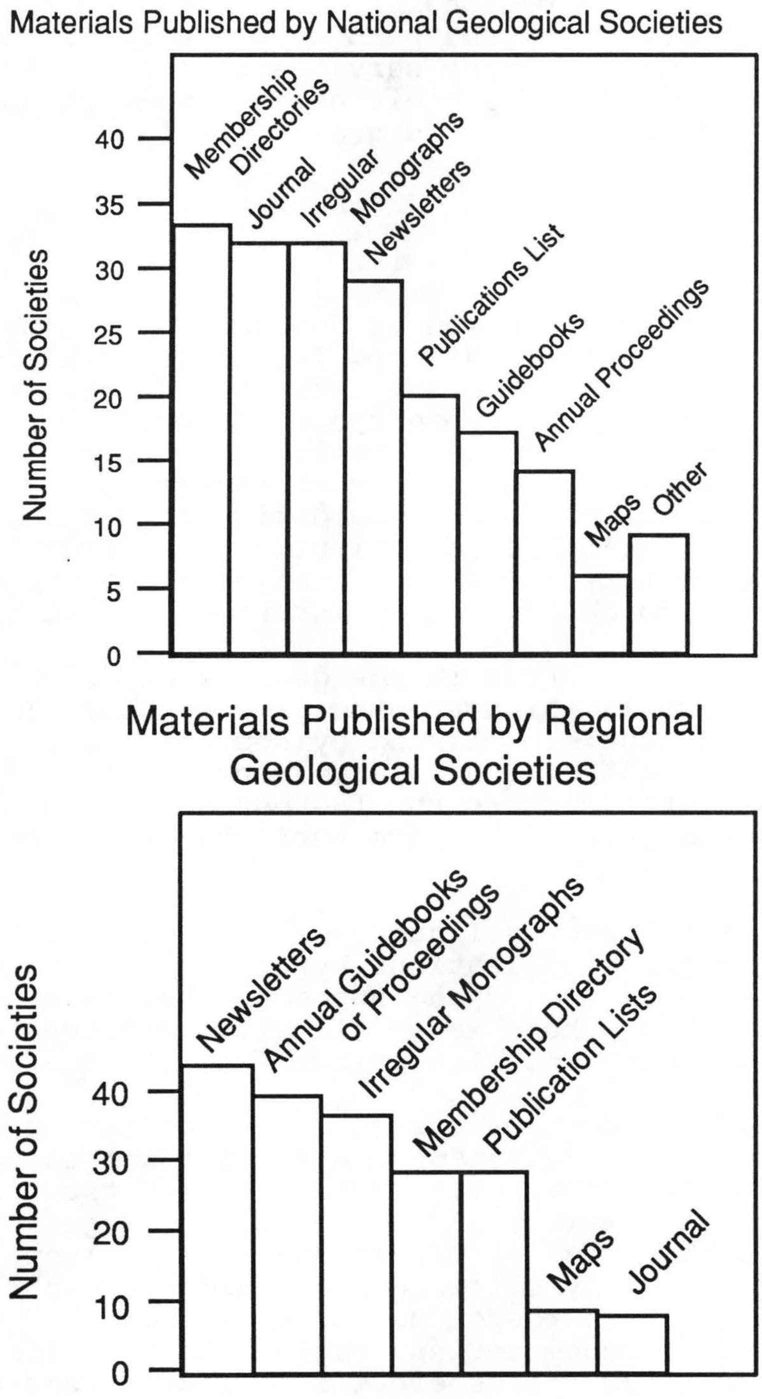


Figure 2: Materials published by national geological societies and regional geological societies.

students to adopt the profession. Continuing education courses, employment services, funding of geologic research, and library facilities make up the other main activities common to both groups of societies. Only regional societies stated that they offer youth programs which may be part of professional outreach on a more localized scale. Other services offered by individual societies include such exotic activities as post-earthquake reconnaissance research and diamond grading or gem identification.

Publishing

The remainder of this section is devoted to the topic of societal publishing. Bottle (1979, p. 24), in a book about chemical literature published in the late 1970s, noted that

> "Though learned societies were the first publishers of scientific journals to further their scientific interests, their publications are still the most important vehicles for the dissemination of basic research data. Their wide distribution and careful scrutiny by expert referees lend them great prestige and enable them to achieve a consistently high level."

This comment is still true in the geological sciences. In the group of 102 journals which are the primary journals indexed by AGI for GeoRef, journals published by societies still compose the largest group, or 45% of the total. Commercial publications make up 40% of the total and are the fastest growing group. A third, much smaller segment (15%) are published by governmental agencies.

The surveys of the national and regional societies conducted by the authors show that publications by geological societies are proliferating in both diversity and numbers. Maintaining an exhaustive collection of these materials will continue to be a major challenge for geoscience librarians.

The results of the two surveys show some differing publishing patterns. (Figure 2) Of the 42 national societies which responded to the survey, all indicated that they publish. The majority publish a variety of publications. Regularly issued journals are published by 32 of the 42 societies. Items in the category "other" are mainly slide sets and video tapes. Of the 75 regional societies that responded, only 55 indicated that they publish. A major difference between regional and national societies is that few regional societies publish a regular journal. This survey also shows that annual field trips and their resultant guidebooks are an important component of regional societies' activities. These field trip guidebooks provide a key source of regional descriptions for the geologist.

Both surveys also queried societies about the actual or perceived changes in their recent publication sales. (Table 2)

Table 2. Changes in geological societies' publication sales.

| CHANGE LEVEL | NATIONAL SOCIETIES (1986-1990) | REGIONAL SOCIETIES (1985-1987) |
|---|---|---|
| Significant Increase (10%+) | 40% | 11% |
| Slight Increase (3 to 10%) | 23% | 9% |
| Remain about the Same | 29% | 33% |
| Slight Decrease (-3 to -10%) | 6% | 25% |
| Significant Decease (-10%+) | 2% | 22% |

National societies show a stable to significant increase in publication sales during the 5-year period of the survey. The only society which noted a significant decrease in sales reported having problems in the publications department which were being resolved at present. This increasing demand could reflect the ability of these societies to do national advertising, their publication of basic research, and the "reasonable" prices of their materials which are published at close to cost. The survey of regional societies, for a slightly earlier and shorter period, reflects a general decline in publication sales. Some of this decline may be due to the slump in the petroleum industry, but shrinking library budgets and the lack of widely distributed advertising may also be contributing factors to this decline. In fact, many of these publications must be actively sought by geoscience librarians. Regional societies publications are an important mode of widely distributing information on regional and local geology. The decline of their publication sales will leave a gap in this segment of the geological literature. Materials will be less readily available to many users.

## Comparison with Other Disciplines

Next we would like to touch briefly on a comparison with societal publishing in several other scientific disciplines: biology; physics; and chemistry. After reviewing some of the basic literature on publishing in the four disciplines, the authors have found similar societal structure and societal publishing patterns for biology and geology. Davis (1981, p. 10) notes in a discussion of biological literature that "the most popular frequency in biological literature is irregular... The biological literature is scattered, fragmented, and dispersed... Over the last decade the interfacing, overlap, and integration of disciplines have been typical..." Sounds like geology! Both disciplines have many societies on several levels in North America, have fragmented societal publishing patterns, and have many amateur participants. On the other hand, physics and chemistry support one dominating society in North America and have societal publishing centralized in one organization.

To back up the reading, an informal and unscientific survey of the titles currently being received by geology, physics, biology, and chemistry at the University of Cincinnati was conducted. (Table 3) Currently received titles in each

Table 3. Sources of journals received by the science collections at the University of Cincinnati.

| PUBLISHING SOURCE | NUMBER OF TITLES GEOLOGY | PHYSICS | BIOLOGY | CHEMISTRY |
|---|---|---|---|---|
| Society | 107 | 87 | 77 | 50 |
| Number of Different Societies | 75 | 18 | 60 | 21 |
| Commercial Publisher | 107 | 104 | 150 | 156 |
| Government Agency | 33 | 3 | 18 | 2 |
| University or University Press | 39 | 5 | 30 | 6 |
| Other | 8 | 6 | 21 | 9 |

discipline were counted by type of publisher. For titles published by a society, a list of societies which published journal titles and how many titles were published by each society was kept.

The patterns observed in geology and biology are quite similar. The scatter of journal titles among a number of types of publishers is evident. Both the geology and biology collections receive a large number of societal journals which are published by a large number of different societies. Geology has no more than nine titles published by a single society, while biology has no more than six. Most societies in each discipline publish only one journal title. Commercial publishers are more important in biology; and they are well represented in biophysics, biochemistry, and medical fields. Government, both federal and state, is an important source for geological materials; while the federal government is a source of biology titles. University presses are important in both disciplines. The "other" category in biology contains a number of publications by botanical gardens. In both geology and biology, journals form only a portion of the total serial literature. In both disciplines, a large number of irregularly published serials and monographic series make up a major portion of the serial base. These publications include government documents, as well as publications of museums, botanical gardens, university departments, and laboratories.

On the other hand, societal journals in physics and chemistry are published by a small number of societies. More than half of the societal titles in physics are published by the American Institute of Physics and its affiliated societies. In chemistry, 19 of 50 societal titles are published by the American Chemical Society. The Royal Society of Chemistry publishes another ten of these titles. Commercial publishers provide the major portion of journal titles for both the physics and chemistry collections. Both disciplines produce few irregular serials.

## Changing Formats

A few questions about changing publication formats were asked as part of the recent survey of national geological societies in the United States and Canada. The results are presented in Table 4.

Table 4. Publication formats used or considered by U.S. and Canadian national geological societies.

| | FORMATS USED FOR 1986-1990 PUBLICATIONS | FORMATS CONSIDERED FOR 1991-1992 PUBLICATIONS |
|---|---|---|
| Paper Copy | 42 | N.A. |
| Microfiche | 6 | 2 |
| Microfilm | 5 | 2 |
| Computer Diskette | 7 | 11 |
| CD-ROM Product | 2 | 7 |
| Video Tape | 11 | 10 |
| Laser Disc | 0 | 1 |
| Other | 10 | 3 |
| No New Format | N.A. | 27 |

The first question inquired about physical formats which the society had used to publish or sponsor publication of materials as a whole or as part of a publication during the past five years. Of the 42 respondents, only 18 had published materials in physical formats other than paper during this period. However, those 18 societies have used a wide variety of publication formats. Interestingly, video tapes were the most common non-paper form of publication mentioned. The demonstration in Ottawa last summer of the American Geophysical Union's supplemental video tape to the April, 1990 issue of Geophysical Research Letters provides an intriguing new concept in journal publishing. However, the Geological Society of America's ill-fated attempt to publish their Bulletin in microfiche in the late 1970s is a reminder to publishers that they need to consider user acceptance and the availability of equipment before they consider publishing a journal in a new format. A challenge for geoscience librarians in the future will be to obtain funding for the equipment necessary to allow our patrons to have access to all of these emerging publication formats with the same ease that they can currently use paper copy.

A question also was posed about whether physical formats other than paper that were being considered for publication of materials during the next two years, i.e., the immediate future. Five of the 24 societies which produce only paper copy are considering this option. Ten of the 18 societies which have published materials in other formats plan to continue to do so in the future. CD-ROM products hold the greatest interest for a new format of publication from the societies surveyed. Computer disks also are being more widely considered. Comments on several of the survey forms noted that paper is still the best format. One Canadian respondent commented "The best and long lasting [format] still is paper, [because] it is always compatible!"

## Trends

The use of a variety of formats is only one major publishing trend emerging in the geological sciences. Another is the move towards the publication of geological journals by commercial publishers. This trend is particularly prevalent outside of North America. For example, the Geological Society of Australia changed the title of their Journal to the Australian Journal of Earth Sciences and opted to use Blackwell Scientific to publish the new title in 1984. In a slightly different case, the journal Lithos changed from the Norwegian University Press to the commercial publisher Elsevier in the same year. Investigation into the reasons for these changes would provide an interesting topic for future study.

Along with the trend towards commercial publishing has come the trend of unifying various national geological societal journals into a single title. This trend seems to be following in line with the merging of western European nations into the European Community (EC). EC national societies also are combining their publishing efforts. An example may be seen in the journal Clay Minerals which became the official journal of the European Clays Group of seven European societies in 1976 but remains a publication of one of the societies, the British Clay Minerals Group. Another example is the Geophysical Journal International which resulted from the merger of three societal journals in 1988, two of which were already published by commercial publishers, and is the product of a commercial publisher, again Blackwell Scientific.

Geological societies continue to change in the composition of members they serve and the role they play in geological publishing. Experimentation with new formats and the change to a greater role for commercial publishers are currently changing the way geological materials are published. These current trends will need to be considered further, as geoscience librarians confront the problem of allocating their scarce resources for materials and equipment during the coming decade.

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# SOCIETIES' IMPACT ON THE EARTH SCIENCES: THREE HUNDRED YEARS OF COMMUNICATION

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Abstract--A study of the historical development of scientific societies from the seventeenth century to modern times reveals considerable diversity in structure, status and funding, but a shared common purpose--the dissemination of information. Societies, international, national, and local, have played a significant role in the development of the earth sciences. The regional or provincial organizations originated as private groups with specialized knowledge and common interests, before official status was conferred on them. In years past, publications of scientific societies were the primary means of communicating research. Today scientific societies' conference proceedings, professional journals, monographic series, field trip guidebooks, maps, and other publications serve as a rich resource of information not available elsewhere in the geological research literature.

From earliest times, speculation about the Earth has gained attention. Philosophers in Greece and Rome recorded observations and assumptions regarding stones and fossils. In the sixteenth century interest was revived with the founding of academies at Padua and Naples and at the turn of the seventeenth century, Lincei at Rome. The proceedings of the Gesta Lynceorum in 1609 were the earliest recorded publication of scientific endeavors by any society. The great learned associations of England and France, The Royal Society and the Academie des Sciences, arose out of informal spontaneous gatherings of scholars and amateurs interested in experimental science and other matters relating to trade, commerce and manufacture. Their form of organization and methods of investigation were to become the model not only of the Berlin Academy, founded in 1700, but also of other learned societies established in the eighteenth and nineteenth centuries.

The earliest record of a meeting directly connected with The Royal Society dates to 1645, but it was not until 1662 that its charter was issued. Along with laboratory work, its members were interested in obtaining information on the natural history and physical condition of foreign countries, of which not much was known. The Society relied on its members as sources of information. Formal correspondence with foreign learned bodies was begun. Lectures were initiated in 1664. Later, in 1673, the Society began holding public meetings, both as a source of education and income. The secretary's duties included extensive correspondence collected in voluminous folios. There were letters from regular foreign correspondents, as well as scientists who wanted to convey their ideas, discoveries and observations. The reading of these foreign letters formed an essential feature of the Society's sessions. Besides letter writing, the secretary had to track published scientific writings and report on his findings. The extensive correspondence and records of experiments of The Royal Society's second secretary, Henry Oldenburg, developed into a scientific periodical, The Philosophical Transactions. Although it cannot be regarded as the first scientific periodical (the Journal des Scavans preceded it by three months), it is the oldest society publication still in existence. The first issue of the Transactions appeared in March, 1665. Scientists communicated their views to the publication. Reviews of foreign books, extracts from the Journal des Scavans, and reports of the proceedings of the French Academy were regular features. The most important aspect was the publication of scientific works by both members of The Royal Society and foreign scientists. Discussions and reports of astronomical and physiological works, as well as papers on experimental physics and biological sciences, appeared frequently.

The Academie des Sciences came into existence in France in 1666. Unlike their English counterparts, the French members did not suffer from lack of funds. Their laboratories received generous support from Louis XIV. Experiments were carried out and written about as a joint effort. The Academie could also afford to sponsor scientific expeditions. One of the society's members edited the Journal des Scavans from 1665-74 and therein published the Academie's research. All subsequent scientific periodicals were modeled on the two aforementioned publications - the Journal des Scavans' format for popular periodicals, the Philosophical Transactions for publications of scientific societies.

During the eighteenth century the structure of the Earth, its minerals and "organised remains" were studied. Several other scientific societies were founded during this period. The Royal Society of Edinburgh, chartered in 1783, published important papers on subjects connected with the history of geology. In 1788 James Hutton wrote a paper, "Theory of the Earth," which appeared in the first volume of the Transactions of the Royal Society at Edinburgh. In response to an attack on his conclusions, Hutton decided to embark on long excursions in the Alps, Scotland and England to gain evidence to support his paper. This was later published in 1795 in two volumes as Theory of the Earth with Proof and Illustrations. Journals and publications of the scientific societies were the most important means of publicizing scientific work in the eighteenth century. The societies had the ability to control what appeared - a potential restraint on the flow of information.

In the nineteenth century, geology faculties were established in universities and specialists began working in collective research. From 1820 to 1860 a number of Western countries published books and papers on the new methods of stratigraphical paleontology. Fossil plants and animals were being examined. Thomas Jefferson, the first American-born geologist and paleontologist, published his earliest paper on fossil vertebrates in the Transactions of the American Philosophical Society (1797). The spreading of geological knowledge was expedited by the geological societies, which organized meetings and field discussions and published a large number of papers. The oldest was the Geological Society of London, founded in 1807. The second, the American Geological Society, was established in 1819 at Yale University. It was dissolved in 1829 and revived in 1888 by James Hall and later became the Geological Society of America in 1889. The Geological Society of Pennsylvania was established in 1832; the American Association of Geologists in 1840. The latter soon began admitting all scientists and paved the way for the American Association for the Promotion of Science, later changed in 1848 to the American Association for the Advancement of Science. One of its responsibilities was to convince Congress that a National Academy of Sciences was necessary to train scientists and disseminate scientific information. In Europe other important societies were being formed in France, Germany and Italy. The British Association for the Advancement of Science was founded in York in 1831. Its lectures publicized scientific problems and research and gained government and private support. A number of German scientists began to organize international congresses and joint collaboration in such projects as charting the magnetic elements of the Earth's surfaces.

The twentieth century brought forth the establishment of a number of scientific societies - national, state, local. Although it is not possible to name all those organizations whose contributions are significant to the earth science literature, I would like to highlight a few not mentioned previously. The American Association of Petroleum Geologists was organized as the Southwestern Association of Petroleum Geologists in Tulsa February 10, 1917. The name was changed at a meeting in Oklahoma City in 1918. Early in 1913 E. L. DeGolyer, chief geologist for the Mexican Eagle Oil Co. at Tampico and a temporary resident of Norman, had proposed the organization of a geological society as a University extension. The first meeting in January, 1916 was a gathering of geologists of the Southwest. Only a few petroleum geologists attended. A number of the papers read at the meeting were later published in volume one of American Association of Petroleum Geologists Bulletin. The second meeting, in Tulsa, February 9-10, 1917, led to the permanent organization of the petroleum geologists of the Southwest. The program called for discussion of geological reports. Among the topics, still timely, are: Future of geology in the Southwest; problems of the state surveys. Through the years the AAPG has maintained an extensive publications program in petroleum research.

The American Geological Institute, a federation of twenty societies in geology and geophysics, has been actively involved in education. It sponsors a minority scholarship program, offers career information services, makes surveys of interest to geoscientists, issues publications, publicizes its GeoRef database and has taken a leadership role in earth science education for grades K through 12. Its monthly periodical Geotimes contains articles of interest to the lay public, as well as professionals.

The International Union of Geological Societies, founded in 1961, is one of the largest and most active nongovernmental scientific organizations in the world. It promotes and encourages the study of geological problems, especially those of worldwide significance. It sponsors the International Geological Congress held every four years, as well as the International Geological Correlation (and) Lithosphere Programmes. Its official quarterly journal is entitled Episodes.

Society publications in the earth sciences encompass a wide variety of formats and types - proceedings of symposia, standards, handbooks, field manuals, field trip guidebooks, dictionaries, directories, databases, lexicons, treatises, short courses, memoirs, reports, lectures, biographies, bibliographies, stratigraphic codes, maps, videos, and digital products. From the distinguished Decade of North American Geology series of the Geological Society of America to the field trip guidebooks of the Tobacco Root Society, present day societies are continuing the tradition of information dissemination and moral support established by the early associations several hundred years ago. We acknowledge and applaud their efforts.

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# FAX, E-MAIL, DISKETTES, SOFTSTRIP, AND CD ROMS... OUR COMMUNICATION REVOLUTION?

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Abstract--The communication revolution is upon us. Gone are the days of leisurely letter writing; gone also is the written record of the development of ideas. The scientist of today needs up-to-date data and information and needs it immediately. This is accomplished via interlinking communications networks such as BITNET. FAX allows an almost instantaneous transfer of illustrations and text. Computer programs and data can be moved efficiently and effectively by diskette or softstrip or even downloaded directly from a communications network or connecting telephone line. Databases and bibliographic sources are as close as the nearest telephone line. CD ROMS are available for those without special telephone access. Even overnight mail now is no longer fast enough as direct exchanges are accomplished electromagnetically. This instant availability of data and information is changing the way in which scientists communicate and do research. It has changed the way in which libraries operate and it is beginning to affect the manner in which organizations distribute information and their publishing practices. Bulletin Boards are a popular way to distribute news. Authors are increasingly responsible not only for the content of their work but also for the preparation and formatting of the material for publication. This accelerated pace of the Information Age will continue in the future as geologists and geological organizations adjust to cope with the communication revolution.

## Introduction

FAX, e-mail, diskettes, softstrip, and CD ROMS and to that list should be added laser discs. All of these items are ways in which to facilitate the work of the earth-science researcher. And what started it all - the computer, especially the microcomputer or PC as it is affectionately known.

We might just take a quick look at the developments that have led up to this communication revolution which we will call it, and which is part of the Information Age. It really started with Babbage - one of the three Charles' in geology's golden age of the 1820s and 30s. Charles Babbage had this idea of processing data without human intervention and therefore designed his calculating machines - the Difference Engine and Analytical Engine (Table 1). With WWII came an accelerated growth of the computer industry as the result of the war effort. The first mass-produced computer was

Table 1. Important Events in Computer Applications in Geology

| | |
|---|---|
| 1642 | Blaise Pascal devised a calculating machine |
| 1694 | Leibniz's machine to multiply and divide |
| 1804 | Jacquard loom used punched cards |
| 1812 | Charles Babbage gets the idea of calculating machines |
| 1822 | First working model of Babbage's Difference Engine |
| 1834 | Babbage starts work on his Analytical Engine |
| 1842 | Ada Augusta "writes" the first program |
| 1890 | Punched-card system developed by Herman Hollerith |
| 1941 | Z3, the first electronic computer |
| 1944 | Mark I put into operation at Harvard |
| 1945 | John von Neumann's idea of stored memory |
| 1946 | ENIAC built at the University of Pennsylvania |
| 1949 | The first stored-program, digital computer, the EDSAC |
| 1951 | UNIVAC the first commercial computer |
| 1952 | Digital plotters introduced |
| 1953 | First FORTRAN compiler written |
| 1954 | IBM 650, the first mass-produced computer |
| 1958 | W.C. Krumbein and L.L. Sloss published the first geologically oriented computer program in a major geology journal |
| | Transistorized 2nd-generation computers introduced |
| 1961 | Establishment of GeoRef |
| | Arizona's *Computer Applications in the Mineral Industries* |
| 1963 | Announcement of 3rd-generation microcircuit computers |
| | Kansas Geological Survey Special Distribution Publications |
| 1964 | More than 100 papers on computer applications in geology |
| | BASIC introduced |
| 1966 | Kansas Geological Survey Computer Contributions |
| | Kansas' Computer Applications in the Earth Sciences Colloquia |
| | AAPG Associate Editor for Computer Applications |
| 1967 | AAPG Committee on Computer Applications |
| | COGEODATA (IUGS) formed |
| 1968 | IAMG founded in Prague at the IGC |
| | Journal Mathematical Geology of the IAMG |
| | GEOCOM Bulletin |
| | USGS Computer Contributions |
| | Computer Applications in the Earth Sciences a book series by Plenum |
| 1970 | SEPM Computer Technology Group |
| | First 4th-generation machines utilizing VM |
| 1972 | Syracuse University establishes a series of Geochautauquas |
| 1973 | GeoRef goes online on SDC ORBIT |
| 1976 | Pergamon's Book series Computers and Geology |
| 1977 | The Apple II microcomputer |
| 1979 | Supercomputers, Cray-1, Cyber 205, and BSP are available |
| 1981 | MGUS holds their first meeting |
| | Announcement of 5th generation computers with AI functions |
| 1982 | Computer Methods in the Geosciences VNR book series |
| | The IBM PC microcomputer introduced |
| 1983 | COGS formed in Denver |
| | Denver GeoTech 83 sponsored by COGS |
| 1985 | Geobyte, a new publication by AAPG |
| | COGS membership surpasses 1,000 |
| 1986 | BITNET comes into general use |
| 1987 | IAMG inaugurates a memoir series |
| 1988 | SEPM forms a Computer Applications Committee |
| | First geology-oriented paper using a supercomputer |
| | FAX comes into general use |
| 1989 | The i486 chip is introduced |
| | First geology computer program published on softstrip |
| 1990 | Meta-analysis becomes available |
| | COGS Computer Contributions is merged with Computers & Geosciences |
| | SEPM introduces its Computer Contribution series |

the IBM 650 which was introduced in 1954. It was just shortly after that earth scientists began using this new tool. Along with use of the computer, it was necessary to develop an outlet for results of research using this new approach and several new publication appeared.

The first series to have a real impact on geology was the Kansas Geological Survey Computer Contributions that was published from 1966 to 1970. The Journal of Mathematical Geology was founded by the IAMG in 1968 followed by Computers & Geosciences in 1975. Parallel to these journals were several books series and soft publications containing proceedings of the many meetings of the late 1960s and early 1970s including the APCOMs, Geochautauquas, and the SEPM/Computer Technology group. Later in the 1970s, the microcomputer was introduced and then the computer revolution was in full swing. Shortly after the introduction of the micro, COGS was formed with their GeoTech meetings along with the new publications of AAPG's Geobyte and the SEPM Computer Contribution Series. Networking came into general use during the mid to late 1980s and FAX by the late 1980s. Floppy diskettes came with the microcomputers, followed in quick order by softstrip, CD ROMS, and laser discs. This is where we are now - today.

## Communication

Letter writing as a communication skill is about lost in the present-day rush of knowledge transfer. As a friend of mine said recently about time slipping past and no letter written - this can not go on "I consider myself to be one of the last living letter writers" - there is more truth to that statement than I care to believe. Communication has gone through a series of revolutions from scratches in stone and scribing to printing to telephone, radio, and television, to electronic transmission. Almost gone are the days of hand-written letters and even the use of a typewriter (with a correcting ribbon). We now are onto wordprocessors and e-mail. We have gone through visual communication of sketches and paintings to photographs and images to computer graphics. We have condensed the time of using these modern conveniences from weeks (or months) and days to minutes and seconds. An old fashion letter may take hours to write and days or weeks to deliver, but an e-mail transmission or a FAX can be done from start to finish in minutes (depending on the location of the hardware). Because of the ease in putting things together, I am afraid that we do not take the care in preparation that we once did.

Most researchers are dependent completely on communication both to receive information vital for their work but also on distribution of information to gain fame and fortune. Most researchers today fall into three categories, (1) those who research the literature with great care and historize their subject; (2) those who assume as stated years ago by the director of the Manchester Computer Centre, that 'there is only one place to be in science and engineering, and that is in the forefront, then there is nothing to read,' and (3) all the remainder in the middle ground who do some bibliographic work and give some credit to their geological forefathers. The first group can only keep up and research their area completely if the work is in a restricted and narrow subject area - otherwise the task would be overwhelming. AGI estimates that they are adding about 80,000 items to GeoRef each year with a total of 1½ million items currently in the database. The thesaurus and guide to indexing alone contains more than 20,000 indexing terms. Gone are the days of the good old natural scientist.

The second group probably is not giving credit where due as they lack the knowledge of previous work - and lets face it, most things are not that new and novel, so that many things are being recycled for the second and even the third time. It can not be denied that it may be cheaper and quicker to ignore previous work, but at a cost. So this group simply continues on - damn the literature and full speed ahead.

The third group is in the middle between the two extremes. For the most part they do try and give credit where due and build on previous work. Most of this literature search is done, not manually, but by utilizing databases such as GeoRef or GeoArchives. There are numerous problems with this approach ranging from poor searches to lack of money for a complete search. If the key words are not representative of the contents of the paper, it will not turn up in the search. And so it goes.

Most researchers probably do a reasonably good job at tracing ideas through the literature and giving credit for previous work. They also depend on others in their field to help by keeping in touch and exchanging information on the status of their research and by use of peer review, which may turn up leads and papers not originally noticed by the author. This is where communications come into the picture. Although most of us probably communicate by mail or phone one a routine basis, we need to look at the possibilities and ways in which we can improve our communications, both to be better and faster.

What are some of the bad aspects of this communication revolution? We may be in such a hurry that we overlook important items, we may tend to be sloppy with the idea that we can clean things up later; we may get to depend on others to do our work for us, for example someone can do the literature search, someone else can do part of the experiment or field work, others can suggest sources of information or different approaches, and we can always depend on the word-speller in the wordprocessor to correct all the misspellings. In short, we may sacrifice thoughtful and careful work by relying on others and electronic and mechanical helpers. So a word of caution - saving time may not improve things.

## How We Communicate

Now how do we communicate? Well it is done both orally and in written form. We are concerned here with how it is accomplished, so we will be concerned only with written communication and how it is input, transformed, transmitted, and output. We can liken this process to letter writing - the input is the handwriting, the information stored on a piece of paper, which is posted, and the recipient receives a letter to read. Input can be by hand, typewriting, keyboarding, or scanning. The storage can be on paper, papertape, diskette, magnetic tape, ROMs, or laser disc. The transmission can be by post or electronically by FAX or e-mail. The output can be facsimile, printout, or displayed on a screen. With this revolution comes on the part of the user - apprehension, expenses (cost of hardware and software), and problems such as compatibility, use of standards, etc. None of these problems incidentally are inconsequential.

What just are some of these problems? Compatibility is a big one - different machines and software can not be interchanged. Scanners are maybe 95 to 97% accurate - not much of a problem unless millions of items are being input. Handwriting has yet to be interpretable optically. There is garbled transmission and nonreceipt of material. Diskettes and magnetic tapes fade with time or worse yet can be erased. E-mail may be read and then purged with no permanent record. You can get a batch of bad diskettes. And the list goes on.

First let us take a look at some of the good and bad points of each of these items on transformation of data by scanner or by hand. The positive features of scanning are that it is easy, quick, and almost anything can be read (Table 2). The bad points are that special equipment is needed and the material to be scanned needs to be of high contrast and clean. This automation offers much to transforming data manually which is labor intensive, expensive, prone to error, and slow. However, it lacks the on-the-spot ability to make decisions on corrections, additions, etc. that can be handled when under human control.

The transmission of data by FAX and e-mail is fast, relatively inexpensive, and generally available worldwide. The drawbacks of electronic transmission of material is that it is not permanent, it can be lost easily, and everyone on the circuit can read the contents (Table 3). The lack of privacy is a serious matter.

Data can be entered onto diskettes, softstrip, CD ROMs, or laser discs or, of course, by hand onto paper for visual inspection. Diskettes are used widely today because they are portable, semipermanent, and cheap (Table 4). Softstrip offers the same features except it is more durable and easier to reproduce and distribute. CD ROMs and laser discs have tremendous storage capacities and are 'permanent.' Visual material can be included which is a major advantage. The positive features certainly

Table 2. Transformation of Data

| | POSITIVE | NEGATIVE |
|---|---|---|
| Scanner | * Easy<br>* Quick<br>* Can Read Almost Anything | * Needs Special Equipment<br>* Certain Types Only<br>* Needs High Contrast<br>* Needs Clean Copy |
| Manual | * Make On-the-Spot Decisions- Corrections, Additions, Etc.<br>* Complete | * Labor Intensive<br>* Expensive<br>* Prone to Errors<br>* Slow |

Table 3. Transmission of Data

| | POSITIVE | NEGATIVE |
|---|---|---|
| FAX | * Fast<br>* Relatively Inexpensive<br>* Can Transmit Handwritten Material and Illustrations | * Not Permanent<br>* Transmission can be Garbled<br>* No Paper - No Print<br>* May Receive Junk Mail<br>* May Require Preparation |
| E-Mail | * Cheap (After Hookup<br>* Fast<br>* Converses in Realtime<br>* Worldwide | * Not Permanent<br>* Not Everywhere Available<br>* Mail Purged After a Time<br>* No Delivery with a Full Mailbox<br>* May Lose Everything if Mainframe Crashes<br>* No Privacy |

Table 4. Form of Data

| | POSITIVE | NEGATIVE |
|---|---|---|
| Diskettes | * Portable<br>* Semipermanent<br>* Large Storage Volume<br>* Erasable<br>* Cheap | * Erasable<br>* Fade with Time<br>* Compatibility Problems<br>* Bad Diskettes |
| Softstrip | * Permanent<br>* Durable<br>* Easy to Reproduce and Distribute | * Special Equipment Required<br>* Not Generally Available |
| CD ROMS | * Large Storage<br>* Permanent<br>* Can Include Visual Material | * Special Equipment Required<br>* Nonerasable<br>* Cannot "Browse" (without special software)<br>* Some Background Needed to Use |
| Laser Discs | * Immense Storage<br>* Lifetime Permanence<br>* Read / Write<br>* Browse Capabilities from Image | * May be Slow<br>* Expensive |
| US Mail | * Permanent (Depending on Paper)<br>* Personal<br>* Inexpensive<br>* Does Not Need an Immediate Response | * Slow<br>* Not Reliable |

outweigh the negative ones. The US Mail, when compared to these forms of data transmission, is slow and not terribly reliable, however it is permanent, personal, inexpensive (by comparison), and an immediate response is not implied.

So, in summary, e-mail is probably the fastest and cheapest method of transmission. FAX is better for accessibility (more people have access to FAX than e-mail) and hardcopy as poor as it is, is better than e-mail. Diskettes are the most widely used storage and they are portable. Although softstrip is the most permanent, it never has caught on as a viable method of transmission. CD ROMs have the most storage next to laser discs, which are not yet in wide use. Laser discs, however, are the wave of the future.

## Electronic Publishing

What can we say about electronic communication methods as applied to publishing practices? First of all, the continued rise in costs of publishing and the associated rise in cost of journals and books, makes electronic publishing practical and promising. Electronic publishing may one day displace hardcopy just for the economy - libraries have experienced a tremendous squeeze in recent years and are looking for cost-cutting and cost-saving ways. In fact, at least one journal has already gone electronic - Tetrahedron Computer Methodology. SEPM is the first of the geological societies to issue a publication series on diskettes and this is along with an electronic bulletin board for information distribution. Many journals now ask for, and some even require, a diskette be submitted with the hardcopy manuscript. Once the paper has been reviewed and revised all on diskette, the paper is edited and formatted and sent off for 'typesetting.' Some journals will even accept manuscripts submitted electronically to be downloaded on a PC and then processed.

A check with three publisher/processors - (1) a scientific society, (2) a commercial publishing house, and (3) a private cottage industry for manuscript processing revealed some interesting information. The scientific society will accept manuscripts via a modem or on a diskette either for a PC or Mac; color being the exception. They presently use a scanner on hardcopy manuscripts to eliminate transcription errors and to speed up processing. The commercial publisher currently has 12 journals, all in the US, that are processed using electronic transmission and diskettes - with more being changed over as fast as hardware/software is put into place. They estimate at least a 20% cut in costs after the automation is put into place for each journal. The cottage industry accepts manuscripts on diskettes in word format for either the PC or Mac. The manuscript is edited and formatted on the diskette and then printed out to specifications in final form.

## Summary

What has transpired in just the past 5 years for example? In hardware we have seen the introduction of the workstations, several new and more powerful mainframe computers such as the IBM 9000 line, wide use of optic scanners, and the introduction of 286, 386, and 486 microchips, improving the speed of computation. The generation time now for computers is about 18 months compared to 5 to 7 years just a few years ago. The 386-chip laptop now has the capacity of an IBM 7090 or 360/65! Graphics are the way, especially 3D graphics.

In software we have seen improvement and introduction of new and better operation systems, extensive use of high-level special programming languages, GIS, and new mathematical/statistical techniques. Networking has become widespread and FAX and e-mail are the communication form. Software has become more user-friendly and more readily available, especially through publications such as Computers & Geosciences, Journal of Mathematical Geology, Geobyte, SEPM Computer Contributions, and COGS publications and distribution center.

New approaches have been developed paralleling the advances in hardware/software. The workstation has given geologists an integrated look at their problems. As we have seen CD ROMs make available tremendous amounts of data at one's fingertips, networking has given e-mail, connection to supercomputers, and access to databases (both factual and bibliographic). Along with e-mail, FAX has improved our ability to communicate and communicate fast. Whether we like it or not, much of our 'substantial' information exchange now takes place through these communication networks prior to publication. It is necessary then to be linked into the network to be fully assessed of current events.

However for the permanent record, hardcopy distribution will be with us for a long time even though it is slower. In this respect journals will continue to serve a needed place in the overall scheme of information distribution.

What can we expect in the next 5 years? Undoubtedly there will be more hardware/software changes. Machines will become faster, more compact, and more portable. PCs will proliferate! Software will become more user-friendly, more readily available, and more powerful. Communications will improve and program/data exchange will be almost instantaneous and available to anyone wanting or needing them. Entire databases will be accessible to each user tied into the network or through CD ROMs or laser discs of line; bulletin boards will replace newsletters. Manuscripts will be submitted on or via the network - edited and made available online prior to hardcopy publication (if there is to be hardcopy). All phases of science will be faster, more intense, and require a better education and background than today. It will be a challenge for the users to be innovative and resourceful to utilize these new hardware/software advances efficiently and effective in solving earth-science problems.

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# APPROACH TO HIGH COST OF DIGITIZATION

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The high cost of technicians and technology related to digitization and ultimately the electronic manipulation and dissemination of data places most associations in an awkward financial position to compete with private industry, government and other better funded suppliers in the market place. The use of digitization and the ultimate manipulation electronically of data is clearly the wave of the future, and those who have traditionally disseminated a great deal of scientific information must find a vehicle for which their materials can be provided in this format. Toward that end, a liaison between associations and free enterprise companies offers an opportunity for associations to stay on the leading edge of technology without facing severe financial strain. Care must be taken in developing a proper contract which allows the maximum opportunities to the association while not restricting the free enterprise company. A clear definition of product and market is required to develop future goals for providing digital information. Additional support or in-house digitization at reasonable prices is also a possibility that will augment joint ventures and provide an enhanced attractiveness to commercial companies. Opportunities such as shared data bases, shared staff people, and other mutually beneficial interactions can only have a positive effect on such partnerships. In general, associations can provide a commercial entity with a unique position in the market place. Remuneration in a varied financial formula for the many potential products in the digital field will require a combination of a specific contract that also allows for flexibility and amendment as programs and possibilities present themselves during the terms of the agreement.

# THE ELECTRONIC GSA

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Abstract--Advances in communications and data management technologies offer significant, new opportunities for the Geological Society of America (and other, similar societies) to better serve its community in a cost-effective manner. Today these services include dial-up electronic mail and bulletin boards; a rapidly expanding national computer network (INTERNET); transfer, ingestion, and publication of digital manuscripts; digital publication of data and documentation too voluminous to be published with articles; and publication of maps as digital cartographic data sets. CD-ROMs offer a highly cost-effective medium for widespread distribution of large volume (650 Mbyte) data sets. It is proposed that the Society implement an electronic mail service, become an INTERNET node, and pursue pilot experiments focused on accepting and handling digital manuscripts, supporting data and documentation, and publishing digital data sets. It is further proposed that this activity happen in parallel with development of a plan for the 1990s and beyond that considers appropriate use of evolving communications and data handling technologies to enhance the Society's services at reasonable cost.

## INTRODUCTION

Existing and probable future capabilities in communications and data handling offer opportunities for the Geological Society of America to enhance and expand services to its community. Further, adoption of selected capabilities could be done at reasonable cost and even at cost savings relative to existing methods. Further, the younger membership, which has grown up immersed in the computer revolution, will expect such capabilities to be adopted. In this paper, several activities in communications and data handling are described that would move the Society rapidly into the electronic age. Further, the activities are divided into near-term and long-term proposals, largely to provide a way of letting the Society gain experience in communications and data handling before making major commitments.

## ELECTRONIC MAIL AND NETWORKS

There are a number of existing dial-up electronic mail and bulletin services currently available. For example, NASAMAIL was used heavily during planning of Magellan Mission to Venus and is now being used to coordinate science analysis. Much of the traffic concerning reviewer selection for the journal, *GEOLOGY*. is now accomplished by use of Telemail between the

Co-Editors and the Society's Headquarters. Further, the American Geophysical Union has used a dial-up service called KOSMOS for several years. The advantages of such a commercial dial-up system are clear. It could be used to facilitate communications among the Society's Committees, alleviating the need for some meetings and decreasing the length of others. It could be used by authors of submitted papers to inquire as to the status of their manuscripts, an activity that is just being used in *GEOLOGY*. Orders could be placed for Society publications. Bulletin boards could be generated that provide information on upcoming events and changes to those events. Thus, it is proposed that the Society initiate a commercial, dial-up electronic mail system and utilize it to help conduct Society activities.

Many of the Society's members are at institutions that are included on INTERNET, a collection of electronic networks that define a national system. INTERNET includes NSFNET and its components (e.g. MIDNET), BITNET, and NASA's SPAN and NSN. INTERNET provides a great deal of connectivity among institutions and is becoming a favored method of electronic exchange of information and data. For example, Washington University and MIT are transferring Magellan data sets at nearly 1 Mbit/second to facilitate analyses. MATHEMATICA POST-SCRIPT files are also routinely transferred between the two institutions. INTERNET will play an increasing role in transfer of information and data. It is thus proposed that the Society Headquarters become an INTERNET node for Society members to be able to communicate with Headquarters, place orders for publications, and access bulletin boards. Further, with the high baud rate and connectivity offered by INTERNET, it is also possible to access meeting schedules through the network.

## DIGITAL MANUSCRIPTS

Most manuscript preparation is now done electronically, using word processing software that typically includes an ASCII output option. This option replaces software-specific control characters with their ASCII equivalents, e.g. spaces in place of a tab-related control character to delineate indentations at the beginning of paragraphs. However, the current practice is to send a print-out of the final manuscript. The hardcopy is then key-stroked into a typesetting system. It is proposed that the Society explore acceptance of digital versions of manuscripts, using as a guideline that the file be in ASCII format, free of control characters. The files should be accepted via dial-up, electronic mail, INTERNET, and on a selected set of magnetic media (e.g. floppy disks). This activity should begin as a pilot effort for several manuscripts, using authors familiar with the nuances of word processing software and ASCII files. Based on experience gained from the pilot efforts, a plan should be developed and implemented that moves to operational acceptance of hardcopy or digital manuscripts, with a preference for the latter. Further, it is proposed that the Society explore, via a pilot effort, accepting graphics in digital form, using one of the popular graphic formats (e.g. POSTSCRIPT) or as raster (i.e. image) files. Again, the intent is to use a pilot graphics effort to gain experience in acceptance of both hardcopy and digital graphics, with emphasis on the latter.

Detailed guidelines will be needed for submission of both digital manuscripts and graphics to avoid problems. It is proposed that the pilot efforts occur over the next year or so, in parallel with long-term planning. The use of digital files should be in place and operational within a few years.

Finally, by the end of the decade, the Society should have in place digital versions of its journals. Digital forms of journals should be offered as an option for members. A highly cost-effective method for distribution of electric journal issues is the use of CD-ROMs, which cost a couple of dollars per copy. For example, NASA's planetary data, including radar mosaics generated from Magellan data, will be released largely on CD-ROMs. Each CD-ROM can hold 650 Mbytes of data.

## DIGITAL DATA SETS AND SUPPORTING DOCUMENTATION

The Society's Bulletin and GEOLOGY journals have seen the number of submitted manuscripts increasing at a faster rate than the number of pages available for publication has grown. Thus, the pressure to shorten manuscripts has increased. However, it is crucial to publish papers that either have relevant data included, or references to where the data can be found. For extensive sets, the key element is the Society's Repository. The Repository is designed to accept back-up data and to distribute the information upon request. Currently the contributions are in hardcopy form. In parallel with development of submission of digital manuscripts and graphics, it is proposed that the Society explore, via pilot efforts, submission of digital data and documentation to the Repository. A pilot effort is, in fact, already underway in that a manuscript describing a coordinated airborne and field geologic remote sensing field experiment is being prepared for submission to the Bulletin. In parallel, the digital data and documentation will be submitted to the Repository, using format standards developed by NASA's Planetary Data System. These standards, developed by the planetary science community, are relatively straight-forward and should be considered for adoption by the Society. Further, for this pilot effort the data will be placed on one CD-ROM for distribution. Finally, it is proposed that a similar pilot effort proceed for generation and publication of a digital map to be accompanied by a hardcopy version of the product.

## CONCLUDING REMARKS

The Society should take advantage of current and projected advances in communications and data handling to significantly improve its services to its membership. The propositions presented in this manuscript offer both pilot efforts to gain experience, and a set of longer term objectives. To implement the outlined tasks, the Society should establish an Information Systems Committee to consider these proposals, and others, and to ensure that cost-effective communication and data handling advantages are properly integrated into the Society's activities.

# THE VALUE OF SERIALS: RELEVANCE TO PRODUCERS AND CONSUMERS OF SCIENTIFIC JOURNALS

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*"Of making many books there is no end..."*
Okerson (1989), who borrowed from Solomon, King of Israel,
c. 950 B.C. *(Ecclesiastes 12:12)*

## ABSTRACT

An extensive study of serial publications in mineralogy, petrology and geochemistry has demonstrated that the *quality* of a journal is reliably indicated by its Impact Factor (IF), as reported by the *Science Citation Index (SCI)*. A serial's IF is highly correlated to *SCI*'s Immediacy Index, to the proportion of papers in that serial supported by research grants from the National Science Foundation, the U.S. Department of Energy, and the National Aeronautics and Space Administration, and even to the number of grants acknowledged *per paper*, as funded by these agencies. One measure of the *value* of a serial may be calculated by dividing the cost per source item or the cost per character by IF. Thus a more costly journal, if it is highly cited, will have a favorably low Cost/Quality index.

A study of 54 serials in "Geosciences," "Geology," and "Paleontology" (*SCI* categories) indicates that on the average IFs are slightly higher for journals published by professional societies than for those published commercially, for profit. But of great importance ot libraries, university financial officers, and taxpayers – though apparently of little or no concern to the all-too-frequently-publishing scientist – is the fact that subscribers must pay four times as much per unit for commercially produced serials. Society journals also have four-times more favorable Cost/Quality indexes and *much* wider circulation (up to 20 times as great).

Scientists should make informed choices when selecting a journal. And if university administrators would encourage quality over quantity and faculties would catch the vision, the "enormous pile of mill-tailings" that we call "the literature" (R. Roy, 1989) might be reduced to manageable, readable, and affordable proportions. Professional societies should be more aggressive in the serials marketplace, if for no other reason than the fact that Elsevier (750 scientific journals) just bought out Pergamon (400 scientific journals), and we all understand what that means for prices!

## INTRODUCTION

Okerson (1989) may make it into some citation index, but it is a safe bet that Solomon's (-950) original will not. It doesn't matter. For though he published prodigiously, Solomon never had to fight for tenure or promotion, a grant or a raise. Perhaps that freed him to speak his mind: "Vanity of vanities! All is vanity!" said he (Ecclesiastes 1:2). Most of us dare not accede to such a truth for fear that we would have to wrestle with *eternal* verities rather than relish the fleeting rush of a paper published, a grant received, or the temporal high of yet another dozen citations.

Which reminds me: this present paper might never have seen the light of day were it not for vanity—*mine* for desiring one more abstract, one more reference, and one more opportunity to speak before throngs of bleary-eyed conferees; *hers* (the now-President of G.I.S. and editor of this compendium) for wanting a full slate of speakers, a successful symposium (which it was), and a much-treasured proceedings volume; *yours* for presuming that you will be better informed for having read it. But perhaps I write into the wind, for much of what appears in the scientific literature today is never read by anyone. No wonder! Currently more than 38,000 science jounals give birth to two papers per minute. Gestation for these ranges from weeks to decades, though some are nothing but altered reincarnations of earlier entities. [Note that in 1971, 56% of all articles entered into the highly selective *Science Citation Index* had never been cited (Garfield, 1972). Imagine the rate of noncitation given that the science-serials "universe" expanded from 8,062 before 1978 to 37,683 in 1988! (numbers from O.R. Ivens, quoted in McDonald, 1990).]

This paper is a case in point. Begun as a presidential address to the Mineralogical Society of America (a momentous event in 1987, but not abstracted and thus not citable), this work or parts thereof appeared once in a scientific jounal (Ribbe, 1988a), once with "corrections and additions" (Ribbe, 1989), once with cosmetic alteration to create a unique ambiance for serials librarians (Ribbe, 1990), and now with a new look for this volume (Ribbe, 1991). Ecclesiastes 1:2!

The ideas presented here are not new (see Ecclesiastes 1:9), though some of the data are. From the current perspective of most research libraries in the United States, the serials crisis is heightened with each federal and state economic report, with the decline of the dollar on foreign exchange markets, and especially with each and every new or reconfigured paper submitted to a commercially published journal, of which the cost to libraries is expected to increase on the average of more than 20% in 1991.* Figure 1 graphically summarizes some of the problems.

Massive cancellations of subscriptions have already occurred. "The University of Illinois at Urbana-Champaign libraries cancelled 4,434 serial titles between September 1986


Figure 1. "Embattled Libraries" Modified from a woodcut by Pieter Bruegel, the Elder (1563)

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* Note added at press time: *The Wall Street Journal* (March 29, 1991) headline, "Elsevier to Buy Maxwell's Scientific Publishing Unit," portends even greater problems for U.S. libraries. A few quotations from that article: "Elsevier reported 1990 net profit of $259.2 million, up 58% from ... a year earlier. Elsevier's science division publishes about 650 journals and 750 books a year. The journals, with such forbidding titles as *Tectonophysics* ... are 'unreadable' for the layman. But the profit margins are around 30%." Pergamon Press PLC [acquired by Elsevier from Maxwell Communication Corporation for $764.9 million] "publishes more than 400 scientific journals and a range of reference books."

and November 1988 to save $438,057" (Librarian Carl Deal, quoted by Okerson, 1989, p. 19). And this will continue. The question is, "What journals should be cancelled, especially in the second, third or fourth round of cuts?" If they were just the expensive ones, the answer would be simple, because assessing the cost of a serial is relatively easy: to the U.S. dollar price of the journal add subscription agency costs (and whatever you may for processing, shelving, etc.). But what is needed is one or more objective measures of *quality* that can be combined with *cost* to help us in deciding the *value* of a serial.

## ASSESSMENTS OF QUALITY

### Language

One hesitates to be provincial, but because English is the language of ~88% of the half-million articles and ~96% of the 7.5 million citations listed in the 1986 *Science Citation Index* (= *SCI*) (Garfield, 1987), it is likely that a journal will not be considered highly valuable unless it is written primarily in the "language of science."

### Bibliometric Rating

*SCI*'s much maligned impact factor, which is basically a ratio between the numbers of citations and citable source items published in a journal, is a readily available bibliometric tool [at least it was until 1990 when the Institute for Scientific Information (ISI) stopped publishing it!]. There is no doubt that it has been misused (Archibald and Finifter, 1987), but as described in ISI's *Journal Citation Reports* (*JCR*) volume (1986, p. 10B), it is "useful in evaluating the significance of absolute citation frequencies," tending "... to discount the advantage of large journals over small ones," and of frequently issued and older journals over less frequently issued and new ones. The impact factor permits "some qualification of quantitative data;" it is "... algorithmic and objective, but nonetheless useful ..." Incidentally, the impact factor has a high positive correlation with *SCI*'s immediacy index, which is a measure of how quickly the 'average article' in a particular journal is cited.

I cannot emphasize too strongly that impact factors should be relied on to rate journals comparatively only *within* relatively constricted disciplines, such as "mineralogy" or "paleontology" or "exploration geophysics" but not *between* groupings in categories as broad as "geosciences" or "geology." Furthermore, I found occasional errors in the *JCR*'s reporting of numbers of source items that caused me only to use impact factors taken as averages over a 3 or 4 year period; those errors are usually – though not always – self-correcting.

### Competitive Financial Support of Research Reported in a Journal: An Example

For the years 1978 and 1979, the total dollar awards of the National Science Foundation's Division of Earth Sciences to the 82 institutions ranked according to "scholarly quality" by a National Council of Education survey, was highly correlated with

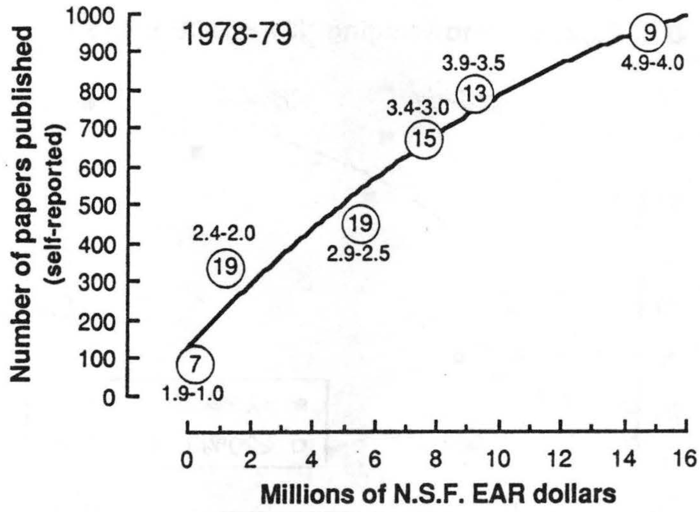


Figure 2. Self-reported number of papers published in 1978 and 1979 by 82 geoscience departments divided into groups according to the results of an assessment of the quality of research-doctorate programs in the U.S. (Jones et al., 1982). The ranges of "scholarly quality" are represented by small numbers; within the circles are the numbers of institutions in that quality range.

the number of published papers from those institutions (see Fig. 2). Grant money drives the publishing machine [at the rate of *much more than* 15,000 1979 dollars per paper for the nine "best" institutions, more, because they also received the giant's share of all other grants and contracts]. This came as no surprise, but it led me to test the following hypothesis: "The more prestigious journals report the more prestigious research which in turn is more heavily supported—not only by larger amounts of money but also by larger numbers of grants—than research of 'less importance'." For seventeen journals in mineralogy, geochemistry and petrology we perused the *Acknowledgments* sections of 4223 articles that had at least one author who gave an address in the United States in order to determine the source, or lack thereof, of financial support for the research reported in each paper for the period 1980-1988. Only federally funded sources were counted for most journals. For these disciplines, the dominant federal granting agencies are the National Science Foundation (NSF), the Department of Energy (DOE) and the National Aeronautics and Space Administration (NASA). If multiple grants or agencies were acknowledged, all were recorded in order to determine the average number of federal grants per paper. See Ribbe (1988a, 1989) for details.

The results are summarized in Figure 3a and 3b, in which the correlation of funded research with average impact factor is very obvious. I argue that this is convincing evidence for the usefulness of the impact factor as a relative measure of quality within a restricted population of scientific research journals.

## ASSESSMENTS OF VALUE

"Cost" is a purely objective component in our evaluation of serials, "quality" would appear to be somewhat less so, and "value" is generally much more subjective. A journal which one person disdains another may esteem or at least choose for reasons as trivial as

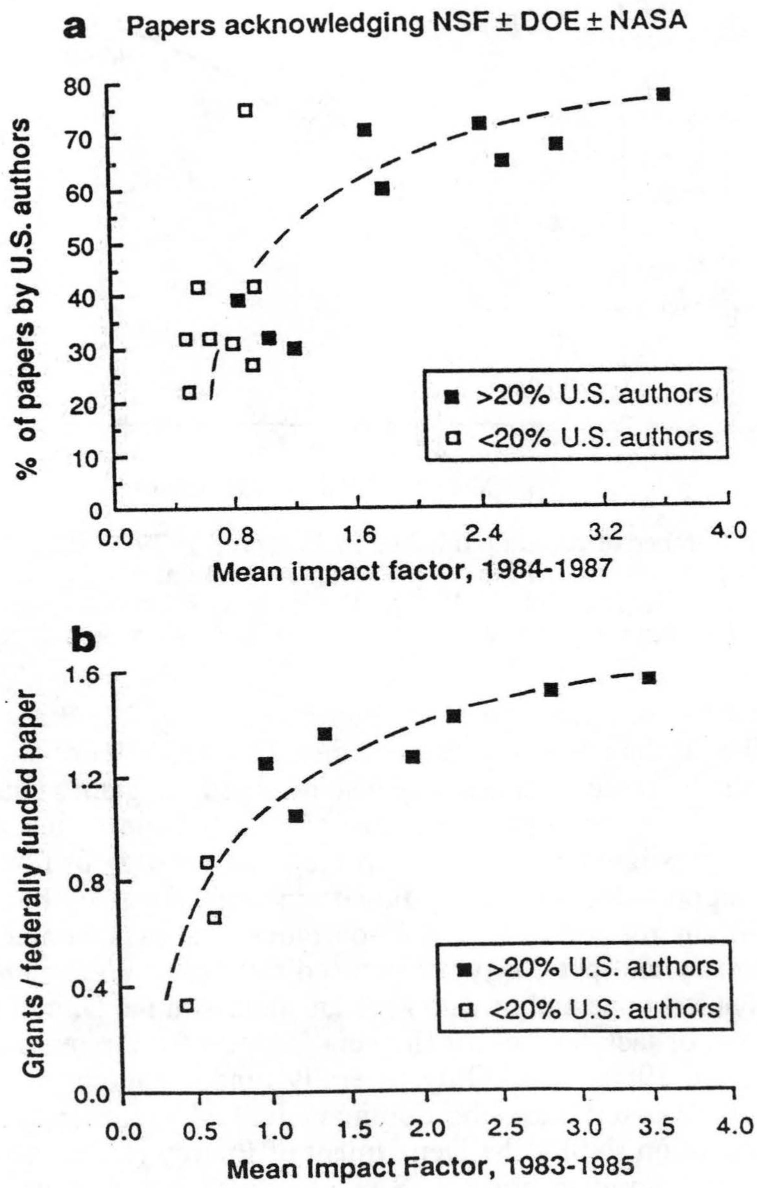


Figure 3. (a) Mean impact factors of journals for the years 1984-87 plotted against percentages of papers by U.S. authors who acknowledged research support from NSF, NASA, and DOE in the years 1980-88. (b) Average number of federal grants per paper, as acknowledged by U.S. authors in papers considered to be "supported", plotted against mean impact factor (1983-85) for eleven journals (modified from Ribbe, 1990, Fig. 3, p. 131).

personal vanity ("I am an Associate Editor of that [obscure, outrageously priced] European journal." "They accepted my paper with almost no hassle from reviewers and no suggestion to shorten it." "They published my work quickly—it's very important that the world see it within five to six months." Et cetera).

Nonetheless, I proposed that a rational way to to approach journal evaluation is to combine cost and quality in what I have called a Cost/Quality Index (C/Q-I). This was tested on 17 journals in mineralogy, petrology and geochemistry by Ribbe (1988, updated 1990). "Cost" was simplistically defined as subscription dollars per citable source item, and "Quality" as *SCI's* impact factor; C/Q-I = "Cost" divided by "Quality" Thus, a high priced commercial journal which is widely cited would be considered "competitive" with a journal published by a professional society, one, for example, that might happen to have a lower impact factor because – in addition to advancing the science – it serves an archival purpose. [The *American Mineralogist* is a case in point: 10-12% of the papers are new mineral characterizations.] This study indicated that two of the eight commercial journals had C/Q-I > 10, four between 3.5 and 5, one at ~1 and one (contracted with Pergamon by the Geochemical Society) at 0.5. North American societal journals had 0.5 < C/Q-I < 1.1, but C/Q-I's were all near 3 for their European counterparts; the disparity is due in part to unfavorable exchange rates and (as I learned from a former president) the fact that at least one of theEuropean societies uses the journal as their major money-making venture.

Another approach to the value question is to consider the journal's cost per 1000 characters divided by its impact factor. Barschall and Arrington (1988) did this – much to their sorrow – for physics journals. They used their own estimators of numbers of characters for the 1987 journal year (subject to an estimated ±20% error) and SCI's impact factors for 1986 (which are based on the average number of citations in 1986 of articles published in a journal in 1984 and 1985). Their results are plotted in bar-graph format in order to mask the identities of journals and publishers.

I divided the data in Barschall and Arrington's Table 3 into six equal-sized groups of 29 serials. And then I simply counted the numbers of commercial and societal journals and plotted the percent of the former versus the median cost/character for each grouping in Figure 4a. The results can be summarized by noting that the mean cost per 1000 characters to libraries for 65 societal journals is 2.54 cents but 11.6 cents for the 109 commercial journals. Using their Table 4, I constructed Figure 4b to present Barschall and Arrington's "Cost/Impact" (C/I) data. The 55 societal journals had a mean C/I = 2.1,, whereas the 95 commercial journals had a mean C/I = 9.2.

Recently I received a preprint of a paper on "The Effectiveness of Journals in Exploration Geophysics" by Brian R. Spies (accepted for publication by *Geophysics* for 1991). Spies' citation analysis is as detailed as any I have encountered and will be of considerable interest to information scientists. He uses cost per thousand characters in his investigation, together with an interesting new "value" parameter, namely, the number of citations per unit cost. The latter range from 27 for the largest circulation (21,000) and cheapest conventional societal journal to 0.3 for a low circulation (900) commercial periodical. He investigated one commercial journal, four that are society journals but published and distributed by well known commercial presses, and eight published by societies. His conclusions differ little from previous studies in regard to what I have called value.

For this study I evaluated journals in three earth science categories in *SCI's Journal*

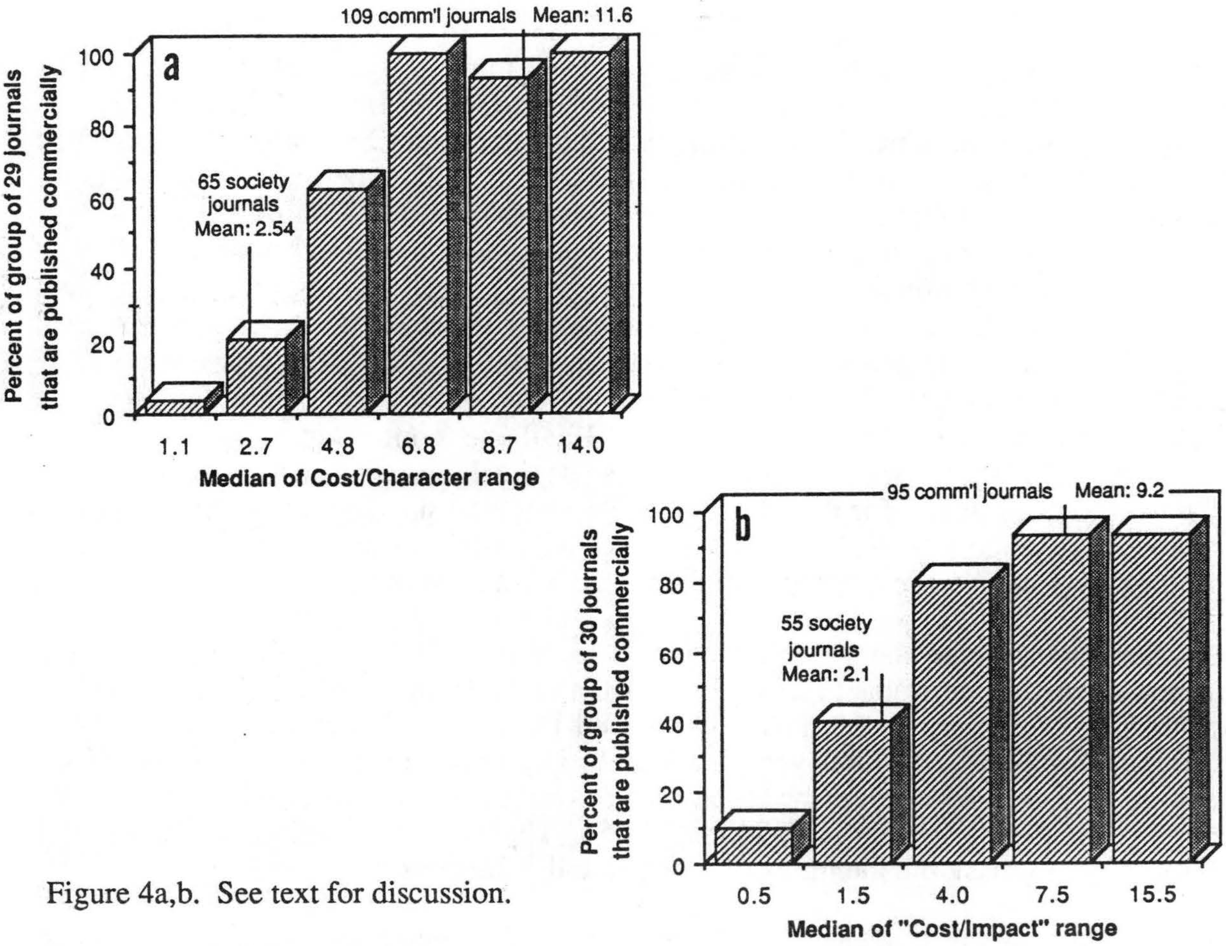


Figure 4a,b. See text for discussion.

*Citation Reports* for the years 1984-1988, 10 in "Paleontology," 20 in "Geology" and 24 in "Geosciences," including in the latter category 3 investigated by Spies (1991) and excluding from the latter two categories any journals that were in my survey of the disciplines of mineralogy, petrology and geochemistry. Rather than publish my bibliometric data (taken directly from *SCI's Journal Citation Reports*) and prices (taken from the journals themselves and converted to U.S. dollars with the help of *Statistical Abstracts* and the *Wall Street Journal* ), I will gladly make available hard copies or Microsoft® Excel files of my tables available to anyone who will promise to refrain from litigation after viewing the evidence, which involves the categories of Table 1 enumerated for each journal surveyed. Hopefully, the summary data of Table 1 and the bar graphs in Figures 5 and 6 convey the general message adequately.

Figure 5a shows dollar prices averaged for the years 1986-1988 for commercial and societal journals in the three discipline categories. The only surprise is the high average price of the societal "Geosciences" journals, but this anomaly disappears when price per paper is plotted in Figure 5b. On the average, commercial journals cost libraries about four times more per paper than societal journals – no news there!

Figure 6a shows that from category for category the populations of commercial journals in these data sets (Table 1) all have slightly lower impact factors on the average

Table 1. Summary of bibliometric and pricing data for earth science journals by SCI category.

| | *Mean values for 1986-1988* | | | | | | |
|---|---|---|---|---|---|---|---|
| | Impact Factor | Source items | Citations -all years | Immed. Index | Price to subscr. | $ per paper | Cost/Qual Index |
| **GEOSCIENCES** | | | | | | | |
| Grand mean, 24 serials | 1.89 | 113 | 2945 | 0.44 | 356 | 4.68 | 3.6 |
| Mean, 12 comm'l | 1.66 | 79 | 1469 | 0.30 | 445 | 7.44 | 5.9 |
| Mean, 12 soc'l | 2.11 | 147 | 4421 | 0.58 | 268 | 1.92 | 1.2 |
| Ratio, Comm'l/Soc'l | 0.79 | 0.54 | 0.33 | 0.53 | 1.66 | 3.87 | 5.00 |
| **GEOLOGY** | | | | | | | |
| Grand mean, 20 serials | 1.17 | 70 | 1382 | 0.26 | 196 | 3.42 | 3.6 |
| Mean, 8 commercial | 1.13 | 55 | 657 | 0.29 | 356 | 6.16 | 6.1 |
| Mean, 12 societal | 1.19 | 79 | 1865 | 0.25 | 88 | 1.60 | 1.8 |
| Ratio, Comm'l/Soc'l | 0.96 | 0.70 | 0.35 | 1.19 | 4.03 | 3.86 | 3.35 |
| **PALEONTOLOGY** | | | | | | | |
| Grand mean, 10 serials | 0.77 | 49 | 531 | 0.20 | 170 | 3.27 | 5.2 |
| Mean, 3 comm'l | 0.73 | 58 | 536 | 0.30 | 415 | 6.81 | 11.3 |
| Mean, 7 soc'l | 0.78 | 44 | 529 | 0.16 | 65 | 1.76 | 2.6 |
| Ratio, Comm'l/Soc'l | 0.93 | 1.31 | 1.01 | 1.89 | 6.38 | 3.88 | 4.43 |

than journals published by professional societies. But Figure 6b indicates that the Cost/Quality Index for those categories are widely divergent, with societal journals rating on the average 5 times more favorably than commercial journals for "Geosciences", 3.3 times better for "Geology", and 4.4 for "Paleontology." In order to use this quality-related information in judging among journals, data for individual serials should be consulted: the C/Q-I range for mineralogy, petrology and geochemistry is 0.5 to 15.3 (Ribbe, 1990, Fig.8), 0.3 to 18.1 for "Geosciences", 0.3 to 13.2 for "Geology", and 0.7 to 17.5 for "Paleontology." Clearly there are some journals that could be eliminated from collections based on these numbers. I repeat my offer to send these data to interested parties.

## IS CIRCULATION RELEVANT?

Should it matter to a scientist who chooses a journal in which to publish whether it has wide circulation or not? The logical answer is "Yes, of course." But this information is rarely available (Elsevier refused to give it to me for my 1988 study), and most assuredly those who submit papers to a journal do not have it, except perhaps in a general way. Serials of professional societies are understood to be widely distributed and perhaps for that reason even widely perused. However, editors of some societal journals have been slow to respond to new directions of the science in their respective disciplines, and the catchy, trendy titles of new, mostly commercial journals with free reprints, glossy format, and fast turn-around have attracted authors, if not subscribers, away from the traditional publishers. I feel sure that many scientists would be shocked to learn how few copies of the commercial journal are actually printed. But then there is the large contingent of authors who are primarily interested in another entry on their vita ... .

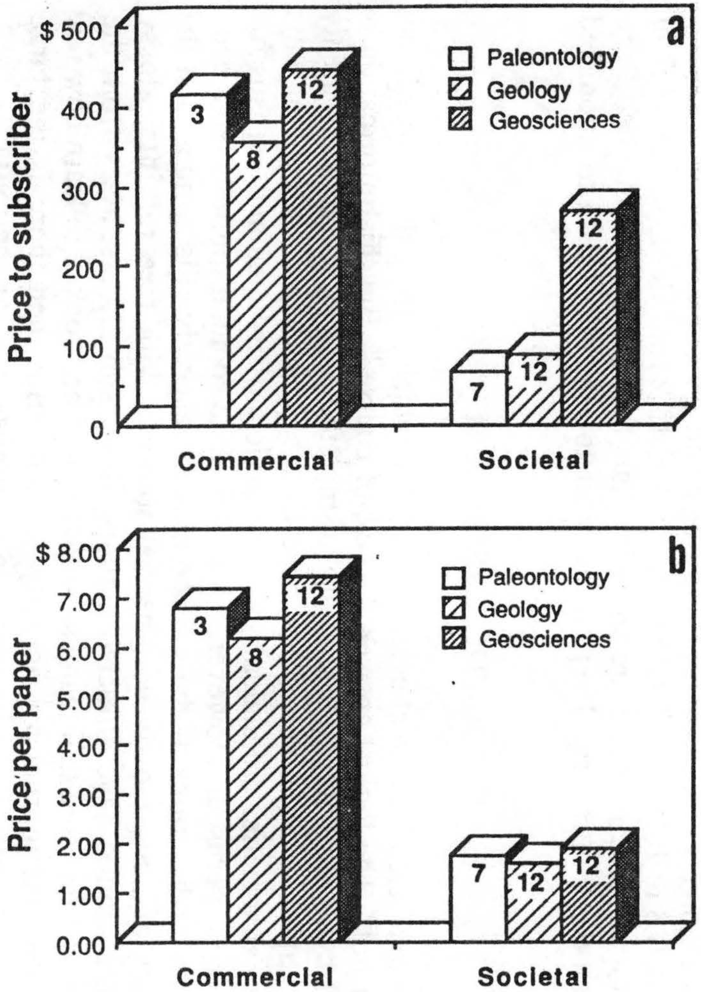


Figure 5. (a) Average price to the subscriber of commercial and societal journals for the years 1986-88. (b) Average U.S. dollar price per paper charged to subscribers for the years 1986-88. Imprinted on individual bars are the numbers of journals whose prices were averaged. Data from Table 1.

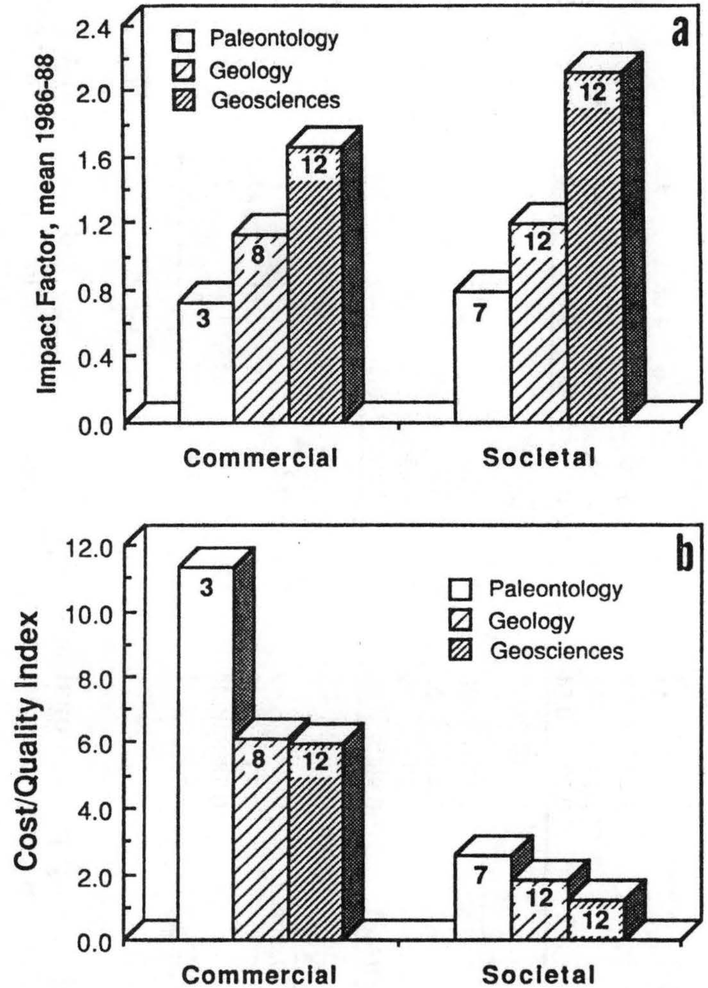


Figure 6. (a) Mean impact factors (1986-88) for the 54 earth science journals whose bibliometric data are summarized in Table 1. (b) Average Cost/Quality Indexes (1986-88) for commerical and societal journals.in the three disciplinary categories. Numbers on bars indicate how many journals were considered in each category.

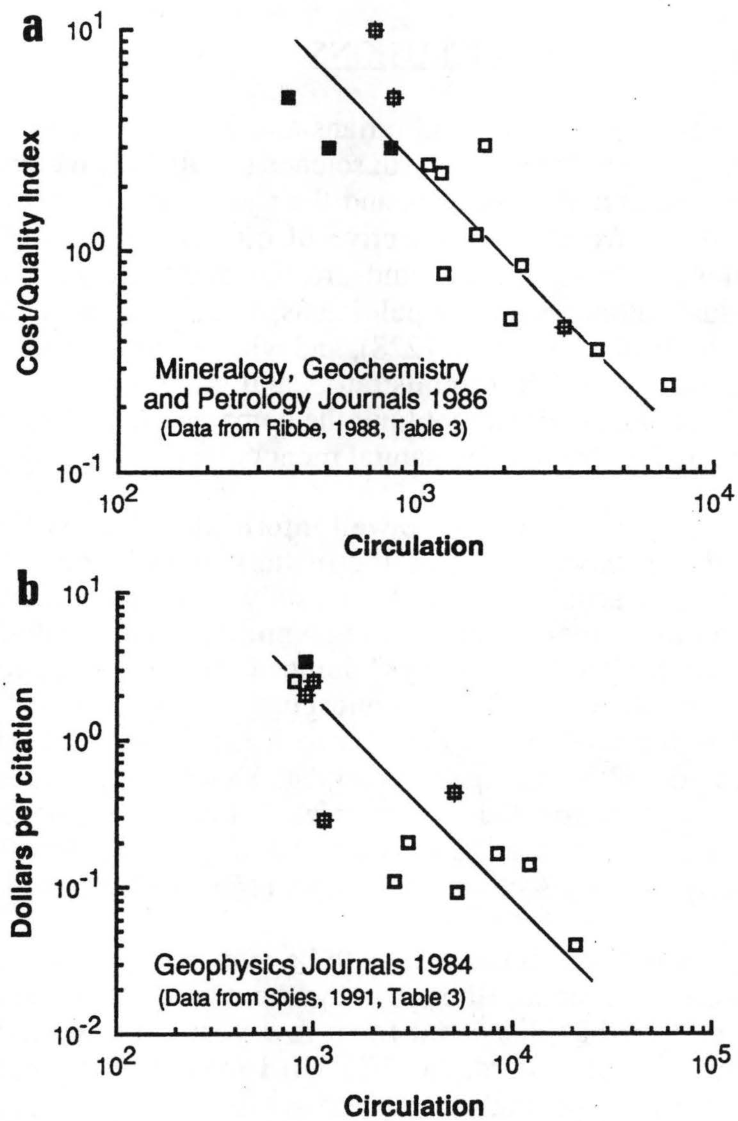


Figure 7. Circulation data for (a) 15 journals in mineralogy, petrology and geochemistry and (b) 12 journals in exploration geophysics. The former are plotted against Cost/Quality Index on a multilog scale; data from Ribbe (1988a) for the year 1986. The latter are plotted against dollars per citation, the inverse of Spies' (1991) "Citations per Dollar" index, for 1984. Filled squares indicate commercial serials, squares with crosses serials that are under the auspices of professional societies but published by commercial European presses, and open squares societal journals.

Figure 7 is a final comment about the "value" of a journal in terms of its general impact on a discipline. Here we see C/Q-I plotted against circulation for mineralogically related journals (Fig. 7a) and dollars per citation against circulation for journals in exploration geophysics (Fig. 7b). The facts that it takes multilog scales to show the relation of quality to circulation and that the commercially published journals dominate the low-circulation–high-cost-per-unit-impact end of both graphs ought to be communicated to those who both write and [presumably] read and use the scientific literature.

## CONCLUSIONS

I sense considerable frustration among librarians and the editors and science faculty involved in the publishing of not-for-profit earth science serials. On the one hand are the obvious facts about the professional societies and their journals: at least in geosciences they are four times "better" from the perspective of quality for the dollar than their commericial competitors. On the other hand are the enticements that commercial publishers offer individual authors, who like politicians, are most often motivated by pure self interest (Lewin, 1986; Ribbe, 1988b, p. 1228), and who are subject to intense pressure to publish from colleagues, academic administrators and granting agencies. And if we would cling to the capitalist ideal, we cannot fault the commercial publishers for trying to make as big a profit as possible from their "natural monopolies."

There remains a small hope that if we are well informed and are willing to take the time away from our other always-more-pressing matters, we will be able to convince administrators and/or faculty senates to require that only a limited number of papers be selected for presentation to promotion and tenure committees by a candidate for either. That might reduce the volume of "mill tailings" dumped into the literature (Roy, 1989). We may also be able to sensitize our scientific colleagues to the dilemma of the libraries – more cancellations of high priced serials may get their attention, especially if a few of their own sacred cows are led to the altar. Scientists should be reminded to act with integrity in regard to "shingling" and the "salami effect." I could rave on, but others have done it far more intelligently than I. Read the *Report of the ARL Serials Pricing Project* (Okerson, 1989) and the papers by Astle and coauthors referenced below.

I recently urged my own professional society to be more aggressive in the publishing business, and there was some response (though not without cost!). But the one topic for a new journal that our council has discussed for a few years now was set aside to be considered at a later time. Just yesterday (12/13/90) I received a formal letter from a European publisher of *expensive* journals asking me to fill out an opinion survey about "a journal devoted exclusively to the field of ------- ----------" that to their knowledge "does not yet exist." It was by the very same name that we had discussed among ourselves. So here we go again!

Acknowledgements — I thank Marianne Stern for help in garnering and processing data, and Marie Dvorzak for urging me on with a task I often weary of doing.

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# SOCIETY PUBLISHING AT THE MILLENNIUM

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**Abstract**

The primary function of a scientific society is to provide the infrastructure for communication between and among scientists. Much of that communication takes place through journals. Traditional society publications are threatened by changes in technology, economics and government policy. Society publications will change in response to these forces, but a far more important influence, the needs of the science and the demands of scientists will ultimately determine the direction of society publication.

Journals and books will not go away and they are not going to cost less. The volume of published material, in whatever format, is going to increase. The challenge will be to provide access to that material. Indexing and retrieval must become an integral part of society publication programs. Requirements for sophisticated graphic presentation and for interaction with the product will change publication formats. There will also be a need for better access to underlying data of scientific papers.

At the millennium, societies that are serving their members and their science will be doing much more of what they are doing now and much of it in more interesting ways.

## WHERE WE ARE GOING

We want to make three points for you. None of these by itself is likely to excite you. In fact, you may be turned off by each of them individually. But, taken together, we hope you will find that they paint an exciting picture of a challenging opportunity for scientific societies to increase their level of support for science at an unprecedented rate.

Our three points are:

First -- The survival and success for scientific societies depends on a workmanlike approach to beating the hell out of those who are in the business of "supporting" science for the money and not for the science -- whether they live in Amsterdam, or New Amsterdam.

Second -- Life is going to be different. Government will continue to create more problems than it solves. Consumer expectations will skyrocket. And technology will be a mixed blessing. Advancing technology will make life much more complicated and its use is going to improve knowledge handling, but it is also going to drive costs up, not down.

Third -- The essentials of scientific societies and their roles in knowledge handling will not change.

In order to paint this picture we won't make these points in order. Instead, we plan to discuss what a scientific society is, what makes it tick, and what we prefer to call knowledge handling, rather than information transfer. We want you to be convinced that scientific societies are not just important to communication, rather they are the heart of scientific communication and must remain so through the electronic age.

## HOW SOCIETIES WORK

Scientific societies are groups of scientists who have come together to advance science. Trade and professional associations are fundamentally different from scientific, scholarly or learned societies. The trade or professional association may speak about advancing the art and science of the profession, but advancing the individuals in the profession or advancing the industry is its primary goal.

The scientific society cannot legally be concerned with the professional advancement of its members, except insofar as that concern is directly related to advancing the science. When a petroleum industry trade association argues for tax incentives for exploration, it may suggest that it is motivated by the public interest in making resources available. But the association would not be there unless its membership stands to benefit economically under the proposal. When a scientific society argues for research funds before the Congress, it is not arguing for lining the pockets of its members; it is arguing for a research capability that will advance our knowledge.

The distinction in motive and resulting actions between a commercial business and a scientific society is much clearer than the distinctions between scientific societies and professional associations. Every commercial business has a responsibility to maximize profit for its owners. Decisions made by a commercial publisher, for example, cannot be optimized for the advancement of the science except in the unlikely event that the owners have agreed to forego a return on their investment.

The members of the board of directors of a scientific society, its council, governing board, or whatever, do not benefit individually from their actions. They are representing a broad community that expects them to act in the interest of the science. Committees of volunteers structure meetings and publications, public affairs programs, educational programs and awards to maximize their individual impact on the science. At the board level these programs are coordinated to optimize the whole. No individual decision is made on the basis of tax incentives, corporate profits, or personal pocketbooks. All decisions are driven by the "good of the science".

Scientific societies provide an infrastructure for the informal and formal communication of knowledge, for designating additions to the body of knowledge, and for assuring the availability of knowledge now and in the future. There is no other institution that can show a structure and a purpose that guarantees that the body of knowledge will be nurtured, defended and shared in the best interests of the science. Commercial concerns, universities, government agencies, and even professional associations, our distant cousins, have conflicting objectives that will at some point compromise any role they play.

## WHO PAYS FOR THE SOCIETY

You might say that the need for money will compromise any organization, even a scientific society. We believe the need for money should not compromise principle, but it will limit the extent to which the society can fulfill its mission.

Let us try to show you how AGU's budget reflects the principles a scientific society should adhere to.

AGU dues revenue is approximately $450K. The full membership costs exceed the dues revenue by more than $50K. If we were to raise the dues, we would decrease participation. The principle we follow is that access to membership rights and services should be as open as possible. This is an extension of the argument Conyers Herring [1970] made in his classic study of the economics of scientific publication. He showed persuasively that the availability of publications for distribution at incremental cost maximizes the benefit for society at large. The difference between the incremental cost recovered through dues and the full cost of membership can be made up through contributions and small surcharges to those who are not marginal purchasers. [See also Spilhaus, 1983.]

Dues for a scientific society that is meeting its obligations to the science should be very small. As one raises the dues for a scientific society, the potential member has to ask the questions -- what does this do for my science, and what does this do for *me*. The more important the second question becomes, the more likely it is that the organization is losing its integrity as a scientific society and its ability to serve as a trustee of the body of knowledge.

Meetings and publications should be the big revenue producers for any scientific society. AGU receives approximately $11 million from the sale of publications and related services. After expenses are paid, about $1.25 million is available for the support of science in other ways. There are no shareholders to drain the profits, and it is illegal to overpay executives.

The big net expense item for scientific societies is often the cost of "good works." Travel grants, fellowships, public information and other education programs consume AGU's publishing surplus. The scientific community must determine the appropriate balance between the reduction in benefit that results from raising the cost of meetings and publications, and the increase in benefit from the good works. These generally non-revenue producing activities need to be constantly highlighted and the balance checked and rechecked.

Endowments and gifts should be significant in every scientific society. The society should have as much call on charitable giving as schools, universities and churches. The advancement of science benefits mankind in ways very parallel to those of social and religious causes. And, why should an individual, who spends a lifetime contributing to science, not place as much value on the scientific society of which she may have been a member for as much as 50 years, as on the college that nurtured her for 4? It is not easy money, but it is our responsibility to pursue it. Gifts can make possible the "good works" that strengthen the fabric of science. The best way we know that a society can reduce the load on meetings and publications is to have significant unrestricted income from gifts and endowment.

There is a continuing temptation to raise prices in order to do just a little more good here and there. To resist that temptation, it is important to have firm policies that assure a relatively constant course through the years. An example of one such policy is AGU's maximum profit margin for revenue-producing projects. This policy is applied individually to each journal, book, meeting, or other product or service. Combined with the philosophy of incremental pricing, this policy helps maximize the effectiveness of AGU in advancing geophysical science.

A scientific society's job is to do what it takes to advance the science. That has and will mean a primary emphasis on knowledge handling -- from the enhancement of personal communication, through all kinds of more formal dissemination and on to storing information for the future. We don't see the electronic age changing that. There is no need for a new paradigm. Scientific societies should remain unchanged in their objectives and principles.

For over three hundred years scientific journals have been published with astonishingly little change. In the face of this long history of stability, it may even be presumptuous to think that there will be significant changes in the next few years.

Nevertheless, we would be negligent not to peer through the looking glass into our future.

## TECHNOLOGY UNCHAINED

Technology in particular is forcing us to look ahead. Our technological capability to handle information is advancing, perhaps, more rapidly than any technology ever has before it. As scientists we can store virtually anything, find it again, and transmit it anywhere. And all this without interference from middlemen like librarians, mail carriers, and publishers. There are electronic journals and bibliographic data bases. Sophisticated retrieval systems are the bread and butter of many entrepreneurs. There are examples of the application of electronic systems and media in all phases of publication. And there is widespread enthusiasm for digitizing more and more scientific publication. We believe that underlying this enthusiasm is a faith in technological promise that is untempered by economic and social realities. In this enthusiasm there is also some danger to the scientific enterprise as a whole.

The journal system works because, by and large, it is very well regulated. It is regulated by editors who represent both authors and readers; and it is regulated by the marketplace. [See Holoviak, 1988.] Scientific societies set the standards within which editors operate by maintaining a consistent course. But more importantly societies respond to the marketplace uniquely because their membership is the marketplace. The integrated interests of the science are represented at every level of decision making from selection of an editor to setting the price.

Some of the lure of electronic publication seems to focus on evading this regulation. For example, virtually unlimited storage and inexpensive access lead some to argue that editorial decisions can be left to the reader. At least, this is the argument in the extreme. Their argument continues by saying -- what is published with ink on paper is limited by what people will buy, and furthermore editors are bound by page budgets. We believe that soon the marketplace in the electronic world will settle down and there will be economic limitations. In the interim, however, there is a risk of turning the so-called literature into an ASCII-coded garbage heap through which researchers will have to sift at great time and expense.

The difficulty and cost of retrieval rise exponentially with the amount of material from which a given item must be retrieved, whether you are extracting it from a computer or from a library stack.

A scientific society's imprimatur serves as an important presorting criterion that should allow an individual scientist to focus quickly on a large fraction of the best and most important work. This recognition should not change regardless of the medium used for the output -- paper, film, electronic, whatever. A society's reputation for quality will be recognized in electronic systems just as it is on the shelf. Again, no change in principle.

Electronic networks offer an excellent opportunity for rapid, informal exchanges, but most meaningfully among scientists who know each other. When we know each other, we know how to discount each other's claims, and how to read between the lines for more information. The electronic networks are expanding rapidly and are likely to lead to a faster pace in research; however, for formal publication of research results, the electronic networks will be unsatisfactory. Expansion beyond the circle of those who know each other, and who are already successfully communicating informally, is unlikely to be sustained, because such broadcasting of unreviewed and unedited material will ultimately take too much of the user's time.

Scientific societies must eschew exclusively electronic dissemination. Electronic dissemination discriminates against those who do not have the special tools required to access the system. It discriminates not on the basis of ability to contribute or learn, but on the basis of geographic accident, material wealth, and habit. Ideas are generated by people; ideas do not respect national boundaries, economic or political status, or birth date. As scientific societies we must assure that the basis for doing good science is available to everyone who can contribute to that science.

A large fraction of publications are now converted to electronic form at some point in the production. As a result it is becoming convenient to ship manuscripts around to reviewers electronically. We caution that in doing so the system must not limit the set of people who are involved in the process and thus forego ideas.

We have no doubt that scientific journals will be disseminated electronically, but that will be only one of the media used. Ink -- or its equivalent -- on paper -- or its equivalent-- will still be with us at the millennium, and we venture to guess that it will still be the medium of choice around the world. Where the printing is done may change dramatically. It is quite conceivable that, as technology advances, there may be far more local printing than is even now supported by the photocopying industry.

The most important short-term contribution of electronic media will, we believe, be improved access to the literature. Providing this improved access to its constituents through specialized services will be a very important new facet of scientific society activity and will strengthen the infrastructure and hence the science. This new activity will be undertaken with the imagination that comes best from society committees working together with a single objective, advancing the science.

The other major innovation will be providing information in a form that will encourage the user to interact with it. The ability to replot data is the simplest example. A geologic cross section that you can modify with your own interpretation is another. These are still only the beginning of what the future will hold.

At the millennium information is likely to be available in a number of different media. Life will be more complex and more expensive. The additional expense is only justified if it improves productivity. The imagination of society committee members will set the course, and the marketplace should determine the results.

## ECONOMIC BUBBLES

There seems to be a widespread perception of an economic necessity for change. Everyone is complaining about the cost of publication -- librarians, individual readers, and authors. In the 50's, 60's and 70's the voracious appetite of the library community for journals fueled an explosion of titles and encouraged the publication of marginal materials. Long years of buying this material has made it seem a necessity. We question whether there is hard evidence to support the claims of these needs. Are they supported by citation statistics? Are readers buying value? Encouraging marginal publication is not a practice responsible societies should engage in.

No doubt the economic squeeze is now on. It is harder to get grants. Library budgets are not going up as fast as journal subscription prices. A combination of a more productive scientific community and the pressure to publish has increased the volume of literature. Universities are raking in more overhead; environmental concerns, regulation and increasing societal costs are all contributing to an inflationary environment.

From inside the scientific communication system, the only answer lies in getting more for our money. This means understanding the quality, timeliness and cost tradeoffs. And using this understanding fully when making every knowledge handling decision. If a journal does not provide value,

-- don't buy it
-- don't contribute to it
-- don't review for it, and
-- tell your friends.

In the long run the journal will improve or disappear. Indices such as citations per dollar, impact factor, and dollars per character help show the quality/cost relationship.

As the bite hits the owners of commercial concerns, they will insist that the company scramble harder. That means raising prices and selling harder and doing everything they can to defeat the competition. Societies are going to have to do even more. We must take on the Maxwells, the Meads, the Dialogs and the Elseviers. We societies must beat them consistently with quality, timeliness and cost. We can do so because our team is the scientific community; money isn't enough in this game. We have a duty to science to assure that every cent realized through the distribution of scientific knowledge is fed back into advancing science.

Scientific societies must take great care in their relationships with commercial entities. A society can fulfill some of its knowledge handling responsibilities through contracts with commercial organizations, but only if the contracts are right. Services provided to the society for a fee by an efficient and effective commercial operation are essential. For example, most scientific societies must purchase printing services, and will purchase analogous data transmission services in the electronic age. The society, however, cannot escape the full accountability for the results and must retain the ability to change vendors if needs are not met. A scientific society must control the decisions that affect the quality of the products bearing its name; it must set the price and must have control over dissemination for posterity.

So long as a journal has AGU's name on it, AGU will control the editorial decisions, will set the prices, and will retain the rights to future dissemination. Only then do we have the tools to fulfill our responsibility.

It is unconscionable for a society to take the information and knowledge entrusted to it and turn it over to a business entity to exploit for commercial purposes.

We are particularly concerned about the pressures on small societies to contract with commercial entities in ways that diminish the control of the scientific community on the dissemination of knowledge. There are alternatives such as the services offered by Allen Press in Lawrence, Kansas. Large societies may also supply such services to related organizations in order to do a better job of meeting the needs of the entire field.

Let us extend our argument to partnerships with commercial concerns that undertake electronic dissemination. We believe these partnerships must be viewed with great suspicion. Turning over a tape to an on-line vendor who sets an hourly charge and pays a royalty is very dangerous. It violates the principle that you should set the price, and it gives someone else control on distribution. Is the prime interest of the contractor to advance science? Probably not! Consider what happens when a flat royalty is accepted for a CD product, or for that matter a printed journal, with up front costs borne by the vendor. As soon as sales income exceeds costs, the vendor will be coining money with the scientific community's silver.

The electronic age will not bring an economic panacea for libraries or anyone else. Journal publishers, in particular, have disincentives to greater use of electronic media. Journal publishing is a money-up-front game. The subscription fee is paid before costs are incurred by the publisher. In many scenarios electronic dissemination means payment only when the material is used or by royalty a year after production. In these cases the risk is substantially increased and the investment costs magnified. Higher risk means higher prices. The prospect of higher prices causes responsible people to think twice.

## THE HEAVY FOOT OF GOVERNMENT

The U. S. government, given its unwieldy frame and volatile temperament, is a very likely candidate to wreak havoc on the entire scientific enterprise. The support of huge projects is a favorite trick of government agencies, like

NASA, for keeping us off balance. Since government funds are effectively unlimited and the power they confer can be capriciously exercised, we ought not permit large government-funded projects to dominate our intellectual endeavors. Government funds are controlled by politicians -- that means they are going to be turned on and cut off for political reasons. This in turn means de facto political censorship of any government-sponsored activity. We do not think that science can afford censorship or political restriction of any kind.

We can also anticipate changes in laws and regulation that will alter the structure of the economy. If the copyright law is not maintained as a balance of rights in spite of the fact that there are more voting users than voting owners of intellectual property, then there can be no information industry or information economy. The copyright law must command the respect it deserves by regulations implementing this fundamental constitutional right. During the coming decade ensuring respect for copyright around the world will be critical. If any major country elects to pirate scientific journals rather than to purchase them, the burden of covering the cost for publication is placed on those who are not large enough to make such piracy economically viable and on those who respect rights to intellectual property and recognize the need to share the cost of information dissemination. Developing countries will be particularly hurt by the higher prices forced by the withdrawal of major countries from the market.

Incidently, the federal government also competes in the information marketplace. Numerous government publications preempt the market for more cost effective private publication. Would that the agencies responsible for this publication could recognize the advantages of using the scientific community, through the societies, to make their output more cost effective.

## WHAT'S IN THE STARS

In the coming decade societies will be doing more for science and scientists. Scientists will interact with the material more, and we will have easier access. These new capacities will raise costs.

Ink on paper will survive, however. It's cheap and it's reliable. Equipment obsolescence is scary. Have you tried to use an 80 column card lately? If you know the language, you can still read the Dead Sea scrolls from millennia long past. Can the same be said for many magnetic tapes that were produced in the 1970s, less than 20 years ago?

In spite of the fact that the capacity of government to wreak havoc is almost unlimited -- that the economics of scientific publishing are poorly understood and -- that the economic outlook for the world is at best uncertain and -- in spite of the fact that over the next ten years there will be significant advances in the technology that can be applied to handling knowledge, we believe that scientific publishing will not be revolutionized. It will evolve. It is the responsibility of the scientific societies to play the key role in this evolution.

Many publications will not survive. The fat may be cut out of the system. The publications that survive will come from the societies that maintain and upgrade their input standards. The best societies will assure that all new work and all new ideas that are based on sound research are published and are accessible no matter how divergent the results are from current thought. Those who meet these criteria while building a financially sound program will provide strength and vitality to the research process.

Survival and success depend on direct confrontation with those who would like to milk science for their own pocketbooks.

We are moving into a new world which will be very challenging. This new world opens extraordinary opportunities for enhancing the productivity of scientists. Societies are best equipped to make the most of these opportunities.

If scientific societies change their principles, they will betray their constituents. Scientific societies are the forces of good and are well equipped to wage and win the battle. Science will be the beneficiary.

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# PART II

## TECHNICAL SESSION:

## GEOSCIENCE INFORMATION - CURRENT ISSUES

# APPROVAL PLANS

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**Abstract**--This is an explanation of a particular form of library acquisition that is commonly used today in university libraries. The major types of acquisitions are defined. Why approval plans came to exist is explained. The organization of a typical approval plan is explained. Report on an informal survey of geoscience librarians is given. How libraries and vendors cope in the present situation of extreme high materials costs is noted.

## INTRODUCTION

This talk is mostly a summary of personal observations and opinions. It is meant to be a broad-brush overview of one type of acquisitions. The methods used to research this paper were a review of the literature on the subject and interviews of 10 geoscience librarians, four vendors, and one publisher representative.

## VENDORS, APPROVAL PLANS, ACQUISITIONS

There are a variety of ways materials are acquired. The first is the FIRM ORDER, an order specifying time and price limits. It is firm and will not be withdrawn or cancelled. The second is the STANDING ORDER, where a publisher or jobber supplies all in a series or all works of a particular subject. These are similar to firm orders in that the library is not permitted to return the material. Standing orders to a specific series are also known as SUBSCRIPTIONS. Third, there are BLANKET ORDERS where publisher or distributor supplies all that's published; Some libraries call some of these blanket orders GLOBAL SUBSCRIPTIONS; these are a package deal to get all that a given agency publishes. Two examples of global subscriptions are various contracts for U.N. publications that are made with the U,.N.'s marketing department, Unipub, and the subscriptions for monograph publications of the National Academy of Sciences. Blanket Orders and Global subscriptions are firm, in the sense that materials may not be returned.

Libraries send orders to a variety of sources: publishers or issuing agency direct, and to vendors of various types. The three major types of vendors are: SUBSCRIPTION AGENTS who deal primarily with journals and monograph series--not too many these days, probably less than 10 major national agents in this author's estimation. The second type are FIRM ORDER VENDORS, booksellers who specialize in supplying firm order books. These vendors also do some standing orders, usually for numbered monograph series. The third group of vendors of which there are at most 9 left in the U.S. today, are vendors who not only do firm order and standing order business but also approval plans.

Acquisitions librarians must become very skilled in determining where to send orders. No one subscription agent usually supplies all standing orders well. In the monograph world, there are also many factors to consider. For instance, some firm order vendors are more persistent at tracking down small society publications than others.

There are specialty vendors, most notably in medicine, art catalogs, law and government publications. This is all in addition to the many out-of-print dealers who specialize in a variety of subjects as well. There has been a definite trend in academic acquisitions toward one-stop-shopping in both subscriptions and monograph orders. However, all ordering cannot be this way. Most research libraries have specialty collections and must use a variety of sources to acquire materials in these subjects and formats. Michigan State University, for instance, has the largest comic book collection in the western world; the Libraries' send orders for these materials to many types of vendors and publishers. It is important for the subject specialist to be aware of the pitfalls that acquisitions librarians must go through to get their materials. An example of an acquisition problem that is common in the geosciences is that of prepayment. Many of the small societies and agencies from which we must buy geoscience publications demand prepayment. Prepayment is extremely difficult for large bureaucracies to handle. Therefore it is common for geoscience orders to be sent to vendors who will do the prepaying and send the book and invoice to the library. It is important to find a vendor who will handle this type of acquisition well.

The final type of acquisition and the one that is the focus of this paper is the APPROVAL PLAN.

The approval plan is different from subscriptions and firm orders. A dealer selects and sends shipments of books to the library. After an agreed amount of time the library returns those books that are not wanted. A plan may be a combination of books and slips (slips describing the book) or exclusively one or the other.

Although there are historical roots both in the U.S. and Great Britain going back over 100 years, approval plans that exist today in many libraries throughout the world originated at the time of the great expansion of higher education in the late 1950's early 1960's when American academia, their libraries, as well as the output of commercial presses, expanded rapidly. There was not enough library staff to keep up with the amount of book selection that was needed. Approval plans were a deal whereby vendors selected and sent to the libraries shipments of books each week. Two key elements made these plans different from other types of acquisitions. First, vendors passed on some of the discount which they got from the publishers. Second, vendors negotiated a deal with the publishers so that they could return those books that their library customers did not want. A third important element was the selection service that many academic libraries needed. Approval plans developed in the days of rapid expansion by being generalists--supplying most of the trade literature in all subjects.

This "lets' make a deal" phenomenon also came at the time when libraries were changing how book selection was done. Until the 1960's much selection in academic libraries was done by faculty. But when the era of expansion began, faculty could not keep up with the increase in number of areas to be covered. Library directors were concerned that all subjects were not being covered and tried to wrest control away from the faculty. Yet at the same time many libraries did not have the staff to do all selection. Thus approval plans were a major help.

Magrill (1989) and Spyers-Duran (1980) provide excellent introductions to the basics of acquisitions and the history and development of approval plans.

Approval plans deal with trade and university publications only. Trade books are products of commercial publishers as distinct from society, institution, or government agencies. It is a truism in geoscience librarianship that the trade publications are a small part of the total amount acquired for a geoscience collection. Rosalind Walcott, in her study of almost 2,000 U.S. dissertations submitted between 1981 and 1985, found that about one third of citations in those theses were for materials produced by commercial publishers, whereas university press and museum publications accounted for 14%, geological survey publications for 11% and society publications accounted for 41.5% (Walcott, 1990. p.4)

At what point does it become worth while to have an approval plan? I asked vendors why special libraries in the earth sciences, for example oil company libraries, did not use plans. Reasons given were: first, all said that special libraries often want speed and fast delivery with no or little concern for price so these libraries order direct to publishers. Second, these libraries order a large portion of materials in response to user suggestion rather than by librarian initiative. Third, these are small, low budget libraries who buy very selectively. The combination of all these reasons prevents such libraries from entering into approval plan agreements. Large special libraries do have plans. Moreover, vendors remarked that the special library sector was simply a yet untapped market that has not yet been developed by the book seller sector. It was just a matter of time before more special libraries would be making approval plan deals, said two vendors.

A library staff who might consider using an approval plan should talk to the vendors and then talk to their other customers (other libraries can identify which vendors want the large all-subject type coverage and which ones will indeed work with a library to develop a special type of plan). Vendor brochures are easily available.

## THE APPROVAL PLAN TODAY

First there is a contract. These contracts can range from highly detailed computer print outs to free form text. It is common for major university libraries to have more than one approval plan and often more than one with major vendors(a humanities, a university press, a sci tech, and a law, for instance) There are four major components to a contract: the mechanics of how materials are sent and returned, the subject description, the non-subject parameters and usually a press list. Some plans base the subject description on the Library of Congress classification system; the contract is a class-by-class description of what is to be sent in each subject. Other vendors base their contracts on a thesaurus list of subjects that has been drawn up by the vendor. There are many non subject parameters, such as level, price, where published, edition, reprint. Most vendors have a press list, which are those publishers covered by the plan. Each library usually has its own press list which is taken from the vendor's master list. Some vendors hone this list constantly and throw out publishers who give them problems, are used by too few of their customers or do not give discounts or worse yet, add service charges.

There is usually a combination of books and "forms or slips"--for example if a book costs more than a certain amount then a slip is sent instead of a book. It is usually not necessary to return the slip within any time frame that there is with books.

Some vendors publish monthly book lists. Some supply fiche or some way for the library to find out if a particular book has been treated. Two vendors have just in September 1990 begun an online look up system whereby their customers can query a database for this information.

Vendors often use the same means as libraries do to acquire books. They too have standing order and blanket order plans with publishers. Some ordering is done by selecting titles from publishers catalogs. Some vendors actually inspect one copy of a title in order to determine how many copies to buy for their customers. It is important to note that this is a human, manual process--to determine which customers will get a book or a slip.

Usually once per week the vendor sends the library a shipment of books and there is an agreed upon time when those that are not wanted are returned with the reasons for the rejection. Most libraries have subject specialists who come to a shelf in the acquisitions department to determine which books to keep.

At the end of the year, the vendor usually supplies the library with an accounting of what the library has bought and the reasons the library has given for those books that were returned. It is usually at this time that each party will suggest ways to modify the plan. Vendors usually do not want to have more than 10% of the dollar amount of the shipment returned.

The book entitled Understanding the business of library acquisitions, edited by Karen Schmidt, gives an excellent summary of vendors and publishers and library decision making in acquisitions.

## GEOLOGY LIBRARIANS REACTIONS: PROS AND CONS

I did an informal interview of ten geoscience librarians and asked them what they thought were the pros and cons of these plans. I also asked these librarians if the severe inflation of materials costs in recent years has affected their approval plans. It was surprising to me that most of those who have used approval plans for more than a few years have positive regard for such plans.

Here are the positive reasons given: 1) approval plans take care of the easy stuff--the trade publications- and therefore the librarian does not have to look through advertisements that come from such publishers. This frees up time to do book selection for the other types of materials that are much more difficult to acquire. Not only does it save librarian time, reported another geoscience librarian, it also has been a help in acquisitions staffing since there is now not enough staff to process these numbers of books if all were ordered singly. Second, the price information that approval vendors give is an excellent help in many ways; it can be management tool for showing one's institution the rising costs of materials. Third, the discount does matter and is of growing importance. Fourth, the profile can be fine tuned over time so that just the right materials are sent.

On the "con" side: First, approval plans cover trade presses only. "Why don't approval plan vendors cover more small presses and give discounts for those," say some geoscience librarians. Vendors, of course, would answer that the vendor survives by getting from publishers both the discount and the permission to return and that the small presses often cannot make such deals. Vendors would argue that librarians should spend their energies on finding other means to buy the hard-to-get materials.

A second complaint of geoscience librarians is that approval plan books come too slowly. I personally have not experienced this problem for earth science books. My own personal experience in searching Geotimes for several years is that the trade publications listed have been covered by the plans by the time the issues were received. Timeliness is a major criticism of approval plans from the humanities. Scholars in the humanities frequent bookstores often and read newspapers, such as the TIMES LITERARY SUPPLEMENT, which carry more timely reviews of major books that such scholars use. In other words, the core, important first tier monographs used by the historian are likely to be reviewed in a major newspaper at the time of publication; whereas such monographs in geology would be reviewed in a scientific journal long after publication. The implication is that perhaps scientists are less likely to be upset at the lag in arrival of approval plan books than are humanists. It is indeed a challenge for libraries to balance the need to obtain important materials quickly yet at the same time find the most cost effective means to run acquisitions programs.

Related to the concern about the slowness of getting approval plan books is the complaint that goes like this,"I often see a book on another library's acquisition list so I know their vendor has treated it. Why has my vendor not supplied the book?" It is this author's opinion that this happens for all approval plans and is related to when orders are placed and how they are filled. Three vendors may place their orders for a given title in a certain week and all are supplied by the publisher. The other vendors may place their orders the next week but the publisher may not have enough copies in stock and therefore not all orders are filled--this is my idea of why we always see a book on another library's acquisition list that we do not have. Another concern in the slowness category is that librarians fear that vendors hold library orders and send only a certain minimum number to publishers in order to get good discounts. Vendors say this queuing doesn't last more than a week.

Approval plan books are not prepublished orders--they are books that are supplied after the book is published but usually before the book is reviewed. These plans are not designed to be super fast. The intent is that the book is supplied in a reasonable amount of time after publication and long before it goes out of print--and also at a discount.

A third concern geoscience librarians expressed is that these contracts are difficult to understand and are not defined to staff. It takes much time and energy for management to inform staff on the mechanics of these plans and to educate them as to why such plans are being used. All staff who work with approval plans must be knowledgeable about the contract, the press list, the monthly fiche or whatever is used to search for confirmation that indeed a given title has been published and treated by the vendor. They must be familiar with the system used to claim titles and the system used to correct errors in the plan. It is the subject specialist's responsibility to understand all these aspects of the approval plan so that it can work efficiently for his or her subjects. This is indeed a major management challenge. It takes time to train and keep bibliographers up to date about changes in the plan. With time this can be done but it does not happen overnight.

The Association of Research Libraries published Spec Kits about approval plans in 1982 and 1988 (Leonhardt, 1982, and Howard, 1988). These Kits contained results of surveys of approximately 100 ARL libraries. Both surveys showed that most ARL libraries had some type of approval plans. The pros and cons listed in these surveys are very similar to what the geoscience librarians reported to me. Some of the pro's: returns are facilitated, there is less paperwork involved, books reach the shelves faster, plans force a dialogue between acquisitions staff and selecting librarians, faculty selection is leveled off. On the con side: there can be excessive duplicative material received, there has been a tendency for the library to accept marginal material, there can be problems with vendor profiling, return rates can be high, there can be no advance information on which titles would be supplied.

## COPING IN HARD TIMES

How are libraries and vendors coping with rising prices that characterize the present-day economic climate? Libraries cope by changing approval agreements so that notification slips rather than books are sent in weekly shipments. The other most common changes made, according to vendors, is the reduction of price levels--no books costing over a certain dollar amount are sent--and changing academic levels--no undergraduate level texts, for instance--in their approval plans. Dana Alessi (1990), in her talk at the March 1990 Oklahoma Conference, added these additional trends that she sees as coping mechanisms: consolidating ordering with fewer vendors in order to get larger discounts; ordering paperbacks instead of hard copy; and ordering direct to those publishers who give discounts. Dana sees two additional trends that are very interesting phenomena: there is a growing use of bids and contracts (which she adds take an enormous amount of the vendor's time to prepare) and the consortia approach to choosing a vendor. A consortia of libraries in a region will call about four vendors to make their pitch and jointly decide which vendor to use. All will do their approval business from that one vendor. This has happened in Texas, Oregon, Illinois, Virginia and North Carolina and includes private institutions as well as public.

Dana then pointed out in the Oklahoma conference talk how vendors in turn are coping in these hard times: first, eliminating no discount materials and no return materials from approval coverage; second, they are adding what they call product extension--handling more types of acquisitions--monographic standing orders and offering deposit accounts, for instance. They are also going into new territories. The new territories are foreign markets. Vendors are also eliminating service charges to their good customers and promoting value added services such as electronic order transmission and supplying MARC records.

## ARE APPROVAL PLANS HERE TO STAY?

My conclusion is that they probably are, although the library literature has mixed opinions on this question. Vendors, of course say yes, the approval plan system is here to stay because these offer good service; because, they, the vendors, furnish extremely helpful cost data and they provide the easiest system for returning the books that libraries do not want. Vendors would also argue that they also provide a valuable screening service by providing just the right books that fit each of their customers' specifications.

I think these plans are here to stay, particularly for large universities who are lean and mean with less staff, who can get discounts and return the books they do not want.

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# HIDDEN ASSETS OF CONTROLLED VOCABULARY WHEN FREE-TEXT SEARCHING THE **TULSA** FILE OF PETROLEUM ABSTRACTS


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Abstract--Optimization of retrieval results during an online literature search of any bibliographic database is of prime importance to the experienced searcher, as well as limiting the time spent online to the necessary minimum. Many searchers cross-file search and therefore must use free-text strategies established to hopefully work in several different retrieval systems. A sometimes heated debate has existed between the controlled vocabulary vs. free-text advocates, both claiming advantages in recall and precision. A symbiotic link is established between controlled vocabulary and free-text searching of geoscience literature on the TULSA File of Petroleum Abstracts. In some instances, it is demonstrated where controlled vocabulary increases retrieval accuracy with much less time being spent in the research phase of the search as well as less time spent online. In other instances, it is demonstrated where free-text searching will enhance retrieval accuracy if some time is spent in the research phase of the search consulting some of the many reference tools provided by controlled vocabulary before getting online. Geoscience literature is a science in which varied terminologies exist for similar concepts, this being the norm rather than the rarity. The controlled vocabulary of Petroleum Abstracts is comprised of well over 62,000 index terms to cover the literature on exploration and production of petroleum. This is a valuable hidden asset to the free-text searcher. Free-text searching in combination with controlled vocabulary can be a tremendously powerful combination if used to their fullest advantage.

## INTRODUCTION

Different retrieval systems use controlled vocabulary to varying degrees. Chemical Abstracts uses an extensive controlled vocabulary on chemical names, but leaves some geological concepts up to free-text. "There are some geological concepts for which CAS does not provide controlled vocabulary headings, e.g., time-rock divisions (Columbus Limestone, Fort Union Formation), time divisions (Cenozoic, Permian, Holocene), and geographic locations. Author terminology for these concepts is routinely cited in title words, abstract texts, keywords, and modifying phrases accompanying the controlled-vocabulary headings, and as such is searchable online. In searching for these concepts, it is necessary to use a variety of free-text synonyms in the search strategy" (Callihan & Stepp, 1987). GeoRef uses an extensive controlled vocabulary to describe the geoscience concepts. "Vocabulary control and consistency become of paramount importance in preserving the accuracy of information retrieval in an online environment. The mechanism for achieving this control is a thesaurus" (Tahirkheli, 1987). GeoRef has gone beyond this with work on a multilingual thesaurus and geographic coordinates. The depth of indexing can also be a factor in retrieval. "The depth of indexing, the number of terms assigned on average to each document in a retrieval system as entry points, has a significant effect on the standard retrieval performance... Tests of the effect of basic index search, as opposed to controlled vocabulary, in these real systems are quite different than traditional comparisons of free text searching with controlled vocabulary searching. In modern commercial systems the controlled vocabulary serves as a precision device..." (Boyce & McLain 1989). Petroleum Abstracts is a specialized information retrieval system with an enormously comprehensive controlled vocabulary to cover the specialized subject of exploration and production of petroleum. Geoscience literature is a science in which varied terminologies exist for similar concepts as can be observed by the debates over how to try and standardize some of that terminology. "Some aspects of the terrane concept pose significant problems for objective tectonic analysis and accurate communication" (Dover, 1990). Geographic terminologies can be even more difficult to standardize. "The Intergovernmental Oceanographic Commission (IOC), the International Hydrographic Organization (IHO), and the joint IOC/IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO) have expressed considerable concern about the indiscriminate and unregulated naming of undersea features which often go into print without any close scrutiny. An author may not realize that the feature has a name already, maybe in another language, or that his terminology conflicts with established definitions" (Bouma, 1990). If this is a problem for the authors, then it is most certainly also a problem for anyone attempting to retrieve this literature.

STUDY RESULTS

After a brief history of the growth of the controlled vocabulary at Petroleum Abstracts, this study looks at the use of controlled vocabulary and free-text in search statements and the contributions that each makes to maximum recall.

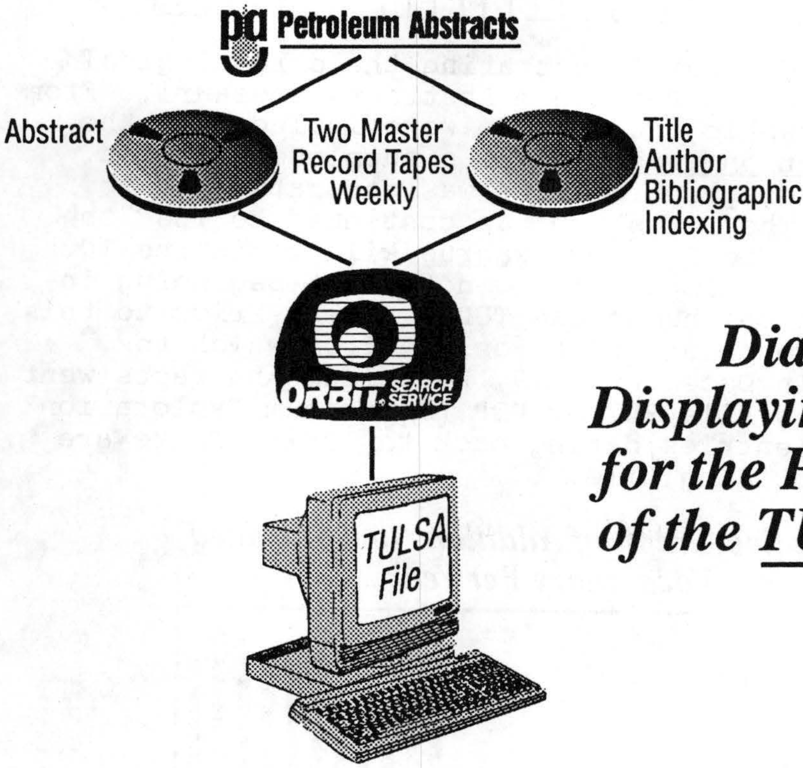


***Diagram Displaying Process for the Production of the TULSA File***

Figure 1 is a simplified diagram displaying the process for the production of the TULSA File. Two tapes are produced weekly by Petroleum Abstracts. One tape containing the abstract, the other tape containing the title, author, bibliographic, and indexing. These tapes are sent to ORBIT which produces the TULSA File.

### *Block Diagram Displaying Chronological History of Updates to the Controlled Vocabulary Thesauri*

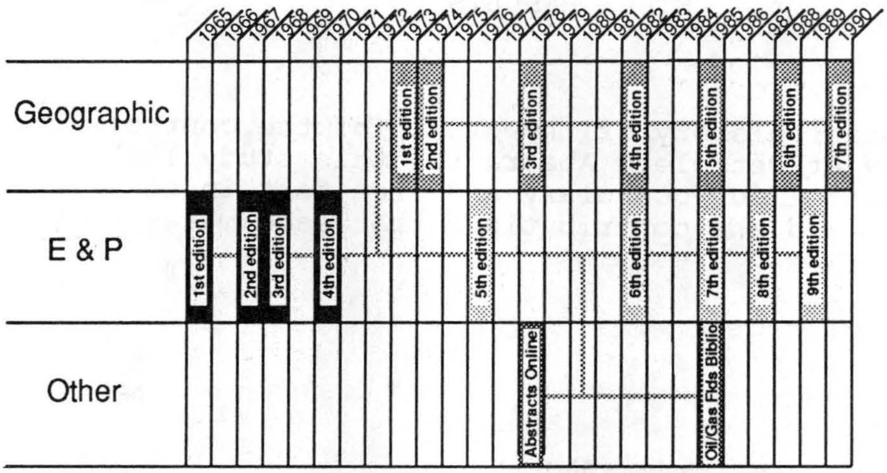


Figure 2 is a block diagram illustrating the chronological history of updates to the Petroleum Abstracts thesauri. From 1965-1973, the geographic index terms were included in the Exploration & Production Thesaurus as a supplemental list. In 1973, the set of geographic terms was separated out to form the Geographic Thesaurus and has continued to its 7th edition as of 1990. The E & P Thesaurus will be in its 10th edition in 1991. It is important to note that beginning in 1978, abstracts went online on the TULSA File. Prior to this entry date, there are no abstracts online from which to free-text search. In December 1989, Petroleum Abstracts went online with Dialog as File 987 or PEP (Petroleum Exploration & Production), with entries dating back to 1981. There are no abstracts on the Dialog file.

### *Cumulative Graph of Additions to Controlled Vocabulary Per Year*

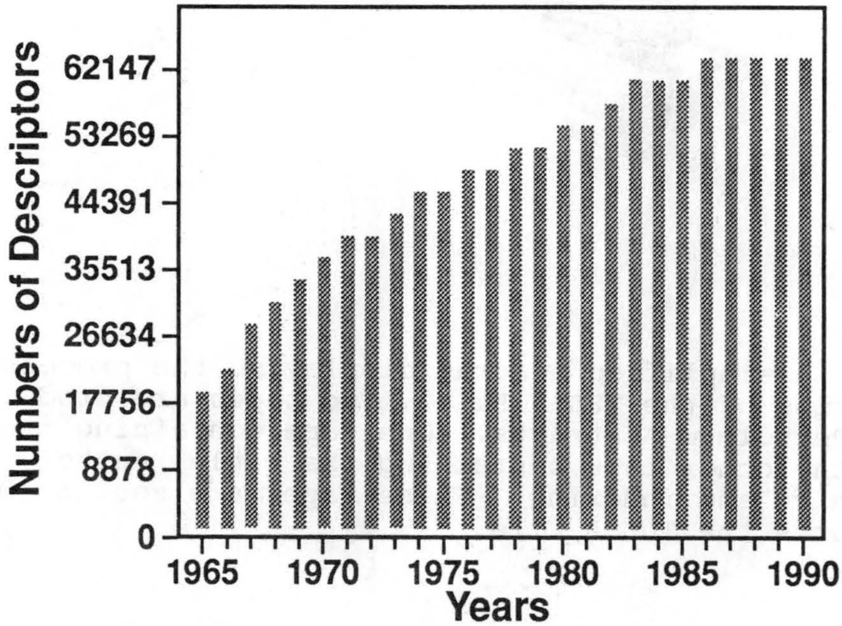


Figure 3 is a cumulative graph of additions to the controlled vocabulary per year showing the steady growth over 26 years.

The average annual addition of new terms into the system is 1,857, not including the first year in which over 15,000 terms were added. The controlled vocabulary is continuing to grow, and we are now looking at well over 62,000 index terms with which to cover the Exploration & Production of Petroleum. The significance of such a large controlled vocabulary in an environment of sometimes ambiguous terminology was described as intrinsic variables (Svevonius, 1986). These intrinsic variables play a crucial role in retrieval performance.

***Example of Contribution to 'Basic Index' from One Record***

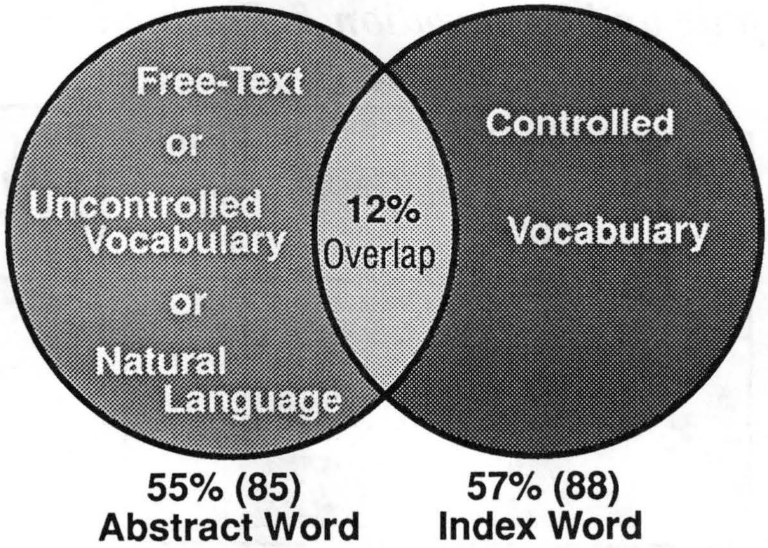


Figure 4 is an example of one **TULSA** geoscience record with an average number of index terms to demonstrate the contributions of controlled vocabulary and free-text to the Basic Index; that is where words for searching come from. It was abstracted and indexed from a full-text document, but not by me, and it was selected essentially at random. The record contains the usual author, title, source, index term, and abstract fields as well as the other fields you would expect. I created two indexes for this record, using words from the abstract for the Abstract Word Index and words from the Index Terms for the Index Word Index. Stopwords were eliminated from the abstract. The combination of these two indexes is the Basic Index; 55% of the words were contributed by the abstract and 57% were contributed by the index terms. Only 12% of the words occurred in both the abstract and the index terms, a surprisingly low overlap of terminology. 43% of the words occur only in the abstract, and 45% of the words occur only in the index terms. "That abstract terms duplicate thesaurus terms whenever possible; brings us back to the issue of complementary vs. duplication between abstract and thesaurus terms. The main contribution of abstracts to the enhancement of retrieval is their ability to complement descriptor indexing" (Fidel, 1986). Words from the abstract are not all useful for searching or at least they vary in their usefulness. On the other hand, words from index terms were created for retrieval and so are more useful for searching. "Items indexed with relevant descriptors have a greater probability of relevance than those simply retrieved by keywords appearing in titles or abstracts" (Quint, 1988). The Basic Index for the TULSA File consists of words from the Title, Index Term, and Abstract fields.

***Graph of Valid and Invalid Descriptors from Geographic and Exploration & Production (E & P) Thesauri***

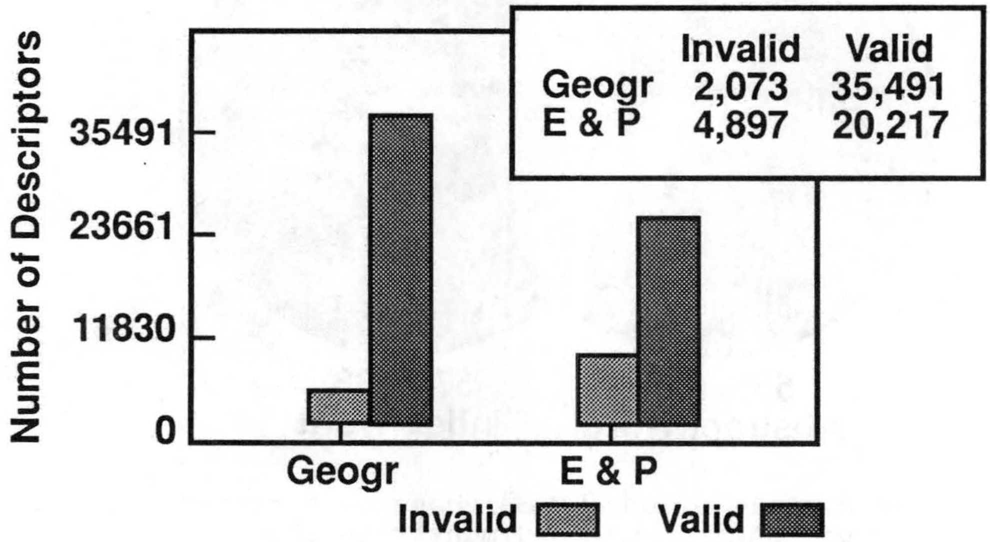


Figure 5 is a graph of valid and invalid descriptors from the Geographic Thesaurus and Exploration & Production (E & P) Thesaurus (including their supplemental descriptors). The Geographic Thesaurus has more terms than the E & P, while the E & P has a higher percentage of invalid to valid terms, nearly 40%. This reflects the pattern of inconsistencies in the terminology being used in the literature. This leads to an hypothesis that these invalid terms might be valuable in free-text strategies with the thesauri providing not only the valid terms, but also the invalid terms from which to select words for free-text searching. To test this hypothesis, 5 topic areas were chosen to demonstrate the comparative use of free-text and controlled vocabulary for retrieval, using the guidance of the Petroleum Abstracts thesauri for choice of terms. The following 4 diagrams display retrieval sets for valid/invalid geographic terms. The combined sets represent the maximum recall retrieved if the search strategy includes both the valid and invalid terms. Free-text was used to retrieve both sets. In every case, when free-text was used on the valid index terms, at least 1 or more additional documents were retrieved. Some nonrelevant as well as relevant documents were retrieved by maximizing recall.

***Diagram Displaying Retrieval Sets for Botswana (valid) and/or Bechuanaland (invalid)***

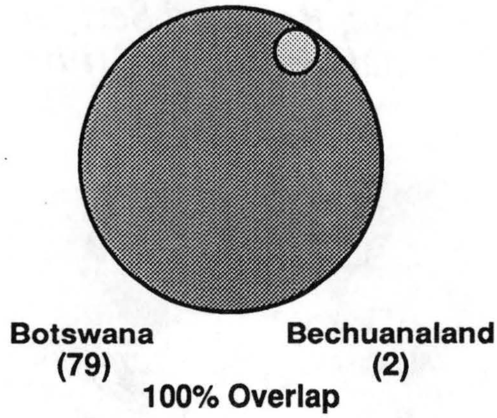


Figure 6 displays the first example of Botswana/Bechuanaland, a country in southern Africa. The entire Bechuanaland set is included within the Botswana retrieval set. In this case, free-text searching on the invalid term would retrieve no extra documents.

***Diagram Displaying Retrieval Sets for Bear Island (valid) and/or Bjornoya (invalid)***

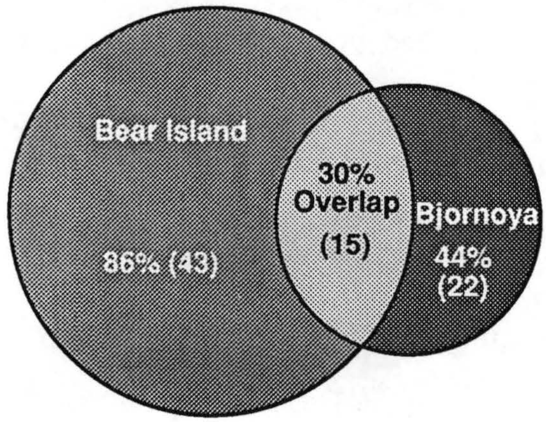


Figure 7 displays the second example of Bear Island/Bjornoya in the Arctic Ocean. Eighty-six percent of the documents retrieved contain Bear Island, 44% of the documents contain Bjornoya, with a 30% overlap between the 2 sets. Fourteen percent of the documents would not have been retrieved if Bear Island had been the only term used. Fifty-six percent of the documents would not have been retrieved if Bjornoya had been the only term used. This implies a substantial hidden asset to the free-text retrieval by the controlled vocabulary.

***Diagram Displaying Retrieval Sets for Aqaba Gulf (valid) and/or Elat Gulf (invalid)***

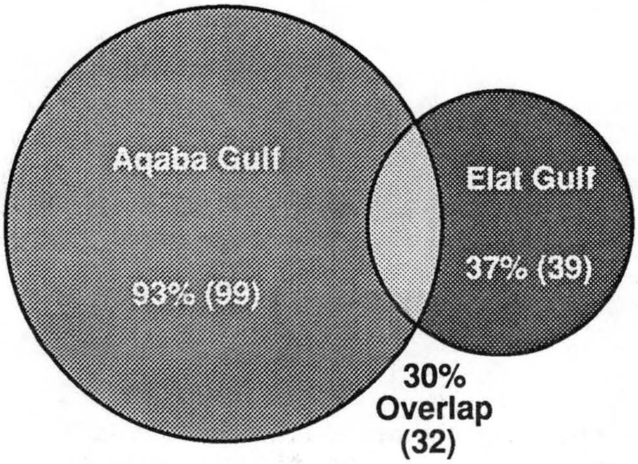


Figure 8 displays the third example of Aqaba Gulf/Elat Gulf in the Middle East. Ninety-three percent of the documents retrieved contain Aqaba Gulf or Gulf of Aqaba and 37% contain Elat Gulf or Gulf of Elat, with a 30% overlap. Seven percent of the documents would not have been retrieved if Aqaba Gulf or Gulf of Aqaba had been the only terms used. Sixty-three percent of the documents would not have been retrieved if Elat Gulf or Gulf of Elat had been the only terms used. Again, the use of controlled vocabulary and the "free text" derived from the controlled vocabulary greatly enhanced the recall.

***Diagram Displaying Retrieval Sets for Zhujiangkou Basin (valid) and/or Pearl River Mouth Basin (invalid)***

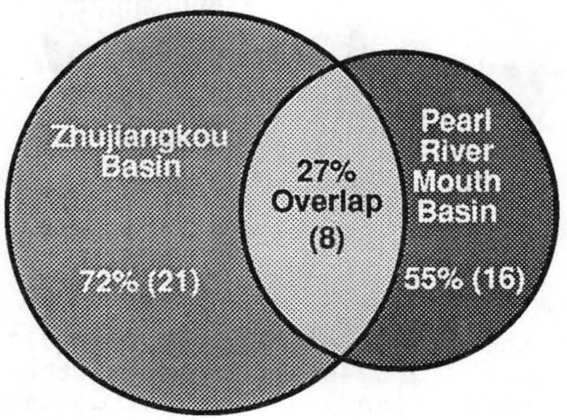


Figure 9 displays the fourth example of Zhujiangkou

Basin/Pearl River Mouth Basin in China. Seventy-two percent of the documents retrieved contain Zhujiangkou Basin, 55% contain Pearl River Mouth Basin, with a 27% overlap. Twenty-eight percent of the documents would not have been retrieved if Zhujiangkou Basin had been the only term used. Forty-five percent of the documents would not have been retrieved if Pearl River Mouth Basin had been the only term used. Once again, it is the use of words from controlled vocabulary that expands the retrieval.

***Pie Diagram Displaying Relative Percentages of Varying Terminology for a Similar Concept***

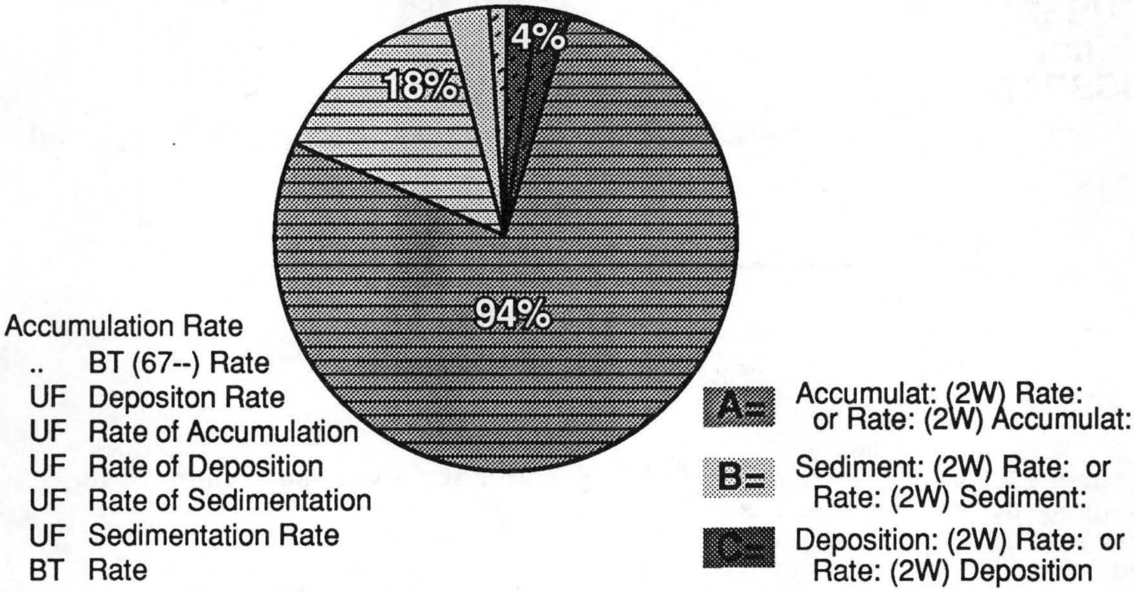


Figure 10 is a pie diagram displaying relative percentages of varying terminology for a similar concept. With multiple invalid terms, the strategy becomes more complex. If a searcher were to go to the E & P Thesaurus and look up ACCUMULATION RATE (at the lower left), he or she would find 5 invalid terms for this single concept. If these invalid terms were incorporated into a free-text strategy, the result would be as shown: 94% of this set were retrieved with A, 18% with B, and 4% with C, with some overlap between the 3 sets. The index term ACCUMULATION RATE is contained in 93% of the documents retrieved (marked by horizontal lines). In set A: 1.2% were retrieved from the titles, 7% were from abstracts, 99% were from the index term. In set B: 15% were from titles and 90% from abstracts. In set C: 7% were from titles and 94% were from abstracts. This supports the value of the abstracts as well as the index terms for free-text searching.

## *Diagram Displaying Retrieval Sets for USSR*

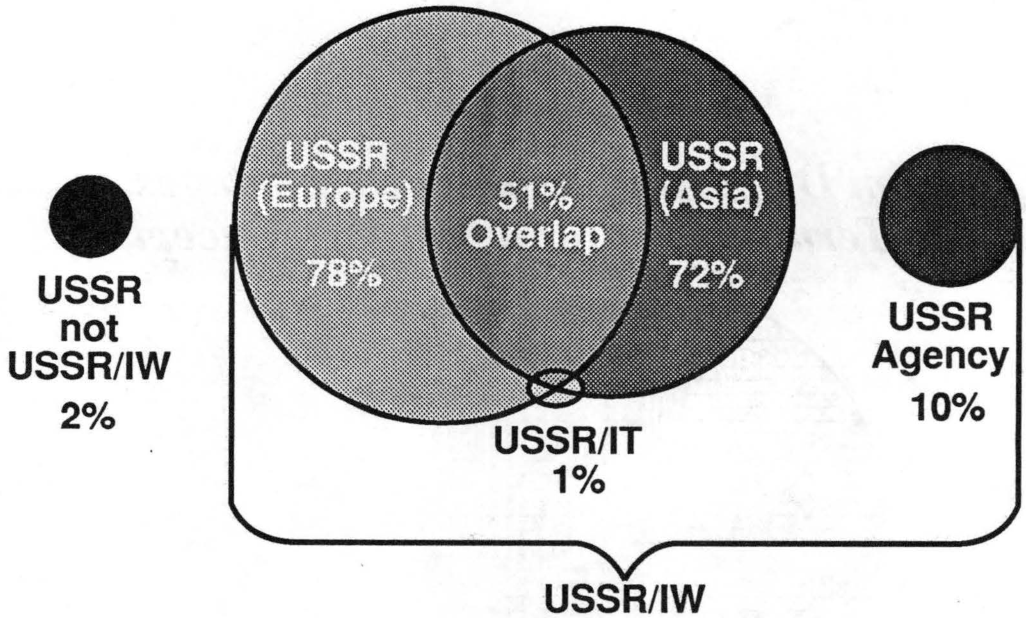


Figure 11 is a diagram displaying the retrieval set when USSR is used as a free-text search statement. Ninety-eight percent of the documents retrieved have USSR as part of the indexing. Two percent did not have USSR in the indexing. Ninety-three percent of this set were retrieved from the abstracts and include many nonrelevant as well as relevant documents. The reasons that documents might not have relevant indexing, but are retrieved by free-text include: 1) indexer error, 2) indexer discretion (i.e. an archipelago encompassing several islands in which case the individual islands were not indexed while the more regional concept of the archipelago was indexed), or 3)false drops(i.e. negative statements such as "this does not include..." or peripheral comparisons such as "this fossil was first described from the USSR"). Ten percent were indexed to USSR Agency as the author affiliation on patents, which would retrieve some nonrelevant records pertaining to the geographic area of the Soviet Union. Petroleum Abstracts has an extensive hierarchy for the Soviet Union and the indexing is done at the most specific level in the hierarchy to take full advantage of the autoposting. APPENDIX 1 is the Petroleum Abstracts' hierarchical index for the Soviet Union. USSR/IW is produced as a result of the autoposting of 627 geographic index terms; 60% autopost to USSR (EUROPE) and 40% autopost to USSR (ASIA). USSR/IT was only added recently in 1988, to describe documents encompassing both USSR (EUROPE) and USSR (ASIA) and is not in the hierarchy. Autoposting is a powerful hidden asset of controlled vocabulary. In most cases, the author does not identify an area geographically as being in the USSR specifically. They might indicate that an area is in the Siberian Platform, for example, but not include USSR in the title or abstract. Autoposting from a term like Siberian Platform consistently adds USSR in one way or another to the record. There are, however, pertinent documents not retrieved in this set. If the document describes an area offshore in a sea or ocean which does not autopost to USSR and an index term from onshore that produces USSR/IW through autoposting was not indexed, then that document would only be retrieved with a supplemental search strategy. The offshore regions which are not in the USSR hierarchy but are entirely whithin Soviet jurisdication include Okhotsk Sea (50% of which do not have USSR in the record), Kara Sea (33% do not include USSR in the record), Laptev Sea (25% do not include USSR in the record), East Siberian Sea (36% do not include USSR), Caspian Sea OR Caspian Basin (36% do not include USSR), White Sea (44% do not include USSR), Azov Sea (33% do not include USSR), and Tatar Strait (45% do not include USSR). Almost 300 more documents could be retrieved if these offshore areas were included in the search strategy. Offshore regions which are in a sea or ocean which also border other geopolitical areas include Black Sea, Japan Sea, Barents Sea, and Chukchi Sea. At this time, there is no efficient way to extract documents relevant to the USSR without retrieving the entire sets. "Access to geographic concepts in bibliographic files is approached through lexical expressions, i.e. words and phrases, in the same manner as access to other concepts. But geographic concepts have a special quality: they are spatial in nature and therefore can be represented graphically, i.e. by maps" (Hill, 1990). Spatial relationships represent a supplemental strategy of retrieval that might be an answer to this type of problem. There is currently work being done in this area. "The focus of my research is to determine the accuracy and predictability, and hence the effectiveness, of current practices of indexing geographic concepts for retrieval from online bibliographic files" (Hill, in progress). Geographic Information Systems may offer the technology to optimize retrieval to a higher degree in the future. Scanning technology is now to the degree of accuracy that some consider scanning the full text articles into a retrieval system with free text as the only search strategy utilized. Even when full text is available for free text searching, there are limitations. "No one search method always provides comprehensive retrieval. The presence of the full text often allows articles to be retrieved that could not be found by searching on titles, controlled vocabulary descriptors, or abstracts. These latter two value-added fields did sometimes contribute unique relevant documents, however, and serve to standardize vocabulary and bring concepts together. Full text searching at the paragraph level results in many false drops, with a precision ratio half that of the controlled vocabulary and abstract searches"(Tenopir, 1985).

CONCLUSION: Free-text strategies often work better than controlled vocabulary strategies alone, **but only** because of the value-added aspect of the controlled vocabulary. "A recognition by providers of online services that both free text and controlled vocabulary search provision is a wise choice" (Dubois, 1987). "Free text searching can often be the better search formulation, especially for high recall searches, but a combination of both controlled and free text is the preferred approach" (Markey, Atherton, & Newton, 1980). In order to achieve maximum recall, you must use free-text + controlled vocabulary. That is, a substantial contribution to free text is made by the index terms in the record. This study has also demonstrated the advantage of using invalid terms in thesauri as sources of varying terminology.

AKNOWLEDGEMENTS: This study has benefitted enormously from the support and assistance from the entire staff at Petroleum Abstracts. I am particularly grateful to Sherry Leithner for some of the data acquisition, to Virginia Wood for assistance with some of the more complex search strategies, to Pam Weaver for countless answers to historical queries, and especially to Linda Hill, without whose assistance this paper never would have coalesced. I am also truly grateful to the staff of Amoco Production Company's Research Center for their assistance with the diagrams, particularly to Sherry Vancquoyc.

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APPENDIX 1

PETROLEUM ABSTRACTS' HEIRARCHICAL INDEX FOR THE SOVIET UNION

**USSR**

USSR is used when area
includes parts of both
USSR (EUROPE) and
USSR (ASIA)

EURASIA
EUROPE
**USSR (EUROPE)**
 **ARMENIA**
  ARARAT TROUGH AREA
  OKTEMBERYAN AREA
  YEREVAN AREA
 **AZERBAIDZHAN**
  AKHZEVIR FOLD
  APSHERON PENINSULA
   BINGGADINSK FAULT
   BUZOVN MASHTAG GAS FIELD
  APSHERON TROUGH
  ASTRAKHANBAZARKII SYNCLINE
  ATASHKYA AREA
  BAKHAR OIL FIELD
  BAKU AREA
  BALAKHAN OIL FIELD
  BALAKHAN SABUN RAMAN GAS F
  BANKA DARVIN OIL FIELD
  BIBI EIBAT OIL FIELD
  BULLA MORE OIL FIELD
  BUZOVNO MASHTAGINSK OIL FL
  DZHEIRANKECHMES BASIN
  FATMAI ZYKH ANTICLINE AREA
  GRYAZEVAYA SOPKA OIL FIELD
  GYURGYANY MORE OIL FIELD
  HORASANI OIL FIELD
  ILYICH OIL FIELD
  KALA AREA
  KALA OIL FIELD
  KALMAS OIL FIELD
  KALMAS UPLIFT
  KAMNI GRIGORENKO OIL FIELD
  KARACHUKHUR ZYKH OIL FIELD
  KHIDYRLY STRUCTURE
  KHORASAN OIL FIELD
  KUSARI DIVICHI SYNCLINE
  KYURSANGYA OIL FIELD
  LOKBATAN PUTA OIL FIELD
  MURADKHANLY OIL FIELD
  NEFTECHALA OIL FIELD
  NEFTYANYE KAMNI OIL FIELD
  PESCHANYI MORE OIL FIELD
  RAMANINSK OIL FIELD
  SABUNCH OIL FIELD

EURASIA
ASIA
**USSR (ASIA)**
 AMU DARYA TROUGH
 ARAL KYZYLKUM FAULT ZONE
 ARAL REGION
 ARAL SEA
 CHU SARYSYI BASIN
 **KAZAKHSTAN**
  ALEKSEEVSKOE OIL FIELD
  ALTYKUL OIL FIELD
  BAICHUNAS OIL FIELD
  BURANKOL OIL FIELD
  BUZACHI OIL FIELD
  BYZACHI PENINSULA
  DJENGI OIL FIELD
  DUNG OIL FIELD
  EAST PRORVA UPLIFT
  GIECHIBAI OIL FIELD
  KARATAI MT
  KARAZHANBAS OIL FIELD
  KOKCHETAV ANTICLINE
  KOMSOMOLSKOYE GAS FIELD
  KOMSOMOLSKOYE OIL FIELD
  LAKE BALKHASH
  MAKAT OIL FIELD
  MALYI KARA TAU AREA
  MANGYSHLAK BASIN
   KARABOGAZ ANTICLINE
   TENGE GAS FIELD
  MANGYSHLAK FAULT
  NARMUNDANAK OIL FIELD
  NOVOMIKHAILOVSKAYA SYNCLIN
  PROORVA OIL FIELD
  SOKOLOVKA OIL FIELD
  SOUTH MANGYSHLAK OIL FIELD
  TENGIZ OIL FIELD
  TURGAI BASIN
  URAL EMBENSKII AREA
   KULSARY OIL FIELD
  USTYURTT PLATEAU
  UZEN ANTICLINE
  UZEN OIL FIELD
  ZHETYBAI ANTICLINE
  ZHETYBAI OIL FIELD
 **KIRGHIZSTAN**

USSR (EUROPE) continued

SAMUR THRUST
SANGACHALY DUVANNYI OIL FD
SIAZAN THRUST
SURAKHAN OIL FIELD
SURAKHANY AREA
TURKYANY OIL FIELD
ZHILOI OIL FIELD
ZYBZA OIL FIELD
ZYRYA GAS CONDENSATE FIELD
ZYRYA OIL FIELD
AZOV KUBAN TROUGH
**BYELORUSSIA**
BELORUSNEFT AREA
ORSHA BASIN
PRIPYAT BASIN
RECHITSA DOME
RECHITSA OIL FIELD
VISHANSKOYE OIL FIELD
RECHISTA AREA
ZOLOTUKHINSKOYE OIL FIELD
CAUCASUS MT AREA
CHATMINSK ANTICLINE
**ESTONIA**
**GEORGIA SSR**
ELBRUS FORELAND AREA
PATARA SIRAKI OIL FIELD
SAMGORI PATARDZEUL OIL FIELD
GREAT CAUCASUS GEOSYNCLINE
JARSKOE OIL FIELD
KALININGRAD REGION
KURA BASIN
LADUSHKIN OIL FIELD
**LATVIA**
KULDIGA ANTICINE
KURZEM PENINSULA
LATVIAN BASIN
**LITHUANIA**
LITHUANIAN DEPRESSION
**MOLDAVIA SSR**
PREDDOBRUDZHSKII TROUGH
VALENSK OIL FIELD
PRELUZHSKOE OIL FIELD
PSEZUAPSE RIVER
RUSSIAN PLATFORM
**RUSSIAN REPUBLIC EUROPE**
ABINO UKRAINIAN OIL FIELD
ABRAMOVSK GAS FIELD
ACHIKULAK OIL FIELD
AKHTYR BUGUNDYR OIL FIELD
ALEXANDROVSK OIL FIELD
ALIYURT OIL FIELD
ALMETEVSK OIL FIELD
ANAPA TROUGH
ANASTASIEV TROITSK OIL FLD
ANDREEVSK OIL FIELD
ARCHANGEL AREA

USSR (ASIA) continued

BUCHARA AREA
ISSYK KUL LAKE
IZBASKENTSKY OIL FIELD
KARASHUR OIL FIELD
KYZYL KUM BASIN
**RUSSIAN REPUBLIC ASIA**
AGUL KANSK FAULT
ALTAI SAYAN AREA
ANADYR BASIN
ANIVA BAY
ARKTICHESKOYE GAS FIELD
BAIKAL ENISEI FAULT
BAIKAL RIFT AREA
BAKALSK OIL FIELD
BARGOY BASIN
BEURDESHIKOYE GAS FIELD
BOGACHOVKA OIL FIELD
BOLSHERETSK BASIN
BORISOV DOME
BOVANENKOVSKOYE GAS FIELD
EAST KAMCHATKA BASIN
DVUKHLAGERNAYA ANTICLINE
STOLBOVSKAYA ANTICLINE
ELKOVA RIVER BASIN
GUBINSKOYE GAS FIELD
GUSINOYE OZERO BASIN
ICHI RIVER DELTA
ILPINSKII DEPRESSION
IRKUTSK BASIN
SREDNE BOTUOBIN GAS FIELD
YARAKTIN OIL FIELD
KAMCHATKA PENINSULA AREA
KSHUK GAS CONDENSATE FIELD
KANDYMSKOYE GAS FIELD
KANSK BLOCK
KARAGIN ISLAND
KARPINSKII ARCH
ERMOLINSK GAS FIELD
TENGUTINSKII GAS FIELD
KATYR BASIN
KHARASAVEI GAS FIELD
KHATANGA BASIN
KHATYR BASIN
KIZHINGA BASIN
KOLENDO OIL FIELD
KOLYMA RIVER AREA
KOLYVAN TOMSK FOLDS
KOMANDORSKI ISLANDS
KOMI GAS FIELD
KONDA RIVER
KORIAK MT
KORYAKSKO REGION
KUREIKA RIVER AREA
KUZNETSK BASIN
KUZNETSK FOLDS
LAKE BAIKAL

USSR (EUROPE) continued

ARLANSK OIL FIELD
ASTRAKHAN AREA
AZNAKAEVSK OIL FIELD
BABLINSK OIL FIELD
BAITUGAN OIL FIELD
BARINOVSKOYE OIL FIELD
BASHKIRIA
 ABDRAKHMANOVO OIL FIELD
 BASHKIRIA OIL FIELD
 BELEBEEVSK OIL FIELD
 KARACHA ELGINSK OIL FIELD
 RAEVSKOYE OIL FIELD
 SHAKAPOVSK OIL FIELD
BATYRBAISKY OIL FIELD
BAVLINSKOE OIL FIELD
BEREZANSK OIL FIELD
BIRSK VERKHNEKAMSK TROUGH
BONDYUZHSK OIL FIELD
BOROVSKOE OIL FIELD
CHECHENO INGUSHETTI OIL FD
CHERMASAN MASSIF
CHERNUSHINSK OIL FIELD
CHKALOV OIL FIELD
CISCAUCASIA
 OKTYABRSK OIL FIELD
DAGESTAN
 SELLI OIL FIELD
 SUKHUMSK OIL FIELD
 YUZHNO OIL FIELD
DERYUZHEVSK OIL FIELD
DON ESTUARY
DON MEDVEDITZA AREA
DZHERBOL GAS FIELD
DZHERST OIL FIELD
ELDAROVSKY OIL FIELD
ELKHOVS OIL FIELD
GASHA OIL FIELD
GORKI OVRAG OIL FIELD
GROZNY AREA
GUSELKINO OIL FIELD
IZBERBASH OIL FIELD
IZKOSGORINSK GAS FIELD
KABARDA BALKARIYA AREA
KALINSK OIL FIELD
KALMYK OIL FIELD
KALUGA AREA
KAMA KINEL TROUGH
KANCHURINSK GAS FIELD
KANEVSKO BEREZANSKII RIDGE
KANIN PENINSULA
KARABULAK ACHALUKSK OIL FD
KARADAG OIL FIELD
KARELIA
KENKIYAK OIL FIELD
KENKIYAK SALT DOME
KHADYZHENSKII AREA

USSR (ASIA) continued

LENA TROUGH
LUGINETSKII OIL FIELD
MAASTAKHSKOYE GAS FIELD
MALOICHHSKOYE OIL FIELD
MANSKO AGUL FAULT
MARKOVO AREA
MARKOVO GAS CONDENSATE FLD
MARKOVO OIL FIELD
MARTYSHI OIL FIELD
MEGIONSK OIL FIELD
MESSOYAKHSKOYE GAS FIELD
MORTYMYA TETEREVSK OIL FLD
MYULDZHINSKOYE GAS FIELD
NEW SIBERIAN ISLANDS
NOVELSK ANTICLINE
OB GULF AREA
 MEDVEZHYE GAS FIELD
OB RIVER
ONON BASIN
ORENBURG ARCH GAS FIELD
PENZHINSKII RANGE
PILYATKINSKOYE GAS FIELD
POTAPOVSKII OIL FIELD
PRAVDINSKOE OIL FIELD
PREOBYE AREA
PUNGINSK GAS FIELD
PURPEISKOE GAS FIELD
SAKHALIN ISLAND
 ERRIN OIL FIELD
 GORNOZAVODSK SYNCLINE
 NEKRASOV GAS FIELD
 ODOPTU OIL FIELD
 OKHINSK OIL FIELD
 PAROMAISK ANTICLINE
 SABINSK ANTICLINE
 TUNGUR OIL FIELD
SALYMSK OIL FIELD
SAMAN TEPENSKOYE GAS FIELD
SAMOTLORSKOYE OIL FIELD
SASYK SIVASH LAKE
SAYAN MT
SEVERO KOMSOMOL GAS FIELD
SHAIMSK OIL FIELD
SHKHUNNOE OIL FIELD
SIBERIAN GEOSYNCLINE
SIBERIAN LOWLAND
SIBERIAN PLATFORM
 ANABARA ANTICLINE
 ENISEI ANTICLINE
 TAIGA DOME
 TUNGUSKA SYNCLINE
SIKHOTE ALIN MT AREA
 DUGOVOI FAULT
SOLENINSKOYE GAS FIELD
SOUTH YAKUTIA
SREDNE VILYUISKOYE GAS FLD

USSR (EUROPE) continued

KHIBIN MASSIF
KHIBINSHI OIL FIELD
KOLA PENINSULA
KOMI REPUBLIC AREA
 PASHNINSK OIL FIELD
 TEBUKSKII OIL FIELD
 VOIVOZHKII OIL FIELD
 VUKTYL GAS FIELD
KONSTANTINOVSK OIL FIELD
KOROBKOVSK GAS FIELD
KOROBKOVSK OIL FIELD
KOSTROMA AREA
KOZLOVSKOYE OIL FIELD
KRASNODAR OIL FIELD
KRASNODAR REGION
 BEREZAN GAS FIELD
 NOVODMITRIEVSK OIL FIELD
 UST LABINSK GAS FIELD
KRASNOKAMSK OIL FIELD
KRASNOYARSH OIL FIELD
KRASNYI YAR OIL FIELD
KRIVOI ROG PAVLOV FAULT
KUBAN AREA
 KANEVSK GAS CONDENSATE FLD
 SEVERSKOYE GAS FIELD
KUBAN GAS FIELD
KUBAN OIL FIELD
KUEDINSK OIL FIELD
KUIBSHEV VOLGA REGION
 DMITRIEVSK OIL FIELD
 KALINOV NOVOSTEPANOV O FLD
 MUKHANOVSK OIL FIELD
 YABLONEVSK OIL FIELD
KUMERTAUSK OIL FIELD
KURINSK GAS FIELD
KUSHKODZH GAS FIELD
KYUROVDAG GAS FIELD
LENINGRAD AREA
LENINGRADSK GAS FIELD
LEVINSKII OIL FIELD
LOBANOVSK OIL FIELD
LOWER DOBRINSK UPLIFT
LOWER VOLGA REGION
MAIKOP GAS CONDENSATE FLD
MALGOBEK OIL FIELD
MALINOVKA OIL FIELD
MANCHAROVSKIY OIL FIELD
MEZENSKII BASIN
MIKHAILOVSK OIL FIELD
MORDOVSKO KARMALSK OIL FLD
MOSCOW AREA
MOSCOW RIVER
MOSCOW SYNCLINE
MYLVINSK OIL FIELD
NIBELSK GAS FIELD
NORTH STAVROPOL GAS FIELD

USSR (ASIA) continued

SUIFUN GEOSYNCLINE
SURGUT ANTICLINE
SVERDLOVSK AREA
TAIGONOS PENINSULA
TAYMYR PENINSULA
TAZOVSKOYE GAS FIELD
TERPENIE BAY
THREE LAKE OIL FIELD
TINRO TROUGH
TIUMEN REGION
 SERAFIMOVSK OIL FIELD
 SHAPOVSK OIL FIELD
 SOSNINSKO SOVETSK OIL FLD
 TYUMEN GAS FIELD
TOMSK OVERTHRUST
TRANSBAIKALIA
TREKHOZERNOE OIL FIELD
TURUKHAN AREA
UDOKAN MT
URENGOI GAS FIELD
UST BALYK OL FIELD
VERKHNETARSKOYE OIL FIELD
VILYUI SYNCLINE
VILYUY BASIN
VLADIVOSTOK AREA
VOSTOCHNYI EKHABI OIL FLD
VYNGAPUROVSK GAS FIELD
WEST KAMCHATKA DEPRESSION
WEST SAKHALIN SYNCLINORIUM
WESTERN SAKHALIN ANTICLINO
WESTERN SURGUTSK OILFIELD
YAKUTIYA RIVERS AREA
YAKUTSK AREA
YAMAL PENINSULA
YAMBURGSKOYE GAS FIELD
YERAVNINA BASIN
YUBILEINOYE GAS FIELD
YUZHNO MINUSINSKAYA BASIN
YUZHNO RUSSKOYE GAS FIELD
ZAZA BASIN
**TADZHIKISTAN**
 ARUKTAU ANTICLINE
 BESHTENTYAKSKII OIL FIELD
 GISSAR RIDGE AREA
 LENINNEFT AREA
 MIRZARAVATSKAYA DEPRESSION
 ZULUM ART RIVER AREA
TURANIAN PLATFORM
TURGAI KYZYLKUM ARCH
**TURKMENIA**
 ACHAKSKOE GAS FIELD
 AMU DARYA OIL FIELD
 BADKHYZ UPLAND
 BARSA GELMES OIL FIELD
 CENTRAL KARAKUMY DOME
 CHELEKEN OIL FIELD

USSR (EUROPE) continued

NORTHERN CAUCASUS AREA
NORTHWESTERN BASHKIR
NOVO PORTOVSKOE GAS FIELD
NOVOUZENI BASIN
NYAMEDSK GAS FIELD
OLEINIKOVSK OIL FIELD
OMRA OIL FIELD
ORENBURG AREA
 IMAILOVO OIL FIELD
ORLYANSK OIL FIELD
OSETIYA AREA
OSINSK OIL FIELD
OZEK SUAT OIL FIELD
PACHELMSKII BASIN
PECHORA BASIN
 LAYAVOZH OIL FIELD
 USA OIL FIELD
 ZAPADNO IZKOSGORA OIL FLD
PELAGIADINSK GAS FIELD
PENZA AREA
PEREDOVYE KHREBTY AREA
PERM AERA
 BAKLANOVSKI OIL FIELD
 CHURAKOVSKI OIL FIELD
 SAVINO MOSKUDINSKI OIL FLD
 YARINO KAMENNOLOZHSK OIL F
POKROVSKOE OIL FIELD
POVOLZHYE AREA
PRIKUMSKAYA AREA
PUGACHEV KOTELNICHEV RANGE
RADAYEVKA OIL FIELD
RODIONOVSKII GAS FIELD
RODIONOVSKII OIL FIELD
ROMASHKINO OIL FIELD
ROZNY OIL FIELD
RUSSKII KHUTOR OIL FIELD
RYAZAN SARATOV SYNCLINE
RYAZAN SARATOV TROUGH
SABLIN OIL FIELDS
SADKIN OIL FIELD
SAMURSKII OIL FIELD
SARATOV VOLGOGRAD AREA
 KOTOVSKAYA OIL FIELD
SEDIOLSK GAS FIELD
SEVEROKAMSK OIL FIELD
SHKAPOV OIL FIELD
SHKAPOVSK AREA
SHUGUROV UPLIFT
SIZRANSKOE OIL FIELD
SOKOLOVA GORA OIL FIELD
SOKOLOVOGORSK OIL FIELD
SOLIKAMSK DEPRESSION
SOLOKHOVO OIL FIELD
SOPCHA MASSIF
SOSNOVSK OIL FIELD
STAROMINSK GAS FIELD

USSR (ASIA) continued

 CHELEKEN PENINSULA
 KALAIMOR TROUGH
 KATUR TEPE OIL FIELD
 KIRPICHLI GAS FIELD
 KOTUR TEPE OIL FIELD
 LAM BANK OIL FIELD
 MONZHUKLA DOME
 MURGAB DEPRESSION
 SHATLYK GAS FIELD
 SHEKHITLINSKOYE GAS FIELD
 SURKHAN VAKHSH AREA
 TURKMENBURNEFT OIL FIELD
 ZAUNGUZ DEPRESSION
 ZEAGLI DARVAZA AREA
 ZEAGLI DARVAZA GAS FIELD
 ZHDANOV BANK OIL FIELD
**UZBEKISTAN**
 ANDIZHAN OIL FIELD
 BUKHARA KHIVA AREA
 BUKHARA OIL FIELD
 DZHARKAK OIL FIELD
 FERGANA AREA
 FERGANA OIL FIELD
 GAZLI GAS FIELD
 HAUDAG OIL FIELD
 KAGAN AREA
 KARAULBAZAR OIL FIELD
 KHODZHIABAD GAS FIELD
 KHODZHIABAD OIL FIELD
 KOKAIDI OIL FIELD
 LIALMIKAR OIL FIELD
 MURGAB OIL FIELD
 SARYTASH OIL FIELD
 SURKHANDARINSKOE OIL FIELD
 TERMEZ OIL FIELD
USTYURT KARAKUM DEPRESSION
 KARA KUMY DOME

USSR (EUROPE) continued

STAVROPOL ANTICLINE
STAVROPOL DISTRICT
STAVROPOL UPLIFT
STAVROPOLSK GAS FIELD
SUBKHANKULOVSK OIL FIELD
SUKHOKUM DISTRICT
SUKHOKUMSK OIL FIELD
SUNZHEN ANTICLINE
SUNZHEN SYNCLINE
TAMAN PENINSULA
TARKHANSK OIL FIELD
TATAR ARCH
TATARIA
TATBURNEFT OIL FIELD
TERSK ANTICLINE
TERSK KUMSK DEPRESSION
TERSK SUNZHENSK OIL FIELD
TIMAN PECHORA AREA
TOKMOV UPLIFT
UDMURT AREA
UFIMSK OIL FIELD
URAL MT AREA
URAL VOLGA REGION
TUIMAZY OIL FIELD
TUYMAZINSKY OIL FIELD
URITSKII OIL FIELD
USINSK OL FIELD
UZENI ICHKIN UPLIFT
VOLGA BASIN
VOLGA DELTA
VORONEZH MASSIF
VUKTYL OIL FIELD
VYATKA DISLOCATION ZONE
WEST CASPIAN FAULT
WEST TEBUK OIL FIELD
WESTERN RYBUSHANSK UPLIFT
YAREGA OIL FIELD
YUGIDSK OIL FIELD
ZAMANKUL OIL FIELD
ZHIGULEV PUGACHEV ARCH
ZIMNYAYA STAVKA OIL FIELD
ZOLNENSKOE OIL FIELD
ZOLNYI OIL FIELD
SAGAIDAKSKOE OIL FIELD
SKHODNITSK OIL FIELD
TRANSCAUCASUS AREA
**UKRAINE**
ALMA RIVER
ALMA TROUGH
AZOV SWELL
BAKHMETEVSK GAS FIELD
BAKHMETEVSK OIL FIELD
BAKHMUT DEPRESSION
BELSKOYE OIL FIELD
BELYAEVSK ANTICLINE
BEREZOVO AREA

USSR (EUROPE) continued

BITKOVSKII OIL FIELD
BORISFENSKII EMBAYMENT
BORISLAVSK OIL FIELD
BORISLOV AREA
BORYSLAV GAS FIELD
BUG RIVER AREA
CHERNIGOV REGION
CHERNUKHY GAS FIELD
CRIMEAN CAUCASIAN GEOSYNCL
CRIMEAN PENINSULA
DALINSKOE OIL FIELD
DNIEPER DON BASIN
DOLINA OIL FIELD
EFREMOVSK GAS FIELD
GLINSK ROZBYSHEV GAS FIELD
GLINSK ROZBYSHEV SWELL
GNIZD GAS FIELD
KACHANOVSK OIL FIELD
KEGICHEV GAS FIELD
KEGICHEV UPWARP
KOCHANOVO GAS FIELD
KRIVBASS AREA
LELYAKOV GAS FIELD
LELYAKOVO OIL FIELD
LVOV REGION
MASHEVO GAS FIELD
MEDYNICHI AREA
MELITOPOL NOVO TSARITSIN F
N DOLINSKOE OIL & GAS FLD
NIKOLAEV OIL FIELD
NOVO BITKOV GAS FIELD
NOVO GRIGOREVO GAS FIELD
NOVODMITROVSKY OIL FIELD
NOVOTSARITSA RISE
OLKHOVSKOE OIL AND GAS FLD
OROV ULICHNIANSK OIL FIELD
POGARSHCHINSKII UPLIFT
POLTAVA REGION
PRICHERNOMORSKAYA DEPRESSN
PRILUKA OIL FIELD
RHUDKY GAS FIELD
RUDENKOVSKII MONOCLINE
RUDKOVSKOE OIL AND GAS FLD
RYBALSK GAS FIELD
SHEBELINSK GAS FIELD
SHEBELINSK OIL FIELD
STANISLAV AREA
SW CRIMEA SYNCLINORIUM
TALALAEV GAS FIELD
TARKHANKUT PENINSULA
TUAK ANTICLINORIUM
VOLYN REGION
ZACHEPILOVSK OIL FIELD
ZHIRNOVSK OIL FIELD
UMBAKINSK OIL FIELD

# DISCUSSION OF THE USE OF FOREIGN LANGUAGE SOURCES IN GEOLOGICAL JOURNALS

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**ABSTRACT** -- In most scientific disciplines the dominant language for scientific publishing is English. Nonetheless, large bodies of scholarly literature have been and continue to be published in other languages; in fact, several studies based on analyses of geological indexing sources suggest that barely half of the published literature is in English. To what extent, however, is this non-English body of knowledge utilized?

In order to determine what geologists publishing in leading journals cite, an analysis was made of a sample of over 7000 citations appearing in the ten leading geological journals in 1964 and 1984, based on the journal rankings in Science Citation Index. English proved to be the most common source language: 89% of the 1964 and 95% of the 1984 references were in English. Germanic languages (predominantly German but including Norwegian, Danish, Dutch, and Swedish) dropped from 7% to 1 1/2%. French stayed constant at around 2%. The remainder of the citations were in Portuguese, Italian, Spanish, Japanese, Chinese, various Slavic languages, and Other.

Of particular interest was Contributions to Mineralogy and Petrology, which went from a large percentage of its articles published in foreign languages in 1964 to nearly all English language articles in 1984. The patterns of references cited in these articles also showed a dramatic shift toward English. Considering the quantities of non-English material being published, this author concludes that foreign language sources are underutilized and that geologists risk missing relevant research by ignoring this body of knowledge.

## INTRODUCTION

If U.S. geologists were asked to identify the dominant language for publishing, most would probably select English. Nonetheless, large bodies of geological literature have been and continue to be published in other languages. Studies based on analyses of indexing sources not only confirm significant volumes of non-English publications, but indicate that approximately half of the literature of geology appears in languages other than

English. Branson (1962, p. 112) reports that 50% of the titles in his study were in English, while Hawkes (1966, p. 24) noted an even more startling figure of only 27%. A third study found that 48% of their total sample were published in English (Connor and Mannheim, 1982, p. 408). Nag (1983, p. 133) reported the highest percentage with English language totals of 67-70%.

I suspect that much of this body of knowledge is ignored by the scientific community. Therefore, this study will attempt to determine the extent to which this material is utilized. A second goal is to discover which languages are most commonly used, and third, the data of the current study will be compared with previous studies to determine if there has been a decline in the frequency citation of foreign language materials. By answering these questions, I hope to add to a better understanding of the nature of geological research and assist librarians in providing information needed by the scholarly community.

## METHODOLOGY

In order to answer these questions I undertook an examination of cited references appearing in leading geological journals in 1964 and 1984. These years were chosen because they bracket a period of tremendous changes in both geology and in library science. Geology was revolutionized by the implications of plate tectonics and continental drift, while library science saw explosive changes in the computing capabilities of libraries, particularly in regard to online databases.

Ten journals were selected and a systematic sample taken in order to determine the frequency of foreign language material cited and identify the languages used. In the course of selecting the journals and sampling the population, I had to make two fundamental assumptions. The first was that U.S. geologists conducting primary research will choose leading scholarly journals as the principal means of formally disseminating their results, due to the prestige and wide readership of these publications and because of the traditional role of the scholarly journal as the primary outlet for scholarly research.

My second assumption was that foreign language material would be identified as such in the citations, either by a title in a foreign language or by a parenthetical note in the citation. After having examined several thousands of references, I feel reasonably comfortable with this assumption, since I found numerous examples of both situations in all the journals examined. I also found many examples of translations identified as such.

The ten journals to be included in this study were selected using the lists of "Journals Ranked by Impact Factor" in the Journals Cited Reports of Science Citation Index for 1979 to 1984

(Garfield, 1979, p. 223; 1980, p. 229; 1981, p. 236; 1982, p. 246; 1983, p. 254; 1984, p. 248). Titles listed under the heading "Geology" were ranked for each year; these ranks were then averaged to create a composite rank. Since I wanted to compare 1964 with 1984 data, only those journals actually published in both years were included. These titles were:

<u>Journal of Petrology</u>
<u>Contributions to Mineralogy and Petrology</u>
<u>American Journal of Science</u>
<u>Journal of Geology</u>
<u>American Association of Petroleum Geologists Bulletin</u>
<u>Geological Society of America Bulletin</u>
<u>American Mineralogist</u>
<u>Sedimentology</u>
<u>Journal of Sedimentary Petrology</u>
<u>Economic Geology</u>

This is, I believe a valid list of titles. At least six of the ten titles were used in other studies of citation studies of leading geological journals, such as Gross and Woodford (1931, p. 661), Craig (1969, p. 231), Woodford (1969, p. 87), and Haner (1990, p. 342).

Of these titles six were published by professional organizations, three by university presses, and one by commercial publisher. Seven of the ten were published in the United States, and one in West Germany. The German title, <u>Contributions to Mineralogy and Petrology</u>, was produced by a commercial publisher. <u>Journal of Petrology</u> was published in England by a university press. The tenth title, <u>Sedimentology</u>, is an association publication. In 1964 it was published in The Netherlands, while in 1984 it was produced in England.

References cited in articles and research notes were included in the population under study; however, letters to the editor and bibliographies were not. Since the logistics of the project precluded the use of random numbers, the references were systematically sampled using methodology described by Carpenter and Vasu (1978, p. 32-34). The sampling interval for each volume was based on the number of citations counted in each volume; the sample size required to allow a 5% (.05) error rate was determined using a formula utilized by Craig (1969, p. 231) in which the sample size is equal to the total population divided by one plus the population times the error rate squared. The results were coded and cross-tabulations run on an Amdahl computer using a SAS cross-tabulation program.

## <u>DATA</u>

The data are shown in Table 1, which is a distribution of languages by the year of publication of the citing article. Under each year the column on the left is the frequency with which a given language was cited, and the column on the right expresses that frequency as a percent. A total of 3348 citations were examined from the 1964 population, and a sample of 3,647 citations was taken from the 1984 population. Once the cross-tabulations were compiled, a value for Cramer's V of 0.146 was derived. Cramer's V has a range of values from -1 to 1, with 1 being the maximum value possible. It is a "measure of association derived from chi-square" (SAS Institute, Inc., 1985, p. 414).

Table 1. Diversity of languages appearing in references cited sorted by the year of publication

| Language | Year of Publication | | | |
| --- | --- | --- | --- | --- |
| | 1964 | | 1984 | |
| | Frequency | Percent | Frequency | Percent |
| English | 2976 | 88.9 | 3524 | 95.3 |
| Germanic (predom. German, also includes Norwegian, Danish, Dutch, and Swedish) | 228 | 6.8 | 55 | 1.5 |
| Portuguese | 12 | 0.4 | 5 | 0.1 |
| Slavic (predom. Russian, also includes Czech, Polish, and Ukrainian) | 15 | 0.4 | 8 | 0.2 |
| French | 68 | 2.0 | 66 | 1.8 |
| Italian | 9 | 0.3 | 9 | 0.2 |
| Spanish | 12 | 0.4 | 8 | 0.2 |
| Asian (includes Japanese and Chinese) | 8 | 0.2 | 15 | 0.4 |
| Other (also includes articles with no title) | 20 | 0.6 | 7 | 0.2 |
| Total | 3348 | 100.0 | 3697 | 100.0 |

It is obvious that, although the study is concerned with the usage of specific languages, the results are in part arranged by language groups. Unfortunately most languages were not present in sufficient quantities to fill all the cells in the cross-tabulation. Therefore, they had to be combined in such a manner as would allow at least five cases in at least 14 of the 18 cells, as is required for a valid chi-square test (Carpenter and Vasu, 1978, p. 78).

Four language clusters were created. Germanic includes German, Norwegian, Dutch, Danish, and Swedish. German could have filled a cell in each study year, but the others could not, so they were collapsed. The same applies to the Slavic languages. Russian was the most prevalent language, but there were a few articles in Czech, Polish and Ukrainian. Neither Japanese nor Chinese articles appeared often enough in the sample to be counted separately. Instead they were combined to form the "Asian" cluster. "Other" included languages which did not fit into any category; examples of these include Turkish and Hebrew. "Other also included articles for which no title was present in the citation and no language was indicated.

English far exceeded all the other languages combined. Of the 1964 sample 88.9% of the articles cited were in English, while 95.3% of the 1984 sample were to English language publications. German, commonly considered to be a "scientific" language, dropped from 6.8% to 1.5%. The other languages and language groups exhibited little change; French, the only other language with more than 2% of the sample, stayed relatively constant at that mark.

One of the journals included in this study, Contributions to Mineralogy and Petrology, exhibited some characteristics which differed from the other journals under examination. The 1964 volumes had a German title and contained a large percentage of non-English articles. By 1984, however, the publication had an English title, and virtually all of the articles were in English.

Table 2 is a distribution of languages and language groups by year of publication for Contributions to Mineralogy and Petrology. Since the data were not collected with the intention of examining separate journal cross- tabulations, more than 20% of the individual cells do not contain the minimum of 5 citations required for valid results (Carpenter and Vasu, 1978, p. 78). However, the results are interesting and give an indication of a possible trend. A total of 314 citations were sampled from the 1964 population, and 388 were selected from the 1984 population.

In 1964 nearly 60% of the citations were to English language publications, while 36% were in some Germanic language. Slightly over 3% of the citations were to publications written in French. In 1984, however, the English percentage was 94% of the whole, while Germanic had dropped to only 2%, and French was at 2.6%. In fact, the 1984 data for Contributions to Mineralogy and Petrology were very similar to the totals for all ten titles.

## Discussion

Why are geologists not using foreign language sources? I suspect that the reasons are as varied as the people involved, but most seem to fall into distinct categories. The first is the 'language as a barrier' category. I must admit that, as a reference librarian, I frequently encounter this one; either the patrons cannot read any language other than English, or they assume that all the good articles are written in English.

Table 2. Diversity of languages appearing in references cited in Contributions to Mineralogy and Petrology, sorted by the year of publication

| Language | Year of Publication | | | |
|---|---|---|---|---|
| | 1964 | | 1984 | |
| | Frequency | Percent | Frequency | Percent |
| English | 187 | 59.5 | 365 | 94.0 |
| Germanic (predom. German, also includes Norwegian, Danish, Dutch, and Swedish) | 113 | 36.0 | 8 | 2.0 |
| Portuguese | 0 | 0.0 | 0 | 0.0 |
| Slavic (predom. Russian, also includes Czech, Polish, and Ukrainian) | 1 | 0.3 | 1 | 0.3 |
| French | 10 | 3.2 | 10 | 2.6 |
| Italian | 3 | 1.0 | 2 | 0.5 |
| Spanish | 0 | 0.0 | 0 | 0.0 |
| Asian (includes Japanese and Chinese) | 0 | 0.0 | 0 | 0.0 |
| Other (also includes articles with no title) | 0 | 0.0 | 1 | 0.3 |
| Total | 314 | 100.0 | 388 | 100.0 |

Bichteler and Ward (1989, 175-176), in a survey of information seeking practices of geoscientists, confirmed in a more rigorous manner my observations from the reference desk. Two-thirds of the professionals included in their study did not use foreign language materials. Both of these reasons were mentioned. They also noted that some scientists would seek translations if significant papers in their area of study were written in foreign languages.

These are not, unfortunately, recent developments. Vitaliano expressed several comments on the subject, one of the most interesting being that students should be encouraged to read foreign language professional literature by their professors (1959, p. 52; 1961, p. 77). She also pointed out the most obvious barrier to translations: "the translator must be paid" (1961, p. 74). However, she also stated two other problems with translated articles: they often are not timely and lack of subject knowledge on the part of the translator (1961, p. 74-76.)

An outgrowth of this is the perception by non-English speaking scientists that they must publish in English in order to be successful on the international level. Sano (1986, p. 300) wrote that Japanese scientists are now publishing in English at a greater rate than in the past so that they can get "wider recognition of their R&D results."

On the other side of the issue, Berger (1989, p. 45-48) notes that a lack of resources often hampers the research of non-English speaking scientists, particularly those working in the Third World. Hence, there are fewer non-English articles appearing in the well-established literature. Since these scientists may not be comfortable writing in English and since national outlets for this research are frequently inadequate, Berger claims the research results of these scientists may never be published.

The second area concerns the journals themselves. Vossmerbaumer and Ehrmann (1979, p. 893) suggest that two factors come into play. First, English language publications have higher circulation figures than non- English language publications and are thus more widely available, and second, more articles appear in English. These authors point out that "the two great (West) German journals produce ... together in one year only approximately half of the titles which are published solely in the Geological Society of America Bulletin" (p. 893).

The journals themselves encourage the use of English. Bridge, Bridges, and Tucker, editors of Sedimentology in 1984, wrote that "until recently most publishing sedimentologists have come from English-speaking nations, but as the field of sedimentology grows we can expect, and should encourage, more high quality papers from non-English speaking nations" (1984, p. 747). To accomplish this they instituted a text-editing service which would be available to non-English speakers who were writing in English.

What about the third of the geoscientists in Bichteler and Ward's study (1989, p. 175-176) who refer to foreign language publications on at least an occasional basis? These authors stated that the value of the foreign language material varies with the particular branch of the geosciences in which the scientist works; mineralogy, hydrogeology, petroleum geology, and paleontology were specifically identified as areas in which foreign language materials are regularly utilized.

A pair of papers presented at GeoInfo IV support both the appearance of English as a dominant scientific language and also the idea that the use of foreign language materials is at least partially dependent on the specific area in which the scientist works. Using the same methodology, these papers examined the citation habits of U.S. and Canadian paleontologists and geophysicists.

Walker (in press) was, unfortunately, unable to analyze the citing habits of Canadian geophysicists; however, his results indicated that English, French, and German were the primary languages cited by U.S. geophysicists included in the study. In fact his results were very similar to the results of the current study. Walker indicated that approximately 97% of the citations were in English, while 2% were in French and less than 1% were in German.

On the other hand Haner (in press), who studied U.S. and Canadian paleontologists, found that although English was the most commonly cited language, other languages were also cited. English accounted for 83.5% of the citations of Canadian paleontologists, while the corresponding percentage for U.S. paleontologists was 91.1%. German represented 6.8% of the Canadian sample and 3.6% of the U.S. sample; French and Russian were also present in measurable quantities.

Haner's work also brings up another interesting point: how dominant is English in the research of non-U.S. scientists? Her results (in press) show that Canadian paleontologists used a higher percentage of foreign language materials than did their U.S. counterparts, although the U.S. paleontologists were more likely to use these sources than the U.S. geophysicists sampled by Walker (in press.) Furthermore, Mitra's study of the citation characteristics of Indian scientists (1972, p. 123), Vossmerbaumer and Ehrmann's study of sedimentology literature (1979, p. 892-895) and Pastrana's analysis of Spanish dissertations in geotechnics and foundations (1984, p. 272-275) report that the majority of the cited literature included in their studies was in English. Granted, four studies do not constitute a definitive statement, but they do suggest that geologists outside the United States also heavily cite English language sources.

This is not a recent phenomenon. Data presented by Gross and Woodford in their landmark 1931 paper (p. 661,664), indicated that 82% of their sample were in English, although only about 26% of the references to foreign publications were in English. German represented 11.6% of the total, and French and the Scandinavian languages each represented about 2%. These results provide the benchmark for Steven's comparisons (1953, p. 17) of literature in several different scientific disciplines. In 1969 Woodford (p. 88) published a second paper which analyzed serial literature and showed that, of the citations to serial publications included in his sample, approximately 91% were published in English. Craig (1969, p. 231- 232) had a range of 87.3-87.5% English languages sources in his citation study. Haner's study concerning the use of government publications also indicated a decided preference for English language documents (1990, p. 350, 352-353). These studies, when combined with the current results, suggest that English has long been the dominant language for the geosciences, although the percentage of English language citations is gradually increasing.

## Conclusions

I am not asking everyone to learn a foreign language, nor am I calling for the exclusive use of English in scientific publications. Rather, I am asking that scientists not automatically eliminate potential sources of information just because they happen not to be published in English. The value of foreign language research should be judged on the quality and relevance of the research, not on the language in which it is published. The comments made by Bickford in a 1990 (p.3) Geology editorial concerning the tendency not to cite older literature could also apply equally well to languages: "much current research, if not actually redundant, may not be building advantageously upon previous work." There is no law stating that significant scientific research be published only in English. Indeed, Teichert (1988, p. 107-108) provides several examples of paleontological research which was severely handicapped, sometimes for decades, because foreign language publications were not consulted. By ignoring previous research simply because it is not available in English, we run the serious risk of missing vital pieces of research.

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## THE CASE FOR DESKTOP PUBLISHING

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Abstract--Desktop publishing is an extension of word processing in which printed matter similar in quality and style to type-set books is produced using a program such as Wordperfect and a laser printer. The case for desktop publishing is one of economy, from perspective of publisher, journal editor, or writer. Many writers help finance publication through page charges for journal articles or subvention for university presses. However, costs are just as real when manuscripts are required to be camera-ready or on disk. As examples, one university press foregoes subvention when camera-ready copy is submitted, and a non-profit publisher gives a cash bonus for submitting material on disk.

Wallace S. Broecker in the forward of How to Build a Habitable Planet noted that "thanks to computer layout schemes and laser printers, it is now possible to circumvent the very high overhead associated with conventional publishing." His 291-page text sells for $18.00. Ed Nuhfer and Mary Dalles produced an 74-page guidebook to a national seashore for $7.00.

Four independent and positive reviews of our 160-page Environmental Atlas convinced us to publish. Our potential target is 1200, largely local schools and libraries. We wanted price to be reasonable. A potential publisher estimated retail cost to be $40.00, and required our guarantee to purchase remainders, a worst case scenario of $36,000.

One or both of us: learned Wordperfect and desktop publishing; scanned photographs; negotiated for custom printing; arranged marketing through local book sellers and the Eastern Parks Association; and provided financing at 15% of the guarantee earlier proposed. The work sells for $16.95, including 40% markup and return privileges. Such details concerning desktop publishing should be helpful to others faced with similar choices for publication.

### Desktop Publishing

The history of desktop publishing (DTP) reportedly goes back to 1984, when Paul Brainerd introduced the term to his company and to the public. Since then DTP has developed into a tripartite market of personal publishing, professional publishing and production publishing, according to John Harrison of IBM (P. Saffo, 1989). Producing a family Christmas Letter, a consultant's report, and a bound textbook would be typical activities representing the three markets of DTP.

DTP is an extension of word processing in which printed matter similar in quality and style to typeset books is produced using a program such as Wordperfect and a laser printer.

Technological advances extend the term to coupling of text and graphics, and Guterman (1990) indicates that CD-ROM technology will soon be linked to DTP, allowing one to draw from a massive library of images and forms. The term DTP, as the method undergoes explosive growth, may simply revert to 'publishing.' Current indicators of this growth are: Hewlett Packard has sold more than 3 million laser printers; P.C. Magazine evaluated 7 low-cost desktop publishing programs (Luisa Simone, 1990); and Xerox announces the DocuTech Production Publisher, combining high-resolution scanning, laser imaging and xerography, with the statement "now you can get offset-like quality at lower cost in unprecedented turnaround time" (Wall Street Journal, Oct. 3, 1990).

The obvious case for DTP is economy. Editing and typesetting add significantly to costs and time schedules. Editors of journals, university presses and commercial presses fully utilize these economies when they require either camera-ready copy or manuscript on disk or both. Less widely recognized in this is empowerment. Writers, having prepared camera-ready copy, have an option of by-passing commercial publishers and undertaking page composition including graphics, reproduction, binding, advertising and distribution. This alternate path involves challenges and pitfalls, and should not be undertaken lightly.

## **The Quest to Publish**

Scholars continually face the challenge of transforming the "life's work" or at least the results of several years research and writing into something beyond a manuscript, thesis or dissertation.

Daniel Coit Gilman, first president of the Johns Hopkins University, established in 1878 the oldest continuously operating university press, and stated "it is one of the noblest duties of a university to advance knowledge, and to diffuse it not merely among those who can attend the daily lectures - but far and wide" (Meyer and Phillabaum, no date).

Of course, not all manuscripts are worthy in scholarship and many that are worthy simply appeal to a small readership. Interlibrary loans, University Microfilms, and ERIC provide a safety net from obscurity. Journal articles are a viable alternative for selected parts of a long manuscript. Publication of a book-length work, however, can be much more of a challenge. The writer who aspires to seeing a work appear as a book has to address each of the following:

Is it worthy?
What is the market (target audience)?
How will it be financed?
How much will it be sold for?
How will it be composed?
How will it be reproduced and bound?
How will it be marketed?
Who will do it?

Answers to the first question may bruise the ego and end the process. Good reviews may contribute later to a sense of frustration. Very few manuscripts deemed worthy by reviewers (scholarship) are deemed worthy by commercial publishers (potential for success).

## **Costs to Writer or Organization**

Even acceptance by a commercial publisher may require some degree of financial subsidy or guarantee. The question of financing is not well understood. Writers are familiar with "page charges" required or at least requested by journals, as editors try to make ends meet.

Subsidies of many types, some less obvious but still representing real costs, are associated with publication of a book-length work. Form of the subsidy varies with the publisher. We cite an instance where camera-ready format represents considerable real costs to a writer's institution, involving contracted drafting and considerable overtime for a secretary to prepare camera-ready text, so that 400 copies of a "life's work" could be produced in book form by a non-profit publisher "without subsidy or subvention." Submission of the manuscript on disk or in camera-ready format is a subsidy, and recognized as such by one non-profit publisher which pays a cash bonus to writers, and by several university presses which forego subvention in return for submitting material on disk.

There are the more obvious ways for a writer or organization to subsidize the publication of a book - subvention, possibly $2000 to $3000 for a press run of 1000 to a university press; guarantee to purchase remainders required by a cautious commercial press; or an outright payment to a vanity press.

If the situation requires the writer to prepare camera-ready copy and provide an additional subsidy, another option is available, and should be considered.

## Do It Yourself

The writer and/or organization may choose to assume the tasks of page composition, reproduction and binding, and marketing. This extra effort may be justified for one or more of the following reasons:

- o final sales price of the publication will be less
- o time until availability will be less
- o risk will be less to personal or organizational funds
- o market is assured or captive
- o in-house capability already exists.

Do not underestimate the responsibilities inherent in the do-it-yourself approach. Professionals have the know-how and amateurs must learn without making disastrous mistakes. Manes (1988) reminds us that "although in theory desktop publishing makes it possible for almost anyone to turn out professional-looking pages, desktop publishing, in truth, makes it possible for professionals to turn out professional-looking pages."

### Reproduction and Binding

Choices range from Professor Publishing (Kinko's, 1989) to custom printing by a large publishing house. If your work is primarily for use at a local college and/or the number of copies needed is small or uncertain, then Professor Publishing or a similar service will require minimal effort and provide great flexibility to the writer. The service will help with copyright permission. Once the service has your master copy, it will handle duplication, collating, binding and distribution of your work, and will allow for a royalty to be paid the writers.

If your work targets a greater market, custom publishing is a no-frills, little-known service of publishing houses which will take your camera-ready manuscript, including illustrations, provide you with a blue-line equivalent of a galley-proof, and under contract print, bind, shrink-wrap in bundles and ship a specified number of copies. The service is good, and, beyond a very low number of copies, is price-competitive with Professor Publishing.

### Marketing

It is critical to have a marketing plan. You must identify the targeted readers, know how you will get the work to them, what price they should pay, and where you will break even financially. How will you sell the book--direct mail solicitation, bookstores, regional wholesale distributors? Can you get meaningful reviews and develop appropriate advertising? Is all of this budgeted and taken into account in the suggested sale price? It is standard that a bookseller marks up the cost by 40%, and maintains return privileges for unsold copies.

## The Fundamental Question

Is all of the effort worth it? Reconsider the reasons to "do it yourself," including apparent advantages of lower final sales price, more timely availability, lower funds at risk, an assured market, and/or in-house capability.

## Case Histories

### Wallace S. Broecker

The forward to "How to Build a Habitable Planet" includes the statement, "many readers will surely ask why this book was not published by the usual channels. Beyond my liking for the unconventional, there is an important financial reason. For each book sold $2.50 will be returned to the Department of Geological Sciences as repayment of typing and drafting costs. After a year of negotiations with various publishers I found this to be the only way I could recover these costs. Thanks to computer layout schemes and laser printers, it is now possible to circumvent the very high overhead associated with conventional publishing." Wallace S. Broeker's 291-page book was copyrighted in 1975, sold directly through the Lamont-Doherty Geological Observatory of Columbia University for $18.00, and has had a second printing.

### Edward B. Nuhfer and Mary P. Dalles

Edward Nuhfer and Mary Dalles (1987) created, designed, illustrated and prepared camera-ready copy for the 74-page "A Guidebook to the Geology of Lake Superior's Apostle Islands National Lakeshore." This attractive and interesting work states on the copyright page, "in order to minimize costs to the user, the authors have done the complete typesetting and camera-ready arrangement. The actual printing was done by W. C. Brown Publishers in Dubuque, IA." Retail price for this work is $7.00 or less, a tribute to the dedication of the authors. It is now in a second printing.

### Our Experiences

We want to add our experiences in order to encourage others who find themselves asking "is it worth it to do it yourself."

our strong motivation to publish requires some background information.

Thanks to the Honorable John F. Seiberling and many others working toward the goal, some 34,000 acres of relatively undeveloped and scenic open space in the Cuyahoga Valley between Akron and Cleveland, Ohio were established in 1974 as the Cuyahoga Valley National Recreation Area. We, along with family members and our students at the University of Akron, were among vast numbers who took great interest in the park. Field research, field trips, and public service activities such as lecturing in the evening, guiding walks, and serving as "Volunteers in the Park" provided many fine opportunities to know and enjoy the area.

At this time we had established a course, <u>Geology of the National Parks</u>. In developing our lectures, we found a wonderful publication of another national area which tied together many features. This was a welcome relief from the typical narrow and fragmented publications (for example, mimeographed species lists) and the highly generalized treatments, such as brief descriptions of parks in a standard text. The "Environmental Atlas of the Cape Cod National Seashore," utilizing a series of maps at the same scale to portray many characteristics, impressed us as a way to show the totality of features in one volume.

One of us (B.M.M.) made the commitment to work toward a Ph.D. in a cooperative program between Geology and Secondary Education at the University of Akron. The other (R.G.C.) served as dissertation advisor in Geology. Here was our opportunity to create "An Environmental Atlas of the Cuyahoga Valley National Recreation Area." The immediate goal was to produce the appropriate scholarly dissertation, conforming to expectations of justification of the topic, original work, and style in the context of science education. The next goal was to completely rewrite and reorganize appropriate portions of the dissertation in order to make it attractive to and useful for teachers planning field trips, park personnel, and the interested public. Of course, this required us to have it published and available to the public and to libraries at a reasonable price.

We are realists, more so now than before. We received extremely enthusiastic comments from four reviewers. Akron at that time was several years away from establishment of a university press, and only now has chosen its first work. We thought a commercial publisher was seriously interested in producing and distributing a first run of 1200 copies, until we got to the hard negotiations. The estimated retail price would be $40.00, and we would be responsible for purchasing all remainders if their standard promotional efforts fell short of a sell-out. We are new at this, but not so naive nor so well-to-do that a potential liability of $36,000 went un-noticed. We also thought $40.00 was higher than reasonable, inasmuch as $25.00 was the top price for books sold at the CVNRA visitor's centers.

Our next attempt was to find a way to have the books paid for by a 3rd party and distributed directly to schools and libraries. We contacted a number of foundations, and had one interested. However, the Foundation Director wanted us to change the focus of our request, and to train teachers during summers in the park environment, using our Atlas as a reference. Our career obligations, interests and futures did not permit us to be that flexible.

Frustrations gave way to renewed enthusiasm after Ed Nuhfer and Mary Dalles met with us at Geological Society meetings held in Akron. We were impressed with their Guidebook, and its cost. They provided the encouragement and many useful suggestions as to how to do it yourself. After fruitless effort with commercial publishers and foundations, we were prepared to establish a "sweat equity."

One of both of us: learned Wordperfect and DTP; arranged to have photographs scanned; completed drafting; negotiated for custom printing; prepared camera-ready copy using DTP (Wordperfect and laser printing); personally provided financing at only 15% of our worst-case liability involving re-purchase of remainders from a commercial publisher; arranged marketing through local booksellers and the Eastern Parks Association; and solicited local libraries by direct mail. As a result, we increased the estimate of the target audience by 50%. Our 150-page book sells at retail for $16.95. Unselfish advice and lists of contact persons from a local bookseller and the director of a local library were crucial to our success. Of great help, as well as a sense of immense personal satisfaction, is the kind review from Congressman Seiberling, which (apart from the financial considerations) answers for us the question "is it worth doing?".

> "I am sure that your Environmental Atlas of the Cuyahoga Valley National Recreation Area will become a standard reference for everyone interested in this fascinating part of Ohio. It is masterfully organized and presented and pulls together in one place the many facets of this beautiful and historic valley."--John F. Seiberling

We close with the hope that this article will provide encouragement and helpful information to others in the same way that Broecker's and Nuhfer-Dalles' success have encouraged us. Desktop publishing, custom printing and some sweat equity make it possible.

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AN EVALUATION OF A FREE, UNLIMITED ONLINE SEARCHING PROGRAM IN A UNIVERSITY GEOLOGY LIBRARY: WHO IS USING IT, WHAT DOES IT COST, AND IS IT WORTH IT.

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Abstract--The University Libraries at the University of Colorado, Boulder received a large gift from an alumnus of the Department of Geological Sciences in 1988 to eventually help build a new Earth Sciences Library. In the interim, a portion of the interest generated by the gift supports completely subsidized online searching for department faculty, research staff, graduate students, undergraduates, and anyone enrolled in geology classes. This preliminary study of the first two years of the program indicates that the heaviest users are graduate students, followed by faculty. Use by undergraduates has been low even though restrictions are few. Repeat use of the service is quite high and there is a core user group among both faculty and students. The cost of providing this service has proven to be less than anticipated, primarily because of AGI's 50% discount, which began in 1988, for academic libraries using GEOREF.

Although usage increased dramatically during the second year, less than half of those eligible for the free searching have taken advantage of it. This indicates the need for a follow-up study, perhaps in the form of a questionnaire, to determine if all faculty and students know about the system, what they do know, where they found out about it, and the level of satisfaction among users.

## Introduction:

This is a preliminary study of the use of a free online searching program by the University of Colorado Department of Geological Sciences. The program has been in existence since 1988 and is funded from interest generated annually by a gift to the University Libraries from the Crail-Johnson Foundation. The principle amount of the gift is held by the CU Foundation in anticipation of funding a new library facility in the proposed new geological sciences building.

It is hoped that the building, which will be primarily privately financed, will be built in the next three years. Until that time, the annual funding from this source to the Earth Sciences Library will amount to $50,000 a year. Each year a proposal is written outlining the use of these funds. It is divided into three parts: equipment, collection development, and online searching. The division usually amounts to approximately 1/5 equipment, 3/5 collection development, and 1/5 online searching. These assignments are not absolute and some adjustment is usually needed throughout the year.

The only area which cannot be funded by the Crail-Johnson gift is journal or serial subscriptions, which would impact the library budget long after the gift is exhausted. The one exception to this is GEOREF on CD-ROM, which will be purchased with gift money as long as the funding lasts. The reasoning behind this is that it is something that would be purchased in any case and the availability to end-users of the CD-ROM version of GEOREF will substantially decrease the amount of online searching being done.

## The Earth Sciences Library:

The Earth Sciences Library is one of five external branch libraries of the University of Colorado Libraries system. It is located in the geology building and has a collection of over 35,000 volumes. Due to space constraints, about 1/3 of the collection is in storage in the main library but is accessible to patrons. There was no librarian on site from 1980, when Dedrick Ward left, until 1988. With the prospect of this large gift, it was decided that having a librarian actually in the Earth Sciences Library was a prerequisite to using the money wisely. One of the major expenditures of the first year of the gift was to rearrange the library and create a reference office. This process was documented in a poster at last year's GIS meeting and an article in the GIS proceedings for the meeting. (Larsen, 1989)

The funding for the Earth Sciences Library without the gift allows for no frills and only the basic necessities of collection development. With the gift, both the collection and library services have been drastically improved.

## The Department of Geological Sciences:

Like most geology departments, the Department of Geological Sciences at the University of Colorado has experienced a roller coaster ride in the numbers of students over the last few decades. Bumper crops of students in the early 1980's have given way to a scarcity of geology majors. Numbers are still low but have shown a marked increase this year. This study covers the school terms of 1988-89 and 1989-90 which coincides with the fiscal year cycle of the funding.

Table 1. CU Department of Geological Sciences

| | Graduate Students | Undergraduates | Faculty |
|---|---|---|---|
| 1988/1989 - | 132 | 65 | 30 |
| 1989/1990 - | 128 | 53 | 32 |

## The Free Online Searching Program:

The prospect of so much collection development to be done brought home the fact that the perfect collection which supports all teaching and research of the department could not exist, even with such a generous budget. So, while the majority of the funding was allocated for collection development and purchase of equipment, such as computers, which could be transferred to the new library, a portion of it was set aside to totally subsidize all online searching for undergraduate or graduate geology majors and Geological Sciences Faculty and staff. In the interest of equal access to information, this was later broadened to include any one taking an upper division or graduate level geology class requiring a paper, regardless of their major. The concept was to provide better access to our own collection, as well as a better tool to access the world of resources not owned in our collection.

Another consideration for providing free online searching was the fact that being an external branch library, we do not have local access to many of the indexes and abstracts in related fields. The growing interdisciplinary nature of geology increasingly requires access to sources such as Engineering Index, Science Citation Index, and Chemical Abstracts, among others.

With no prior use statistics to go by $10,000, was allocated for searching the first year. Surprise! The entire Geology Department did not immediately line up out side the library door waiting for online searching. Only $2,800 was used. One reason for the low expenditure was that AGI reduced the cost for GEOREF, the most heavily used file, by 50% in the fall of 1988. But the primary reason for such low usage was that the availability of searching was new to the Department. Traditionally, online searching is not heavily used in the academic world because of the cost involved. Many, both students and faculty, were not aware of the possibilities. Each month, as the year progressed, the number of searches increased. Even so, a much higher use was expected.

Table 2. Searching statistics - 1988/89

| | jul | aug | sep | oct | nov | dec | jan | feb | mar | apr | may | jun | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # Users | 0 | 2 | 6 | 4 | 4 | 10 | 5 | 14 | 27 | 23 | 23 | 11 | 129 |
| # Files Searched* | 3 | 16 | 24 | 18 | 19 | 40 | 29 | 47 | 69 | 48 | 54 | 29 | 396 |

* includes ready reference searches and demonstrations

The program is publicized in numerous ways. It was announced several times in departmental faculty meetings. It is announced in each issue of the library newsletter, which is distributed to all faculty, staff and graduate students. A library presentation is part of the Department's new graduate student orientation and the online program is stressed. It is outlined in each bibliographic instruction class given for geology classes (usually junior or senior level classes requiring papers, about 2 a semester). The availability of online searching is mentioned when helping students find information in the library, if it is applicable. A sign was placed above the Bibliography and Index of Geology indicating that it is computer searchable. However, the most efficient and successful way of publicizing the service, according to an informal poll taken when doing the searches, is word of mouth!

The second year of the free searching program, statistics were up appreciably:

Table 3. Searching statistics - 1989/90

| | jul | aug | sep | oct | nov | dec | jan | feb | mar | apr | may | jun | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # Users | 13 | 15 | 12 | 34 | 29 | 13 | 22 | 11 | 19 | 25 | 13 | 11 | 217 |
| # Files Searched* | 41 | 33 | 24 | 62 | 58 | 26 | 51 | 20 | 29 | 53 | 23 | 19 | 439 |

* Includes ready reference searches and demonstrations

The fluctuation in the number of users correlates to the academic year. The Department of Geological Sciences usually offers only one class during the summer term, if any. Undergraduate student use of the library at that time is practically non-existent and graduate student/faculty use is quite low as well.

Who uses the program?

1. Graduate Students

Predictably, graduate students were by far the heaviest users of the program for both years. The number of searches done for this group more than doubled in 1989/90 but the number of students using the program increased by less than 50%. This may indicate a large number of return users. In 1988/89, 30.3% of the graduate students enrolled used the free searching program at least once. This figure rose to 45.3% in 1989/90. These figures are slightly skewed by the fact that some of the graduate students on the departments rolls are doing fieldwork or are finishing theses and dissertations while working and are therefore not physically on the premises. So in reality the percentage of students using the program is much higher than these figures indicate.

Table 4. Searching - Graduate Students (GS)

| | # Files Searched | # GS Enrolled | # GS using | % GS using | # Files Searched per GS |
|---|---|---|---|---|---|
| 1988/89 | 76 | 132 | 40 | 30.3 | 1.9 |
| 1989/90 | 148 | 128 | 58 | 45.3 | 2.6 |

2. Faculty

The faculty has been the next highest user of the program. Surprisingly, the numbers are almost exactly the same for the two years of the program. One phenomena these statistics do not show is that even though the numbers stay the same, it is a different set of faculty using the system each of the years. This probably indicates that a majority of the faculty is aware of the program but that their specific needs vary from year to year with teaching and research loads.

Table 5. Searching - Faculty (Fac)

| | # Files Searched | # Fac | # Fac using | % Fac using | # Files Searched per Fac |
|---|---|---|---|---|---|
| 1988/89 | 41 | 30 | 18 | 60 | 2.3 |
| 1989/90 | 49 | 32 | 18 | 56.2 | 2.7 |

3. Undergraduates

Undergraduates have used the program the least. However, the increase in use in the second year of the program was greater than either of the other groups. The low usage by this group is understandable because of the limited demand on them for research papers. The majority of the searches for undergraduates have been for those taking graduate level classes or those doing honors theses or special projects. Some special limitations are put on the undergraduate searches. First the student must use the paper version of the Bibliography and Index of Geology and find at least one article on his/her subject. This is in order to make sure they have a rudimentary understanding of subject headings and how the paper index is organized. It also insures that they have a basic knowledge of their subject and the necessary vocabulary.

Table 6. Searching - Undergraduate Students (US)

| | # Files Searched | # US | # US using | % US using | # Files Searches per US |
|---|---|---|---|---|---|
| 1988/89 | 4 | 65 | 3 | 4.6 | 1.3 |
| 1989/90 | 17 | 53 | 14 | 26.4 | 1.2 |

What files were being used?

Most of the searching is done on the DIALOG system. STN is used on occasion for both GEOREF and Chemical Abstracts. As part of the pre-search interview various databases are discussed regarding their strengths and limitations in both subject and time periods covered. Surprisingly diverse files are being used in the program, 26 different ones in 88/89 and 33 in 89/90. Of course GEOREF receives by far the most use. The file most heavily used after GEOREF is SciSearch (Scientific Citation Index). This is interesting in that most students are not familiar with this tool in its paper version. The faculty is, and several professors send their students to search this database specifically. Once students see how powerful it is, they tend to be return users. Geobase (Geographical Abstracts), CA SEARCH (Chemical Abstracts), and Compendex Plus (Engineering Index) are the next most requested databases.

Table 7. Primary Files Searched

| | 1988/89 | 1989/90 |
|---|---|---|
| GEOREF | 267 | 308 |
| SCISEARCH (all files) | 26 | 27 |
| CA SEARCH (all files) | 14 | 16 |
| GEOBASE | 18 | 9 |
| COMPENDEX PLUS | 10 | 11 |

Two online files that have been impacted by the existence of CD-ROM versions are Selected Water Resources Abstracts, which the Earth Sciences Library owns, and NTIS, which is located in the Government Publications Library in the main library building. These files are used extensively in that format and therefore rarely searched online.

What was the average cost per individual? per search?

The cost for providing this program has been less than anticipated. However, the use and cost nearly doubled the second year. It will take a few years of statistics to really get a feeling for the optimum usage and if or when more stringent rules need to be set up to make sure that everyone has equal access to the program.

Table 8. Cost of Searches:

| | Total Charges* | Cost per Search** | Cost/Indiv. User** |
|---|---|---|---|
| 1988/89 | 2800.00 | $22 | $42 |
| 1989/90 | 4300.00 | $11 | $47 |

Total cost for 2 years: $7100.00
* rounded off to the nearest $5.00 ** rounded off to the nearest $1.00

## Conclusion

This is only a preliminary study. Two years is not enough time to draw any concrete conclusions. Even so, it does define some trends that may, in time, result in the ability to determine the true cost and possible constraints needed for such a program. The study also pointed to some additional questions which need to be answered in order to better define these variables.

a. Graduate students are the heaviest users. In order to really budget for the appropriate number of users it will be necessary to know the number of graduate students that are resident in the department, not those who are on the roster but are in the field or elsewhere.

b. Undergraduate student searches are on the increase but are still relatively few and tend to be inexpensive. If the number of undergraduate geology majors increases, will it still be only a core group which uses the online program or will the demand increase proportionately.

c. Faculty use was at a constant level both years, although different faculty members were involved each year. Can this be counted upon as a regular cycle?

d. The development of CD-ROM technology has already made an impact on online searching. What will the impact of the GEOREF CD-ROM be? The existence of the Selected Water Resources Abstracts CD-ROM has effectively cut off searching in that online database. This is one of the reasons why the GEOREF CD-ROM will be funded out of the online program budget as long as possible. Graduate students and undergraduates, especially those who do not use the online program regularly now, will be probably be very excited about the CD product. It is anticipated that CD use by all students will exceed their use of the online searching program because the hands on capability with no clock ticking encourages self-directed exploration. The majority of the faculty will more than likely still wish to have mediated online searches done, even in GEOREF.

## Is the free online program worth it:

An important point in this free program is that it gives equal access to enhanced research capabilities to all students and faculty in geology, not just to those who can afford it. Up to this point, no other portion of the library budget has suffered by the funding of free searching. But the gift money will not last for ever. In the future some hard decisions will have to be made on whether or not, or how to fund online searching. However, in this day of soaring journal and book costs, perhaps the money spent on online searching should be considered a bargain. Of course the trickle down effect must be addressed, such as increased interlibrary loan requests. (Barringer, 1989)

In addition, the hard fact is that someone, somewhere must continue to purchase those expensive journals and monographs. The concept of funding searching out of the materials budget was the subject of a 1986 article by Jay Martin Poole and Gloriana St. Clair in College and Research Libraries. (Pool, 1986) It was subsequently challenged by several others in a "reactions" section in the same issue of the journal.

Perhaps a middle road approach would be appropriate. The answer might be a more restrictive, partially subsidized online program. At any rate, the decision is at least 3 years off. In the mean time, each time searches are done for faculty and graduate students they are reminded that in the future they might want to include specific funding for searching in research grant proposals.

## Future Study

The next logical step, now that the program has been operational for a few years, is a formal user study. The effectiveness of the GEOREF CD-ROM should be measured in a similar manner once it has been on site for a period of time. The following information needs to be documented:

1. Who knows about the program -- how did they find out? Faculty involvement may be the key here. (Schumacher, 1989)

2. What do they know about the capabilities of online searching, ie access to databases other than GEOREF, search strategy, limitations.

3. If they have they used the program -- how much, what for?

4. Have they been satisfied with the results?

A similar study was done by Clark and Silverman jointly at Winthrop College and College of William and Mary. (Clark, 1989) Their survey is serving as a model for an evaluation tool now being devised.

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# GEOLOGIC INFORMATION ON POLAR REGIONS AVAILABLE ON COMPACT DISCS

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Abstract--With the increasing interest in the Arctic and Antarctic, compact discs containing information on polar subjects add a new searching dimension to locating geological materials. This presentation reviews the latest edition of the following compact discs on polar regions: Arctic Data Interactive, PolarPac, AORIS, NISC Arctic and Antarctic. The coverage and unique searching capabilities of each product is assessed with regard to high latitude geologic coverage.

What was the price of a barrel of oil in the morning paper? Shall the United States explore for oil in the Arctic National Wildlife Refuge? The eyes of the country are once again focused north on the oil, gas and mineral resources of Alaska and Canada. Arctic information sources are becoming increasingly important to answer the questions about the future of these high latitude areas and the environmental issues associated with their development.

This presentation will alert you to four new CD ROM products: Arctic Data Interactive, AORIS, NISC-Arctic and Antarctic Regions and POLARPAC, which have appeared or will appear on the information market this year. Each one of these new products makes a contribution to the arctic information network. The purpose of this paper is to review the unique aspects of each CD product with regard to subject content, date, coverage, searching capabilities and user friendliness.

## ARCTIC DATA INTERACTIVE

Available from: The U.S. Geological Survey
Reston, Va.

Price: Less than $30.00

Arctic Data Interactive represents an experimental interagency project sponsored by the U.S. Geological Survey to produce an electronic interdisciplinary research journal. The prototype was on display at the convention and will be available early next year (1991).

The Arctic Data Interactive will include the following multimedia elements:

1. Arctic Environmental Data Directory

   This will contain more than 300 data sources maintained by U.S. government agencies and other institutions.

2. Bibliographic Information

3. Full Text of Research Reports and Short Papers

   Illustrations from these documents will also be included.

4. Arctic Data Sets

The format for the Arctic Data Interactive will resemble a journal with a table of contents which will allow the reader to browse the entries. The researcher can locate information in the data directory. Then he can move to the data section to read specific data sets or move to the journal article from which the data sets were extracted. This is done with a hypertext system that incorporates icons (graphic representations) and multiple windows on a computer monitor. These graphic representations allow readers to browse information by following associative links between bibliographies, numeric data, textual information and spatial imagery. It sounds like an exciting new pilot product. (Written and oral communication, Denise Wiltshire, 1990).

## ARCTIC AND OFFSHORE RESEARCH INFORMATION SYSTEM

Available from: National Software Center
Argonne National Laboratory

and

NISC Arctic and Antarctic
Regions (see later discussion)

Price: Not established at this time.

AORIS (Arctic and Offshore Research Information System) is a database developed by the Arctic Research and Development Program of the U.S. Department of Energy. This data base was developed as a centralized computer information source for bibliographic and data sources relating to the development of Alaskan oil and gas production. It includes not only scientific, but also engineering, planning and policy sources. The major topics included are sea ice, geotechnology, oceanography, meteorology, arctic engineering, permafrost and seismology. AORIS is available from two CD ROM vendors: National Software Center and NISC. The National Software Center AORIS product is a pilot disc with a one time production. It has a provision for additional information to be added to the database by the users. This feature could be useful for future updates.

The NISC AORIS product is a part of the Arctic and Antarctic disc which will be described later in this paper.

The AORIS CD consists of three sections:

1. A Directory - 85 Arctic energy related information sources

2. A Bibliographic File - 8,000 references and abstracts on Arctic research topics related to the development of oil and gas.

3. A Data File - 800 data sets of tabular and graphic information on sea ice characteristics.

The Directory section is cleverly called "Roadmap." It is divided into 10 broad topics: Arctic Engineering, Geology and Geophysics, Geotechnical, Glaciology and Hydrology, Marine Life Sciences, Meteorology, Permafrost, Physical and Chemical Oceanography, Terrestrial/Fresh Water Biology, Upper Atmosphere Physics.

These then can be subdivided by subtopic if needed. The "Roadmap" section on information sources can be searched by topic or title and has a cross reference feature.

The Bibliographic section contains citations which reflect the topics listed in "Roadmap." AORIS contains all entries in it's subject fields from "Cold", the Orbit database produced by CRREL (U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire) through 1987. The AOGA (Alaska Oil and Gas Association) and APOA (Arctic Petroleum Operators Association) publications are also indexed.

The Bibliographic section is searchable by keyword, author, date, title, and AORIS identification number. The search statement can contain up to 6 keywords, the author's name and date range. The default date range is 1965-1987. Only the Boolean operator "and" can be used. This is a handicap for "or" or "not" would be useful. If a term is not listed in the thesaurus, a window will appear with the terms closest alphabetically to the requested term. The bibliographic citations indicate if any figures or maps are available.

The Data section contains scientific data from specific sea ice publications. The Data has been categorized by topic, subtopic, geographic area and ice types. These processes can be limited by using the Boolean "and."

This Pilot disc was received in my library only recently. The directory of information has been a useful research tool, although the information is dated. The bibliographic section has not been evaluated for duplication of coverage with other systems or for unique entries. The introduction comments that it includes grey literature which could be very useful. One drawback is that the coverage only appears to go up through 1987. A software provision is made so the user can add additional entries. The sea ice data section appears to be a very useful assemblage of information with good access.

## NISC - ARCTIC AND ANTARCTIC REGIONS

| | |
|---|---|
| Available from: | National Information Services Corporation<br>Suite 6, Wyman Towers<br>3100 St. Paul Street<br>Baltimore, Maryland 21218 |
| Price: | $795.00 |

The latest version issued this fall contains database from 5 major polar libraries plus the previously mentioned AORIS database. These databases include not only the monographs, but also reports, conference proceedings and periodical articles on polar topics. The following libraries are contained in this new version with these library databases:

| | |
|---|---|
| ASTIS: | Arctic Institute of North America, Calgary, Canada |
| C-Core: | Centre for Cold Ocean Resources Engineering, St. John's Newfoundland |
| CRREL: | U.S. Army Cold Regions and Research Laboratory, Hanover, N.H. |
| SPRILIB: | Scott Polar Research Institute, University of Cambridge, Cambridge, England |
| WDCA: | World Data Center A for Glaciology, Boulder, Colorado |

The disc is so new no documentation has been received. The scope of each of these collections is of vital interest to potential users, so each library was contacted for information about their specific holdings on this disc.

The ASTIS section from the Arctic Institute of North American disc contains all the ASTIS records as of February 2, 1990. It covers all subjects with most of the records dating from 1978 to the present. Thirty-nine percent of the database is earth science information and eight percent is geology. It also includes the description of research projects as well as bibliographic records. (Written communication, Ross Goodwin, 1990).

The C-Core entries on the disc are a special collection of materials relating to ocean engineering and offshore resource development. The subjects include: sea ice, icebergs, icing, offshore structures, hydrocarbon exploration, geotechnics, and North Sea offshore technology. The collection covers the Beaufort Sea, East Coast Offshore and the Arctic Islands. It covers the technical report literature, conference papers and proceedings, directories, maps and meteorological, oceanographic and sea ice data. Each year the out of date materials are weeded from the collection. (Written communication, Barbara Rodden, 1990).

CRREL is based on the Orbit database "Cold" which is produced by CRREL (U.S. Army Cold Regions and Research Laboratory, Hanover, N.H.). It contains the publications from CRREL, the Antarctic Bibliography and the Bibliography of Cold Regions Science and Technology from 1950 to present. The subject content is snow, ice, frozen ground, arctic construction and transportation, ice engineering, energy conservation and environmental problems. This disc contained approximately 45% Russian language materials, but this is changing with different research interests at CRREL. (Written communication, Nancy Liston, 1990).

SPRILIB from Scott Polar Research Institute contains over 30,000 records from 1985 forward; the next edition will contain approximately 40,000 records with many of these coming from a RECON program of records on the Antarctic before 1985. The library records reflect the bipolar and circumpolar nature of the collection. The library is strong on Scandinavian and Russian materials with a particular focus on glaciology. Noted are the abstracts for the SPRI entries. (Written communication, William Mills, 1990).

(World Data Center A for Glaciology) includes all materials cataloged through the first quarter of 1989. The subject area covers all areas of glaciology, snow cover, sea ice, glaciers, some permafrost, avalanches, etc. The recent collection emphasis is the role of the cryosphere in climate and possible global change. The geologic content is minimal and relates mostly to glacial geology, an inactive area of collection at present. WDC-A has no abstracts. (Written communication, Ann Brennan, 1990).

NISC has two search modes: Novice and Expert. The Novice mode is a global search of all the textual data in the record regardless of field (Illustration 1). It is the best way to search for a topic or subject. In addition, this mode also permits searching by author or specific database (library) in conjunction with the subject.

The Expert mode permits the searcher to search by field. The following fields are available for searching: title, major topic, geographic area, keywords, abstract, language, publication date, foreign title, form of work, database specific fields.

From the search screen, the user can easily go to the bibliographic screen where the following information is supplied: title, author, source or citation, geographic area, keyword, abstract language, date, form of publication and location.

The NISC disc also has a index of all the valid index entries. This is important with the meshing of the holdings of the 5 libraries. Complex searches can be developed using truncation, boolean, phrase and proximity searching.

Polar librarians are excited over this new product for it provides access to specialized collections, both books and periodical articles, which were

F1:Help F2:Index F3:Records F4:Connection F5:Storage F6:Setup F7:Quit

Novice Search - Global Search

NISC DISC
ARCTIC & ANTARCTIC REGIONS

Global Search: Title, Keywords, Abstract, Area, Place — Matches:
→ GEOLOGY OR GEOLOGIC — 13,524

→ Author Search:
→ Corp. Author:
→ Select Database:
(Use F2:Index)

Combine search words with AND·OR·NOT·(). Use Esc to cancel a search, ENTER to run the search, F3: Records to view a list of titles. Or, use F2: Index to see a word index and simply TYPE the word you want, then press ENTER to select. Press F1-Help to learn more about searching and using the NISC Expert Search.

Connection — TOTAL: 13,524

Illustration 1

previously not easily available. The new software is a major improvement over the previous edition, but student users have trouble learning the searching intricacies. There are too many options for most users. Good documentation will help solve this problem and hopefully it will be issued in the near future.

## POLARPAC

Available from: Western Library Network
P.O. Box 3888
Lacey, Washington 98503-0888

Price: $300.00

POLARPAC evolved from the interest of participants in the 12th Polar Libraries Colloquy to develop a polar information network to provide access to Arctic and Antarctic information. Paul McCarthy, Director, Rasmuson Library, University of Alaska Fairbanks, and Martha Andrews, Librarian, Institute of Arctic and Alpine Research, University of Colorado coordinated a National Science

Foundation project to create this CD ROM pilot product. Sharon West, University of Alaska Fairbanks has been coordinating the input of the bibliographic data from the foreign libraries and the CD ROM production.

The PolarPac CD has two components: the monographic holdings from polar libraries and serial holdings from a number of international libraries. These have been integrated into one database and are searchable using Western Library Network software called LaserCat. To my knowledge this is the only international union list of serial available on CD ROM. This particular feature makes this an invaluable research tool.

The international union list of serials held in polar libraries includes the following collections of interest to earth science librarians:

Arctic Institute of North America, Calgary, Canada
National Institute of Polar Research, Tokyo, Japan
Geological Survey of Canada, Institute of Sedimentary and Petroleum Geology,
Calgary, Alberta
Geological Survey of Finland Institute, Espoo, Finland
Geological Survey of Norway
British Antarctic Survey, Cambridge, England
Scott Polar Research Institute, Cambridge, England
Goldthwait Polar Library, Byrd Polar Research Center, Columbus, Ohio
National Geographic Society, Washington, D.C.
Institute of Arctic and Alpine Research, University of Colorado, Boulder,
Colorado
World Data Center A for Glaciology, Boulder, Colorado

A detailed list can be found in Sharon West's 1990 paper given at the International Association of Marine Science Libraries and Information Centers.

The monographic holdings include the polar materials from the following libraries:

Rasmuson and Geophysical Institute, University of Alaska, Fairbanks, Alaska
Alaska Resources Library, Anchorage, Alaska
Alaska State Library, Juneau, Alaska
U.S. Minerals Management Service Library, Anchorage, Alaska
Institute of Arctic and Alpine Research, Boulder, Colorado
Stefansson Collection, Dartmouth College

The first edition disc includes 85,293 bibliographic records from 34 libraries in 15 countries. 52% of the records are unique to this database. The second edition will be available in 1991 and will include additional polar U.S. and international libraries. (Written and oral communication, Sharon West, 1990).

With this library coverage in mind, the next step is to look at the searching capabilities. The main search screen permits the user to search by author, title, subject, ISBN, ISSN, in 3 modes: (Exact, Keyword, Browse), (Illustration 2). The Exact search must be exact, even to the initials of the author. Keyword permits a keyword search in the fields. Browse gives a broad spectrum search for the user to scan. The user also can set additional search parameters: specific library holdings, type of material, language, large print and juvenile (Illustration 2). LaserCat also has a boolean search capability.

Western Library Network     WLN LaserCat V3.50     Enter Search Words

| EXACT SEARCH | KEYWORD SEARCH | BROWSE SEARCH |
|---|---|---|
| Author | Author | Author |
| Title | Title | Title |
| Subject | Subject | Subject |
| LCCN/RID | | |
| ISBN | | |
| ISSN | | |

| CURRENT SEARCH LIMITS | |
|---|---|
| FILE: | LaserCat |
| LIBR: | Profile |
| DATE: | All |
| TYPE: | All |
| LANG: | All |
| GOVT: | |
| LRGE: | |
| JUVN: | |

| |
|---|
| Enter search words. Ins Del Home End. Tab/Backtab to next box. |
| Search Words: JOURNAL OF GLACIOLOGY |

Illustration 2

The researcher easily goes from this screen to find the holding library and call number. Note these holding libraries are both domestic and international (Illustration 3).

LaserCat is extremely user friendly. Research staff learn the searching system with minimal demonstration time. Even foreign visitors quickly learn how to find materials. Regular users are frustrated by the slow boolean searching response. Perhaps the next edition will have updated this feature. POLARPAC is an innovative addition to the CD ROM field for libraries with polar research interests.

| Western Library Network | WLN LaserCat v3.50 | Holdings Display |
|---|---|---|

Title: The Journal of Glaciology
Public Info: British Glaciological Society, [54-023033]

| Call #: | |
|---|---|
| Alaska Resources Lib. | PER v.1-1947- |
| Univ. of Ak., Anchorage | PER v.1-v.28 no. 98 1947-Feb. 1982 v. 3 missing, v.19 incomplete |
| U. of Alaska, Fairbanks | PER GB2401.J68 v.1-1947- |
| Geophysical Institute | PER v.1-1947- |
| U. of Alberta Boreal Inst. | PERIODICALS v.1-no.1-Jan. 1947- |
| World Data Center A | PERIODICALS 1947- |
| Arctic & Alpine Research | PERIODICALS 1947- |
| Cold Regions Research Lab | PERIODICALS 1979- |
| NZ Dept. Scientific Res. | PERIODICALS v.1-1947- |
| Scott Polar Res. Library | PERIODICALS 1947- |

Illustration 3

## SUMMARY

To summarize, this presentation has been an overview of the following CD Rom products: Arctic Data Interactive, AORIS, NISC Arctic and Antarctic Regions and PolarPac. Each of these products has been reviewed as to content, data coverage, searching capabilities and user friendliness. Arctic Data Interactive and AORIS will be available for purchase in the near future. NISC and PolarPac are currently available and compliment each other as far as coverage. All four new discs provide unique new searching capabilities for arctic information.

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# METHOD FOR EVALUATING PRESERVATION NEEDS OF OVERSIZED ILLUSTRATIONS IN GEOLOGY THESES

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Irvine, CA 92713

Abstract--Geology theses and dissertations frequently contain oversized maps and illustrations, which are often hand-colored. Unique to the theses, they are heavily used and generally obtainable only from the degree-granting institutions. This is particularly true of master's theses, which are not commercially available on microfilm. Preservation of this material is of critical importance.

The datasheet and system of abbreviations designed to evaluate the preservation needs of the illustrations in the geology master's theses at the University of California, Los Angeles, were used to efficiently record the size, color, presence and condition of tape, tears, use, and overall condition of each illustration and to facilitate the analysis of the data. They are presented here to encourage use of a standardized method for this type of project, which would enable institutions to make comparable studies and to collectively justify funding of cooperative theses preservation projects.

## Introduction

Dissertations and theses are important, unique documents of which only a few copies exist. They are generally held only by the degree-granting institution. They frequently contain important, original information not obtainable anywhere else, particularly if not subsequently published. Consequently, they may be subject to heavy use. This is especially true of geology dissertations and theses. Walcott (1987) found that geology dissertations are more frequently cited than theses in other fields. In a study at the Mines Library at the University of Nevada-Reno, Newman (1987) found that 1/10 of the overall circulation was for theses and that 16% of the interlibrary loan requests in the Main Library were for theses.

Geology theses commonly contain oversized illustrations held in a pocket at the back of the volume. They are frequently geologic maps, which are hand-colored and may be the only maps in existence for a geographic area. Because these illustrations are often large, unwieldy, and difficult to refold properly, they are subject to tearing and rapid deterioration. Preservation and conservation measures may be necessary to ensure their survival. The situation is particularly acute for the master's theses. Whereas the Ph.D. dissertations may be obtained from University Microfilms International, even though the quality of the reproduction is frequently poor, master's theses are available only from the institutions which produced them. They are more likely to be subject to loss and greater damage than the doctoral dissertations.

The immediate purpose of the project I undertook at UCLA was to inventory and analyze the master's theses in geology for preservation needs of the oversized illustrations. A secondary goal was to develop a method which could be used as a model for similar studies at other University of California campuses with the ultimate goal of funding a systemwide preservation project for all the dissertations and theses.

With this goal in mind, I consulted with Michael Noga, head of the UCLA Geology/Geophysics Library, and Barbara Haner, Physical

Locked Case

LD
791.8
G3E33

Locked Case

Ehrreich, Albert L
The geology of the Dalton quadrangle, Madera County, California. [Los Angeles] 1955.
96 l. illus., map and diagr. in pocket.

Thesis (M.A.) - UCLA - Geology.
Typewritten.
Bibliography: 3 l. at end.

1. Dissertations, Academic - UCLA - Geology.

Geology Library

sl

**Recommendations:**

**Copy 1**

**Copy 2**

**Plates:**

| | | | Copy 2 | | | | | Copy 1 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Type | Size | Missing | Color | Condition | Tape | Tears | Missing | Color | Condition | Tape | Tears |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |

Notes: ______________________ ______________________

**Use:** **ILL** ______________ ______________

First date - **In house** ______________ ______________

Last date - **Circulation** ______________ ______________

Figure 1: Theses project datasheet.

Sciences Librarian at the University of California, Riverside, both of whom were initiators of the project, and with preservation personnel from each campus to determine the criteria to be evaluated in the project. We decided not to do any physical or chemical tests which might further damage this unique material. The variables chosen for evaluation were size of the illustration, factors related to color, presence and condition of tape used in previous repairs, extent of tearing, and discoloration and observable condition of the paper. An overall condition was to be assigned to each illustration based on these evaluated factors.

## Methodology

### Datasheet

To facilitate the recording and analysis of the data gathered, I designed a datasheet and system of abbreviations, which enabled me to put all the necessary information on one page. The purpose of this paper is to describe this datasheet with the intent of encouraging standardization for this type of project. This system resulted in rapid recording of the data and allowed for efficient sorting of the datasheets for different evaluative purposes. To analyse the overall condition of the geologic maps, e.g., sheets for theses containing geologic maps could be extracted easily from the collection.

To avoid having to manually record the basic author/title information for each thesis, I first photocopied the shelf list cards for all the theses onto the upper left hand corner of the datasheets. This saved an enormous amount of time. The datasheet form was then photocopied onto the same paper (Figure 1). A second sheet with additional spaces for recording the primary data was stapled to the first sheet for titles which contained more than six illustrations.

A non-circulating copy (Copy 1) and a circulating copy (Copy 2 ) of each thesis were evaluated. Some of the copy ones had previously circulated. At UCLA use information was available from the date due label in the back of the thesis. Interlibrary loan and circulation dates were stamped on the label. Some in-house use was available from a use study done in the library from July 1, 1987, to May 31, 1988, and was also recorded in the volume. Other in-house use was, of course, unavailable. It was necessary to indicate the first and last dates of use in order to identify those volumes with complete records of use. If the first use date did not correspond closely with the date of the thesis, earlier date due labels had probably been removed, and the data could not be used to evaluate the effect of use on the condition of the illustrations.

## Abbreviations Used

The abbreviations used provided for rapid entering of the data and more efficient use of limited space (Figure 2). The size categories were selected to correspond with the capacities of copying equipment. Color evaluation was a problem. My initial intent was to evaluate the effect of time and use on the quality of the color by comparing the illustrations from each copy of a thesis. Because the coloring was done by hand, it was not possible to ascertain whether the colorer had used the same pressure and technique on each copy or even whether the same person had colored both copies. Consequently, I chose to evaluate only the degree of contrast present to give some indication of how well the piece might copy. The presence of red was recorded because it microfilms as black.

The scale of overall conditions assigned to the illustrations is defined in Figure 3. Although the tear scale corresponds to the overall condition scale and is used in the definitions, it was not always advisable to give an overall rating based on the degree of tearing. An illustration with a 1/2 inch tear on the edge, e.g., might otherwise be in excellent condition and need no major preservation. A higher overall rating would be given with a note under Recommendations indicating only a need to repair the tear (see Figure 4). The evaluation is basically a subjective process, which ideally should be accomplished by one knowledgeable individual for consistent results. However, using the combined scale as is would allow more consistent objective evaluation by multiple data recorders or by less

| | | |
|---|---|---|
| **Size:** | **L** = Ledger (8 1/2 x 14) | |
| | **P** = Portfolio (17 x 22) | |
| | **24** = Up to 24 in. on shortest side | |
| | **30** = Up to 30 in. ... | |
| | **36** = Up to 36 in. ... | |
| | **42** = Up to 42 in. ... | |

**Color:**

Method: **c** = crayon
**p** = pencil
**w** = watercolor

Contrast: **l** = low (colors pale or difficult to distinguish when adjacent)
**m** = medium (in between pale and high or mixed)
**h** = high (very bright or easily distinguished)

Number of colors: #

Presence of red: **r** = indicates use of red

**Tape:**

**f** = front of map
**v** = verso of map
**e** = edge of map
Is or can be folded: yes = **y**
no = **n**
Condition: **g** = good: intact, not peeling or cracking
**b** = bad: peeling, cracking, discolored

**Tears:**

**4** = up to 1/2 in.
**3** = 1/2 in. to 1 in.
**2** = 1 in. to 2 in.
**1** = greater than 2 in.

**o** = tear on outside edge
**i** = tear on inside, affects print

Figure 2: Abbreviations used for theses project datasheet.

**Type of illustration:**

ge = geologic map
xs = cross section
co = columnar section
ch = chart, including correlation chart
st = structure contour
om = other maps
lm = location map
mf = mineral foliation map
fm = facies map
im = isopach map
3D = 3 dimensional isometric map
sl = sample location map
tp = travel time plot (seismic data)
xr = x-ray diffraction pattern
di = diagram
tb = table
fl = faunal list
gr = graph

Figure 2 (cont.): Abbreviations used for theses project datasheet.

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knowledgeable student recorders. It would at least identify those items which need further consideration by the librarian at the time of preservation.

Figure 4 illustrates a completed datasheet. Note that the geologic map in copy one is in worse condition than the map in copy two. Copy one had probably circulated at one time or, perhaps, the maps had been switched.

| CONDITION | CRITERIA |
| --- | --- |
| 6 = Pristine | No evidence of yellowing or other signs of damage or deterioration. |
| 5 = Good | Paper yellowing, minor wear at folds but not torn or cracked; paper not soft; does not need preservation now. |
| 4 = Moderate | Same as 5 but has minor tear, up to 1/2 inch; needs watching; should be dealt with after more critical problems are handled. |
| 3 = Fair | Paper yellowed; minor tears or cracks, 1/2 inch to 1 inch; may be soft; needs preservation. |
| 2 = Poor | Very yellow/brown; major tears and/or cracks, 1 inch to 2 inches; paper soft; needs immediate help, may be salvageable. |
| 1 = Very poor | As in 2 but tears greater than 2 inches |
| 0 = Hopeless | Literally in pieces, probably not saveable |

Figure 3: Criteria used for defining conditions assigned to illustrations.

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## Summary

Geology dissertations and theses are important, unique documents which deserve conservation and preservation attention. The oversized illustrations are particularly vulnerable to wear and deterioration. Use of a standard datasheet would facilitate recording of data and enable institutions to do comparable studies based on the same criteria and methodology, which might justify proposals for funding of cooperative theses preservation projects.

sl

Ehrreich, Albert L
The geology of the Dalton quadrangle, Madera County, California. [Los Angeles] 1955.
96 l. illus., map and diagr. in pocket.

Thesis (M.A.) - UCLA - Geology.
Typewritten.
Bibliography: 3 l. at end.

1. Dissertations, Academic - UCLA - Geology.



**Recommendations:**

**Copy 1**

**Copy 2** repair tear; replace pl. 2

**Plates:**

| No. | Type | Size | Copy 2 Missing | Copy 2 Color | Copy 2 Condition | Copy 2 Tape | Copy 2 Tears | Copy 1 Missing | Copy 1 Color | Copy 1 Condition | Copy 1 Tape | Copy 1 Tears |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | ge | 30 | | pm14r | 5 | | 40 | | same | 3 | vfyg | 30 |
| (2) | di | L | ✓ | | | | | | | 4 | | 40 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

Notes: map on coated paper = test - yellow edges; paper on pl. 1 good but has tears

**Use:**

First date - 1965

Last date - 1986

**ILL** 5

**In house**

**Circulation** 11

Figure 4: Completed datasheet.

## References Cited

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Walcott, Rosalind, 1987, Geoscience dissertations for the future: a case study from the United States, Geoscience Information Society Proceedings, v. 19, p. 59-65.

# PRESERVATION OF GEOSCIENCE LIBRARY COLLECTIONS: CURRENT CONDITIONS AND FUTURE TRENDS

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Harvard University
Cambridge, MA 02138

Abstract--Earlier work indicates that earth sciences libraries are in danger of losing materials due to age, brittleness, and the unique problems posed by formats. In this study an initial survey indicates that earth science librarians feel that more could be done to preserve our collections. In many subject areas materials can be appropriately preserved by microfilming. Survey respondents for the most part felt that this is not a preservation option, and prefer to wait until a new technology is developed. In the meantime, the critical issues include the poor conditions under which earth science collections are housed, and the inability to obtain funding for staffing of routine conservation efforts. The majority of librarians felt that current binding efforts are adequate. Librarians define their preservation priorities using a geographic approach, sometimes in conjunction with a format priority.

## Introduction

Past work has pointed to the need for preservation and to the concerns particular to earth sciences (Klimley, 1984, 1985). Last year at this technical session, two papers dealt with preservation of these materials; one a pilot project to store documents in digital form (Heiser, 1990); the other to assess cooperative preservation efforts (DeFelice, 1990).

The present study seeks to assess the extent of current preservation efforts at the front line level in individual earth science collections. I wanted to get a clearer picture of the current efforts, aside from those that are pioneering. Although facilities and operations issues are not in any way glamorous, they in fact represent an inexpensive cost-per-item for increasing the life of the materials. And while we cannot all be involved at the cutting edge of new technologies for preservation, there is much that can be accomplished on an ongoing basis. Or... do we feel that in our current situation we are being forced to preside over decay? What are we doing while the technologies are being perfected?

As an initial survey I chose to send the questionnaire to Geoscience Information Society members at Association for Research Libraries institutions in the U. S., as well as a few others. Fifty surveys were sent, of which 36 were returned. ARL is well-known for collecting statistics from its members. I felt that many of those I surveyed could provide substantial information as they are the front-line managers who deal with the collections on a daily basis. The questionnaire contains sections on facilities, binding, circulation and security, and conservation and filming. The survey also asked respondents to nominate particular parts or areas of their collections which would be the highest priority for preservation.

## Facilities

The first question sought to determine whether the library or institution as a whole had developed a plan for optimization of environmental conditions of the collections. 74% of the respondents indicated that this had not been done, 20% said such a plan had been developed and 6% were unsure or said it was under consideration. I then wanted to know if each earth sciences librarian felt that she or he had been involved in any process of making recommendations regarding these elements for the geosciences collections. 58% indicated that they had not had the opportunity to provide input or propose solutions.

Not surprisingly, given these results, 74% of the respondents felt that the current environment is inadequate for preservation needs. 23% felt that the environment is adequate, with the rest being unsure. Of those who felt that improvements were mandated, 56% indicated that lighting or ultraviolet (uv) filtering as an area of needed improvement. 22% listed better overall climate control and mitigation of fluctuation of conditions. Other changes included need for more shelving, concern about sprinkler systems, the need to filter the air, and concerns about labs and other "wet" facilities in close proximity to the library.

32% of those who responded indicated that improvements which would add to the life of the materials had been made during the past 5 years. These changes in several cases included a new facility or a renovation in which climate control was added. Others were new air conditioning units, book cleaning, fumigating for book lice, and switching to acid-free binders and folders. Lights which go off if no motion is detected were noted as a feature installed for energy conservation, but having preservation as a by-product.

## Binding

Binding, perceived as one of the more mundane library tasks, is also one of the front-line approaches to collection preservation. Of those who responded, 94% bind monographs, with almost the same percentage binding current journal and backfiles, when necessary. 25% of those surveyed bind all guidebooks. This particular genre is believed to be both an important source of geologic information, as well as hard to replace (Kidd, 1980). Perhaps the low percentage of libraries which bind these relates to funding available. Perhaps they are thought to be harder to use in the field if bound, or have inadequate margins. Perhaps they do not always circulate. 33% of the respondents felt that they were losing budgetary support for binding due to exigencies of other needs. It would seem that serials price increases and the need to implement new technologies might perhaps force the reallocation of funds. One place from which one can often switch monies that is not immediately visible is the binding budget. Obviously, this is a short-term solution in which one is deferring a maintenance item to the future. It should be noted, however, that of those who indicated that no cutbacks had been made, there seemed to be an anxiety level that this might be right around the corner.

Overall, 78% felt that their current program is adequate. Of the 22% who felt that improvements were needed, not surprisingly, loose plates and pocket material led the list. The other perennial problems of funding and staffing were also mentioned.

## Circulation and Security

The responses in this section indicate the strong service nature of the collections. 100% indicate that volumes with loose materials are checked out on a regular basis. But 67% of the respondents do not check to see if all the pocket materials are returned, or do so less than 100% of the time. One library reported using metallic theft detection strips on each loose piece, and another library refolds plate items and attaches them to the volumes. Maps are not always circulated, however. Of those surveyed who have maps in their collections, 10% do not circulate, or only by exception. Of the 90% who do circulate these materials, 96% provide some sort of special housing such as tubes and 56% limit the circulation period. Other interesting approaches included requesting that maps not be taken into the field and providing information about the availability of color copying, and another library which charges cost plus $25 per sheet for damaged or non-returned maps.

91% of the respondents utilize some sort of limited access area for materials which are thought to be subject to disappearance or otherwise fragile. These methods range from a shelf in the librarian's office to reserve shelves and rare book rooms. It is interesting to note that 78% of the respondents are using some sort of remote storage of their library's materials at this time. This ranges from a special collection or rare book room in a main library to off-campus sites. One respondent noted that 20% of the collection was currently stored, and another indicated that 1/3 of the collection is stored elsewhere. This suggests another avenue of inquiry regarding user satisfaction with retrieval methods for these materials.

## Conservation and Filming

When asked about the current conservation efforts taking place in geoscience libraries, the responses reflected that a variety of treatments are being used, with no one treatment seeming to be the treatment of choice. Leading the list is mending and repair, followed by encapsulation. Less than 10% photocopy to acid-free paper or bind edges of maps.

Only 10% of the respondents indicated that a part of the collection is routinely replaced by microfilm. This is probably due to a combination of lack of availability of film for titles held in these collections, and the strongly held belief that film lacks adequacy for the job. It is interesting to note that those who are replacing materials with film see it as a permanent addition to the collection rather than an interim technology.

## Preservation Priorities

Each person surveyed was asked to nominate particular parts of the collection for preservation. On the assumption that we cannot each save all materials, I was looking for subjects and areas where a library felt it had particular strengths or materials which for one reason or another were particular prime candidates for preservation. Most respondents cited several subjects or types of materials. The results showed several things and clearly indicated that a methodical approach to defining responsibilities of earth science information preservation is possible.

Ten percent of the respondents listed a specific non-geographic subject area in which their library has strengths. 40% listed their own geographic area as being an area of strength that they felt responsibility for preserving. State survey publications in general were cited by 21% of those surveyed. 19% of the respondents listed USGS publications as appropriate for preservation. 8% noted that foreign survey materials, either overall or of a specific time period or area as being a high priority. 5% of the respondents chose to indicate a particular format, such as theses, guidebooks or maps, as being a high priority without indicating which particular subset such as subject or area, is most desirable.

It seems as if we can establish preservation responsibilities if we use the particularly useful geographic designation to define this. While only 10% listed non-geographic subjects, over 70% used some geographic way to define how to choose candidates for preservation. By using this approach, and by sharing information, through bibliographic utilities or otherwise, as to what we have preserved, we can identify areas of responsibility and possible collaboration for preservation of earth sciences materials.

## Ongoing Preservation Projects

With a several million dollar grant from Xerox and the Commission on Preservation and Access, Cornell University is working on a copying process to convert some 100 texts to digital storage. It is expected that by employing this technology these materials will not take up so much shelf space, and can be reproduced for use-ultimately inexpensively. Also, the digital form of the book could be sent over computer networks to be reproduced elsewhere.

Last year a notable example of cooperative preservation projects was the New York State map preservation program, which at that time had dealt with few geological maps (Allen, 1990). The project is in its final phase, and will not be renewed next year. In terms of geoscience information, the items preserved include pre-1940 soil surveys of New York, the USGS folio volumes which pertain to New York, and 100, perhaps as many as 200 other geological maps.

The issue of microformat as a preservation medium continues to be an area of concern. An ALA task group has addressed the issue of microfiche as a preservation medium and whether it is a suitable medium at all.
The Commission on Preservation and Access recently did a pretest involving commercial publishers of microform. The issue is whether commercially filmed material is in fact preserved material. Commercial publishers do not necessarily follow the appropriate preservation steps when filming and there are questions about how the master negatives are stored by the publishers. It is also possible that if, say, two publishers merge, and a particular film is not considered marketable, (which could happen in the earth sciences where there are a limited number of consumers of the film) that the masters may not be preserved.

The Commission on Preservation and Access issued a report this past summer entitled "Image Format for Preservation and Access" (Lesk, 1990). The conclusions contain the following statement: "Because microfilm to digital image conversion is going to be relatively straightforward, and the primary cost of either microfilming or digital scanning is in selecting the book, handling it, and turning the pages, librarians should use either method as they can manage, expecting to convert to digital form over the next decade. Postponing microfilming because digital is coming is only likely to be frustrating and allow further deterioration of important books." This is of course a rather provocative statement for earth sciences librarians, because if the material cannot be well handled by the film format, how can a digital product made from that film be adequate?

The Commission has also formed a new task group on image and text. In addition, the commission is undertaking a research project on the dark stability of color film and a demonstration on the use of high resolution color microfilm (Commission on Preservation and Access, 1990).

## Conclusions

The survey indicates that we seem to be imperiled by our surroundings: leaking labs, leaking sprinklers, non-existent or non-functioning ventilation and air handling systems. While computing centers and laboratories are perceived as in need of better climate, we are perilously close to the bottom of the list of those with a need for adequate facilities. In fact, I find that even among my library colleagues, the issue is one that is often hard to engender enthusiasm for. It seems to be substantially more glamorous to talk of emerging technologies than to grapple with old facilities. This may not leave us well-positioned for meeting our preservation needs.

Given the state of our collections now, it may not be necessarily prudent to await the outcome of large studies or nationally-funded projects. Therefore, the best alternative might be to pursue other sources of funding as they come available. Digital storage will work well for many of our materials, but ultimately some should be really be preserved in the original. The use of some of these historic documents is not only by earth scientists, but by historians of science. By taking away the look and feel of the original we are no doubt losing information about how science and scientific publishing were conducted at that time. And even those materials that can perhaps wait for electronic technology need to be preserved in the interim. Phased conservation treatment is one way. Some of the steps taken by the libraries surveyed are other ways.

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APPENDIX

## SURVEY ON PRESERVATION AND CONSERVATION OF EARTH SCIENCES MATERIALS IN RESEARCH LIBRARIES

NAME:_______________________

LIBRARY:_______________________

SIZE OF COLLECTION:__________

### 1-FACILITIES/ENVIRONMENTAL CONDITIONS

Has your institution developed a plan for optimization of temperature/humidity/light (THL) conditions for the library as a whole?____

Have you, as earth sciences librarian, been able to make recommendations or been involved in the process of optimizing THL conditions for the earth sciences collection or library?__________________________

Do you believe that you collection is adequately housed for the above parameters?_______________. If not, what would you add, subtract, or change?__________________________________

Have any improvements which would lengthen life of materials (including renovations) been made in the past five years? This might include, but is not limited to UV filters, air conditioning, dehumidifiers, humidifiers.

_______________________________________________

### 2-BINDING

Does you earth sciences library bind current monographs?__________. Current journals?__________________________________

Do you actively bind backfiles and older monographs?________________ If so, how many per year?_______________________

Do you take apart and bind guidebooks which arrive spiral-bound?__________ Are all guidebooks bound?_______________________

Have you experienced any cuts in binding funds because of the necessity of reallocating resources (eg., to the serials budget)? If so, do you believe it will be possible to recover that binding budget in the next few years?_____

Do you feel that the binding of earth science materials at your institution is adequate?_____________If not, what improvements would you make?__________

_______________________________________________

### 3-CIRCULATION AND SECURITY

Does your library circulate volumes with folded materials in pockets?______ If so, are materials checked upon return to assure that all loose pieces are returned?__________________________________

Do maps circulate from your collection?____________If so, are there any specific measures which you take to preserve the material? (such as map tubes provided, office use only, limited circulation period)?_____________________

Do you limit access to certain materials, such as a "permanent reserve shelf" or do you use a rare book room for materials, which while not truly are subject to theft or are too fragile for open shelves?_______________________

Do you use a remote storage site for fragile and/or little-used items?______

**4-CONSERVATION AND FILMING**

What type of routine conservation treatment does your earth sciences library undertake on a regular basis? These might include mending, tape removal, reinforcement of map edges, map encapsulation______________________________

Do you routinely replace any journal backfiles with film/fiche?___________ If so, how many volumes per year do you replace?_____Do you see this as a permanent addition to your collection or an interim technology?___________

**5-PRIORITIES**

Given the opportunity to nominate a particular part or parts of your earth sciences collection for preservation, which would it be? Assume no particular definition (eg, size) of the collection, but specify what makes it a collection, such as materials on a particular area or subject, or a particular time period, or a particular publishing body or agency, or some combination of these.

# PART III

# POSTER SESSION

# COLOR REPRESENTATION OF DATA IN GEOLOGY

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**Abstract**--Manipulation, examination and display of data on color computer monitors is occurring in all areas of the earth sciences. Due to the expense of color computer equipment and the high cost of color publication, utilization of color technology and images is progressing unevenly through the sciences. Examples from the work of several Lamont-Doherty Geological Observatory researchers are used to illustrate the breadth of research utilizing color data techniques, including information on data sets, equipment and printers being used, as well as journals accepting color images for publication. The examples will include color computer-produced gravity, geologic and bathymetric maps and color coded seismographs and bore hole images.

# NAMED AWARDS IN THE GEOSCIENCES: A BIOGRAPHICAL DIRECTORY

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**Abstract**--Each year many outstanding geoscientists are honored by being awarded one of the numerous prizes or awards given by individuals, foundations, societies, universities, or corporations. Many of these awards are named in honor of prominent geoscientists. Who are these people and what was their contribution to the geosciences? These questions are addressed in this biographical directory of the named awards in the geosciences.

## INTRODUCTION

This directory includes named prizes and awards given in the United States and Canada for work in the geosciences. It includes only those awards given specifically for geoscience, not general science awards that might be given to geoscientists. This is a listing of only those awards that have been named for a person, not all the awards given in the geosciences.

The list of awards was compiled from several sources. Awards, Honors, and Prizes, 8th ed., Gita Siegman, ed., Gale Research Inc., 1989, and Winners, The Blue Ribbon Encyclopedia of Winners, by Claire Walter, Facts on File, 1982, provided the basic listing. This was supplemented by announcements in society directories, programs of annual meetings, society publications such as bulletins and newsletters and the 1989-1990 issues of Geotimes.

The biographical information for each award person was compiled using standard sources such as American Men of Science, American Men and Women of Science, Dictionary of Scientific Biography, and Modern Scientists and Engineers. Additional information was located using GeoRef and Biography Master Index databases on line to locate obituaries, biographies, or memorials. References to these are included in the individual entries. In a few cases the awarding organization was contacted for any information they could provide.

The directory is arranged alphabetically by the last name of the person for whom the award is named. In cases where two awards are named for the same person, both awards are listed before the biographical information for that person. In the case of an award named for two people, both biographical sketches are listed together under the name of the award.

An entry consists of:

**Name of the award**
Organization presenting the award
*Description of the award.*
Biographical sketch of the person for whom the award is named.

The directory section is followed by an index by organization presenting the award.

## DIRECTORY

The full directory, as displayed in the Poster Session, is too large to be published in these Proceedings. It will be published separately. As an example of the contents of the directory, the first entry is included followed by the list of the other entries.

### J. Willis Ambrose Medal

Geological Association of Canada

*To recognize an individual who has rendered sustained distinguished service to the earth sciences in Canada, through outstanding accomplishments in one or more of the following areas: education; research; management and administration; promotion; and institutional, professional or society affairs.*

John Willis Ambrose was born in Pincher Creek, Alberta on June 20, 1904. After high school he studied one year at the Normal School in Calgary before teaching in public and junior high schools in Alberta. After about four years of teaching, in 1927 he enrolled in the mechanical engineering program at the University of Alberta. The summer of 1929 he worked as a field assistant for geologists of the Alberta Gas and Fuel Co. Because of his interest and talent in geology, the geologists steered him to Stanford University where he graduated in 1932 with a B.A. in geology. He then went to Yale where he undertook a study of progressive regional metamorphism and deformation of the Precambrian Missi Series in the Canadian Shield near Flin Flon, Manitoba for the Geological Survey of Canada. He completed his Ph.D. in 1935 and went to work for the Survey. In 1945 he also started as a special lecturer at Queen's University. In 1947 he was instrumental in the founding of the Geological Association of Canada and in March 1947 was elected the first president. In 1948 he accepted a full-time appointment as Professor of Geology at Queen's. From 1962-1968 he served as the head of the Department. He retired in 1973. John Willis Ambrose died February 19, 1974. For more information see Price, R.A., "Memorial to John Willis Ambrose, 1904-1974," Geological Society of America Memorial 6, 4 p., 1977.

Other named awards included in the directory:

Bancroft Award
Barlow Memorial Medal
Billings Medal
Selwyn G. Blaylock Medal
Julian Boldy Memorial Award
William Bowie Medal
Jules Braunstein Memorial Award
Kirk Bryan Award
Walter H. Bucher Medal
E.B. Burwell, Jr. Award
Gilbert H. Cady Award
AGI Medal in Memory of Ian Campbell
F.W. Clarke Medal
Isabel C. Cookson Paleobotanical Award
Allan V. Cox Student Research Award
Joseph A. Cushman Award for Excellence in Foraminiferal Research
Arthur L. Day Medal and Arthur L. Day Prize and Lectureship
DeGolyer Distinguished Service Medal
Duncan R. Derry Medal
Ralph Dighman Award
Young Scientist Award (Donath Medal)
Robert H. Dott, Sr. Memorial Award
R.J.W. Douglas Memorial Medal
Daniel Giraud Elliot Medal
Maurice Ewing Medal (2 different medals)
Reginald Fessenden Award
John Adam Fleming Award
John C. Frye Environmental Geology Award
G.K. Gilbert Award
Sam Goldich Award
V.M.Goldschmidt Medal
William Harvey Gross Award
Arnold Guyot Memorial Award
Michel T. Halbouty Human Needs Award
Hayden Memorial Geological Award
Hollis D. Hedberg Award
William B. Heroy, Jr. Award
Harry H. Hess Medal
Claire P. Holdredge Award
Robert E. Horton Award and Robert E. Horton Medal
Daniel C. Jackling Award
Richard Jahns Award
Floyd T. Johnston Service Award
W.A. Johnston Medal
Virgil Kauffman Gold Medal
Frank Kelley Memorial Award
James Furman Kemp Award
William Christian Krumbein Medal
A.G. Leonard Medal
A.I. Levorsen Memorial Award
Lindgren Award
Link Award

Logan Medal
Anthony F. Lucas Gold Medal
James B. Macelwane Medal
Marsden Award
George C. Matson Award
O.E. Meinzer Award
Willet G. Miller Medal
Neil A. Miner Award
Moore Medal
John Moss Award
Orton Award
Owen Award
Ben H. Parker Memorial Medal
William T. Pecora Award
Robert Peele Memorial Award
Penrose Medal (2 difference medals)
Douglas R. Piteau Outstanding Young Member Award
Sidney Powers Memorial Award
Wallace E. Pratt Memorial Award
Roebling Medal
Romer-Simpson Medal
Charles Schuchert Award
Shepard Medal
Walt Skinner Award
Waldo E. Smith Medal
Sorby Medal for Excellence in Sedimentology
J.C. "CAM" Sproule Memorial Award and J.C. Sproule Memorial Plaque
Strimple Award
Lester W. Strock Award
W.A. Tarr Award
Mary Clark Thompson Medal
Alfred E. Treibs Award
Twenhofel Medal
Martin C. Van Couvering Award
Charles Doolittle Walcott Medal
G.K. Warren Prize
Charles A. Whitten Medal
J. Tuzo Wilson Medal
George P. Woollard Award

**INDEX BY ORGANIZATION**

Academy of Natural Sciences of Philadelphia
    Hayden Memorial Geological Award

American Association of Petroleum Geologists
    Jules Braunstein Memorial Award
    Robert H. Dott, Sr. Memorial Award
    Michel T. Halbouty Human Needs Award

American Association of Petroleum Geologists (cont.)
- A.I. Levorsen Memorial Award
- George C. Matson Award
- Sidney Powers Memorial Award
- Wallace E. Pratt Memorial Award
- J.C. "CAM" Sproule Memorial Award

American Association of Petroleum Landmen
- Frank Kelley Memorial Award

American Geological Institute
- AGI Medal in Memorial of Ian Campbell
- William B. Heroy, Jr. Award

American Geophysical Union
- William Bowie Medal
- Walter H. Bucher Medal
- Maurice Ewing Medal
- John Adam Fleming Award
- Harry H. Hess Medal
- Robert E. Horton Award
- Robert E. Horton Medal
- James B. Macelwane Medal
- Waldo E. Smith Medal
- Charles A. Whitten Medal

American Institute of Professional Geologists
- Ben H. Parker Memorial Medal
- Martin C. Van Couvering Award

Association of American State Geologists
- John C. Frye Environmental Geology Award

Association of Engineering Geologists
- Claire P. Holdredge Award
- Richard Jahns Award
- Floyd T. Johnston Service Award
- Douglas R. Piteau Outstanding Young Member Award

Botanical Society of America
- Isabel C. Cookson Paleobotanical Award

Canadian Geophysical Union
- J. Tuzo Wilson Medal

Canadian Institute of Mining and Metallurgy
- Barlow Memorial Medal
- Selwyn G. Blaylock Medal
- Julian Boldy Memorial Award
- J.C. Sproule Memorial Plaque

Canadian Quaternary Association
- W.A. Johnston Medal

Canadian Society of Petroleum Geologists
- R.J.W. Douglas Memorial Medal
- Link Award

Columbia University
- James Furman Kemp Award

Cushman Foundation
- Joseph A. Cushman Award for Excellence in Foraminiferal Research

Geochemical Society
- F.W. Clarke Medal
- V.M. Goldschmidt Medal
- Alfred E. Treibs Award

Geological Association of Canada
- J. Willis Ambrose Medal
- Logan Medal

Geological Association of Canada - Mineral Deposits Division
- Duncan R. Derry Medal
- William Harvey Gross Award

Geological Association of Canada - Paleontology Division
- Billings Medal

Geological Society of America
- Arthur L. Day Medal
- Penrose Medal
- Young Scientist Award (Donath Medal)

Geological Society of America - Coal Division
- Gilbert H. Cady Award

Geological Society of America - Engineering Geology Division
- E.B. Burwell, Jr. Award
- Richard Jahns Award

Geological Society of America - Geophysics Division
- Allan V. Cox Student Research Award
- George P. Woollard Award

Geological Society of America - Hydrogeology Division
- O.E. Meinzer Award

Geological Society of America - Planetary Geology Division
- G.K. Gilbert Award

Geological Society of America - Quaternary Geology and Geomorphology Division
- Kirk Bryan Award

Indiana University Geology Department
Owen Award

Institute for the Study of Earth and Man (Southern Methodist Univ.)
Hollis D. Hedberg Award

Institute on Lake Superior Geology
Sam Goldich Award

International Association for Mathematical Geology
William Christian Krumbein Medal

International Association of Sedimentologists
Sorby Medal for Excellence in Sedimentology

Mineralogical Society of America
Roebling Medal

National Academy of Sciences
Arthur L. Day Prize and Lectureship
Daniel Giraud Elliot Medal
Mary Clark Thompson Medal
Charles Doolittle Walcott Medal
G.K. Warren Prize

National Aeronautics and Space Administration
William T. Pecora Award

National Association of Geology Teachers
Neil A. Miner Award

National Association of Geology Teachers--Eastern Section
Ralph Dignman Award
John Moss Award

National Geographic Society
Arnold Guyot Memorial Award

Ohio State University Geology Department
Orton Award

Paleontological Society
Charles Schuchert Award
Strimple Award

Pittsburgh Geological Society
Walt Skinner Award

Royal Society of Canada
Bancroft Award
Willet G. Miller Medal

Sigma Gamma Epsilon
W.A. Tarr Award

Society for Applied Spectroscopy
Lester W. Strock Award

Society of Economic Geologists
Lindgren Award
Marsden Award
Penrose Medal

Society of Economic Paleontologists and Mineralogists
Moore Medal
Shepard Medal
Twenhofel Medal

Society of Exploration Geophysicists
Maurice Ewing Medal
Reginald Fessenden Award
Virgil Kauffman Gold Medal

Society of Mining Engineers
Daniel C. Jackling Award
Robert Peele Memorial Award

Society of Petroleum Engineers
DeGolyer Distinguished Service Medal
Anthony F. Lucas Gold Medal

Society of Vertebrate Paleontology
Romer-Simpson Medal

U.S. Department of the Interior
William T. Pecora Award

U.S. Navy
Maurice Ewing Medal

University of North Dakota Department of Geology and Geological Engineering
A.G. Leonard Medal

# REFERENCING AND ARCHIVING DIGITALLY PRODUCED MAPS AT THE KANSAS GEOLOGICAL SURVEY

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Abstract--The Kansas Geological Survey has been producing maps from digital data bases stored on the Survey's mainframe since 1973. During the last few years, advancements in software and plotter technology have allowed for the Survey to break from traditional methods of map production and begin producing all maps from a computer-driven plotter. This new concept in map publication has made it necessary to look closely at archiving and referencing digitally produced maps. The Survey now archives computer files of maps on magnetic tapes assigned to the published Map Series and Open-file Series and does not store paper copies. Since electronic publication of maps makes it possible to revise the data files and plot new maps, revision dates are printed on maps. File inventory information (i.e. tape number and file number) is supplied to the Survey's archivist by the Automated Cartography Section. Since not all maps being produced fit into the Survey's formal Map Series or Open-file Series, a new category call Project Map Series is being developed. The Project Map Series will insure that maps used by staff for presentations or special projects will bear a number for referencing purposes. However, since the need to recreate a special map is limited, only paper copies will be archived and inventoried by the Survey's library staff.

## Mapping at the Kansas Geological Survey

The Kansas Geological Survey, a research division of the University of Kansas, has utilized computers and plotters to produce maps since 1973. Combining data sets stored on a computer with plotter technology allowed for state-of-the-art map production techniques to be used in place of conventional hand drawing, scribing, and printing. During those 20 years of development, a variety of hardware equipment and software has been used. However, the Survey currently relies on a Data General MV20000 mainframe and a CALCOMP plotter, a non-impact imaging device that deposits color ink onto specially treated paper or mylar using electrostatic techniques. In the article "On-demand Map Publication," published in the April, 1990, issue of Geotimes, Rex Buchanan and Don Steeples discuss map production at the Survey. They raise questions regarding the archiving and referencing of maps where data can be easily updated and revised. This new concept of map publication requires critical eamination of methods used to archive and reference maps produced by digital means.

This poster session presented archiving and referencing practices now used at the Survey and opened discussion of the impact of this new technology on libraries and archives. Maps generated from oil and gas production data sets and a geologic county map were used for the poster paper as examples of archiving and referencing challenges where computer maps are concerned. Additionally maps produced for specialized research projects were displayed.

## Oil and Gas Fields of Kansas

The Kansas Geological Survey has published Kansas oil and gas fields maps for over 40 years. The map is updated annually using current production data files. The 1989 version represents the use of a digital map production technique at the Survey. Both maps on display were generated from data files stored on the Survey's mainframe and plotted on the CALCOMP electrostatic plotter using GIMMAP, software developed at the Survey. This technique allows production of different scales and versions of the same map and updated versions of the same scale map. The oil and gas fields map is available on a 1:500,000 or 1:1,000,000 base. Additionally 1:250,000 quadrangles have been produced for more detailed depictions of fields and field names. Once files are created, corrections and revisions can be made to maps. Instead of archiving paper copies of each revised map, digital files are stored on magnetic tape in the library/archives' directory. For example:

Tape Content:

| | | |
|---|---|---|
| File 0 | M-18 Oil and Gas Fields Map (January 1989 version) | |
| File 1 | M-18 Oil and Gas Fields Map (May 1989 version) | |
| File 2 | M-18 Oil and Gas Fields Map (September 1989 version) | |
| File 8 | M-18-12 | Joplin quadrangle (9-4-90) |
| File 17 | M-18-3 | Manhattan quadrangle (9-4-90) |

**Tape Number** 22001
**Format** Dump
**Density** 6250bpi
**Block Size** 32768

**Maps displayed:**
**"Oil and Gas Fields of Kansas," 1989, Kansas Geological Survey, Map Series no. 18**
**"Oil and Gas Fields, Great Bend Quadrangle in Kansas," 1989, Kansas Geological Survey, Map Series no. 18-7**

## Ellis County Geologic Map

The Ellis County geologic map was the first Kansas map to be produced from a computer-based data file. The Ellis County map was an experimental project, and a preliminary version was

included in the Survey's Open-file Series. Until reviewers' comments were collected and applied to the map's data files, the map retained its status as an open-file report. After final revision, the map was transferred to the Survey's published map series. The published version of the Ellis County geologic map has been archived in digital form.

Map displayed:
"Geologic Map of Ellis County, Kansas," 1988, Kansas Geological Survey, Open-file Report 88-16

## Project Map Series

With expanded map production capabilities, the number of maps created at the Kansas Geological Survey has increased. Although many maps are open-filed or included in the Survey's Map Series, not all maps are suited for either category. For example, the map on display is being used in a study of a central Kansas oil field. Since maps of this nature are used outside the Survey and in-house, they need referencing and archiving. However, project maps are considered working maps and will not be made available to the public. The establishment of the Project Map Series is being designed with that in mind.

Map displayed:
"Zenith Project--Remaining Hydrocarbon Saturation (Theoretical Remaining Res. bbls oip/pore vol.)," 1990, Kansas Geological Survey, Project Map Series 90-009

## Summary

These new map production techniques raise a host of new questions. For example, what is considered a revision? We currently consider a map revised when we change information on the map. That is, a change correcting a misspelled place name or a mis-labelled oil field location would not be considered a revised map. However, the addition of a new oil field would be a revision and would need a new date. Should copies of all revised maps be archived? We now keep copies in digital form and not paper. Not all of the questions have answers at this time. Nor will practices now in place solve problems. For this new technology, new methods of management must be designed.

# PLANNING, IMPLEMENTATION, AND BENEFITS OF MERGING THE GEOLOGY AND PHYSICS LIBRARIES INTO A COMBINED RENOVATED FACILITY AT THE UNIVERSITY OF CINCINNATI

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Abstract--After more than ten years of planning and a year long renovation project, the Geology Library and the Physics Library at the University of Cincinnati were merged into a new facility which opened in January, 1990.

One of the more intricate challenges in planning the move was the consolidation of widely scattered collections. Both libraries had been housed in older, cramped, and rapidly deteriorating physical facilities. Each of the libraries had large portions of their collections in a storage facility. The DataEase management system was used to write a program that would facilitate the integration of dispersed materials into the new facility. The move itself proceeded smoothly over a three week period in late 1989, and was greatly aided by the computer-generated reports.

The attractive and spacious new library provides more than 18,000 square feet of space to accommodate services, collections and users. The effective use of high density mobile stacks affords increased on-site access to a majority of the collection. The new facility provides an improved climate controlled environment in which to preserve materials. Better security for the collection is afforded by the installation of a theft detection system. Added services for the user include a map copier, a state of the art microform reader/printer, and automated reference services. Comfortable seating provides user space for 132 patrons. An added benefit is the consolidation of most of the University's map collection in one physical location.

## Introduction

On January 3, 1990, the new Geology/Physics Library at the University opened its doors. Located in the former site of the University Bookstore, the renovated facility houses the combined services, collections, and staff of the former Geology and Physics Libraries. This spacious, modern facility makes it easy to forget the crumbling, dark halls of the former Geology Library and the cramped, overcrowded rooms of the old Physics Library.

Both departments and their libraries have a long history at the University of Cincinnati. The Geology Department was founded in 1907 by Nevin Fenneman. From the early part of this century a combined Geology/Geography Library was housed in several locations in the Old Tech Building. In 1948 the library was moved to Room 103 on the ground level because of weight problems. Maps were maintained in a separate space by the Geology Department. In 1978 the social science materials of the Geography collection were moved to the central library owing to increasing space and facility problems. The library space was expanded to occupy the entire north end of the first floor of the Old Tech Building when the Geology Department was relocated in 1987. The Physics Department also traces its roots back to the early part of the 20th century. The Physics Library was housed on the 4th floor of Braunstein Hall when the building was completed in 1929. The space was an elegant facility of wood construction built to hold library materials. Two small rooms and several storage areas were added as the collection outgrew the space. The Mathematics collection was a part of the Physics Library from 1963 to 1978.

## Planning the move

The concept of new facilities to house both the Geology and Physics libraries had been considered for more than a decade. Both libraries were housed in cramped, older facilities with ever larger portions of their collections being moved annually to a storage facility. Each library head was asked to prepare plans for a new facility for their respective library during the late 1970s. The concept of combining the two libraries into a single facility emerged with a plan to relocate the Geology and Physics departments into a new building in 1980. Space in an adjoining building, previously occupied by the University Bookstore, was allocated for use by the two libraries. Planning for the library project began in earnest in mid-1987. The library renovation and construction phase took place during 1989.

The total cost for the project was $752,000 for renovating 20,716 gross square feet. The cost per square foot was $36.30. The construction costs were $425,500 which included the HVAC system, electrical work, telecommunications, and carpeting. Equipment costs were $326,500 which included furniture, equipment, signage, shelving, and a security system. The project resulted in a facility of 18,750 net assignable square feet with a book capacity of 125,000 volumes and a seating capacity of 132.

## Use of Dataease

As they outgrew their space during the 1970s and 1980s, the Geology Library and the Physics Library had shipped large portions of their respective journal collections to on-site and off-site storage locations. The result was six subcollections, each shelved by Library of Congress call number for easy retrieval. The challenge was how to efficiently move this widely dispersed material into one location with a single consecutive call-number arrangement for each discipline. To accomplish this project we needed to determine the total volume count, shelf requirements for the current volume count, annual growth figures, and shelf requirements for 15-20 years growth. Another goal was to identify infrequently used titles which would remain in permanent storage.

The strategy adopted was to purchase a microcomputer and appropriate software. The hardware selected in June of 1987 was a Zenith XT Z159 with color monitor and MS-DOS operating system. The software chosen was DataEase Version 2.5. The goal was to create a file of all journal holdings, establish linking relationships between fields, and define reports based on these linked fields. Establishing the database, entering almost 1,000 records, and incorporating the information produced by the reports for preparing for the move spanned a period of almost three summers..

The first step was to define a form in which to store information in data-entry fields. The on-line data-entry fields had to be defined precisely. Questions which had to be considered in the design of the database included the type of information to be stored in the field, how the information would be displayed and entered, and whether the information should be limited to a specific range. The process of completing the forms was made faster and more accurate by specifying multiple choice fields, calculated fields, table look-up operations, and default values.

Next, the relationships between the fields that would link all forms together was defined. Then the data was entered into the record system. Earlier efforts to define precise data-entry field specifications assured that the system would check the validity of the information entered into the fields. It also made certain that it was the right type of information for the field and that the information would fall within a specified range. The system had to perform all necessary calculations automatically and continually which would result in a correct, complete and up-to-date source of information.

The final step was to define the desired report structure to meet our needs. For each report, records and fields from multiple files were selected by sorting and grouping data on a number of fields and by ordering statistical operations on fields. Every report then was formatted, a process that is similar to a word processing operation. The final procedure required definition of print style such as page size, margins, pitch, and type style.

As a result, the database provided us with a variety of reports providing data by type of material, discipline, location, volume count, and present and future shelf requirements, all of which proved highly useful information for expedient planning of the move.

After the move, the database has proved advantageous in furnishing easily updated lists of geology and physics journals. It can also be used to provide a list of permanently stored holdings and a list of current journal expenditures for each discipline. The database can provide the total number of current subscriptions, changes in the total number of subscriptions, and the total volume count on a given day.

## The Move

The transfer of materials, furnishings and equipment from the old facilities to the new one took place over a three-week period from late November to mid-December, 1989. Professional movers were hired to perform the move. Because of extensive planning the move went smoothly. Since materials were being moved into the new library from the same building and from other buildings, the movers were able to work around bad weather by moving materials inside on days with rain or snow. The outdoor portion of the move was completed before extreme cold and heavy snow set in at mid month. The only major glitch came on the day the map cases were moved. That was the day the elevators were shut off for the testing of the building fire alarm system, and all of the map cases had to be carried up two flights of stairs.

Materials from the various locations were easily placed on the shelves in the new library. The DataEase program produced data for shelf lengths for actual volumes of each journal title or call number segment of monographs plus estimated growth space for a given number of years. A diagram of the shelf units was created and measurements were placed on it from DataEase. The actual shelf units were labeled using these diagrams.

Some minor shifting of monographic materials was required after the move. On several days there were more mover's crews placing materials on shelves than there were library staff to supervise them. Unsupervised crews tended to pack the volumes on the shelves immediately after the beginning call number indicator of a section and not space materials on the shelf to allow for growth. In areas where each library had part of an LC classification, the holdings of the library with the smaller holdings of materials was placed at the end of the space allocated for that LC classification. These materials were later integrated.

## The New Facility

The combined facility provides a spacious two level setting for the collection of 80,700 bound volumes, 105,000 maps, and 37,000 microfiche. (Fig. 1 & 2) Strong support from the Library Administration provided the funding to offer new services and to purchase new equipment. Increasing hours of operations permitted the discontinuance of issuing keys to faculty or students. The expanded space, new services, and use of new technology provide better services to the user and a better environment in which to house the collection.

One of the features of the new facility is carpeting throughout the entire space. This helps to provide a quieter, cleaner environment. However, problems with the carpeting have already occurred. Problems with stains and wear began occurring soon after the move. A persistent leak in steamlines outside the southwest wall of the library allowed water to enter the lower level of the library for many months until it could be located and repaired. The water has cause permanent damage and discoloration to the carpet in this area.

Before the move each library had 2 FTE staff members. The new unit has 4.5 FTE staff. The former head of the Physics Library heads the new unit and is also responsible for technical services and selection of physics materials. The former head of the Geology Library heads public service and is given responsibility for maps and government documents, as well as for selection of geology and geography materials. The new unit has 3 support staff. The half time technical services position in Physics was made full-time in the new library. The full time Geology assistant position was moved mainly into circulation. A Physics half time circulation position was retained with mainly the same duties.

### Expanded Space

The two libraries had a combined space of less than 5,000 net assignable square feet. The new facility allowed for expanded user, collection, and staff work space. Because of the original configuration of the space the program took advantage of many small rooms to house special materials and provide unique user and service spaces.

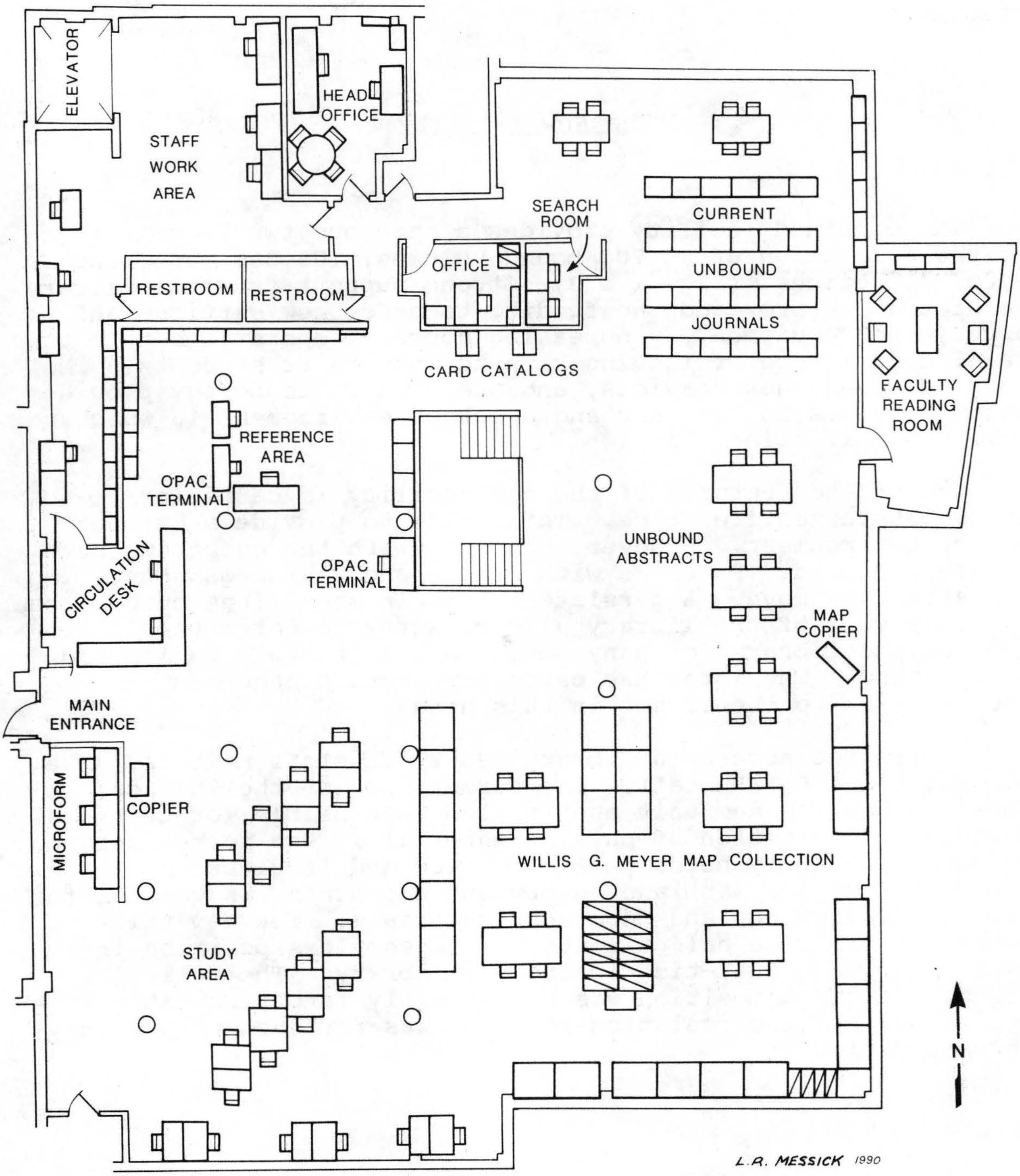


Figure 1: Floor plan of the Upper (Entrance) Level

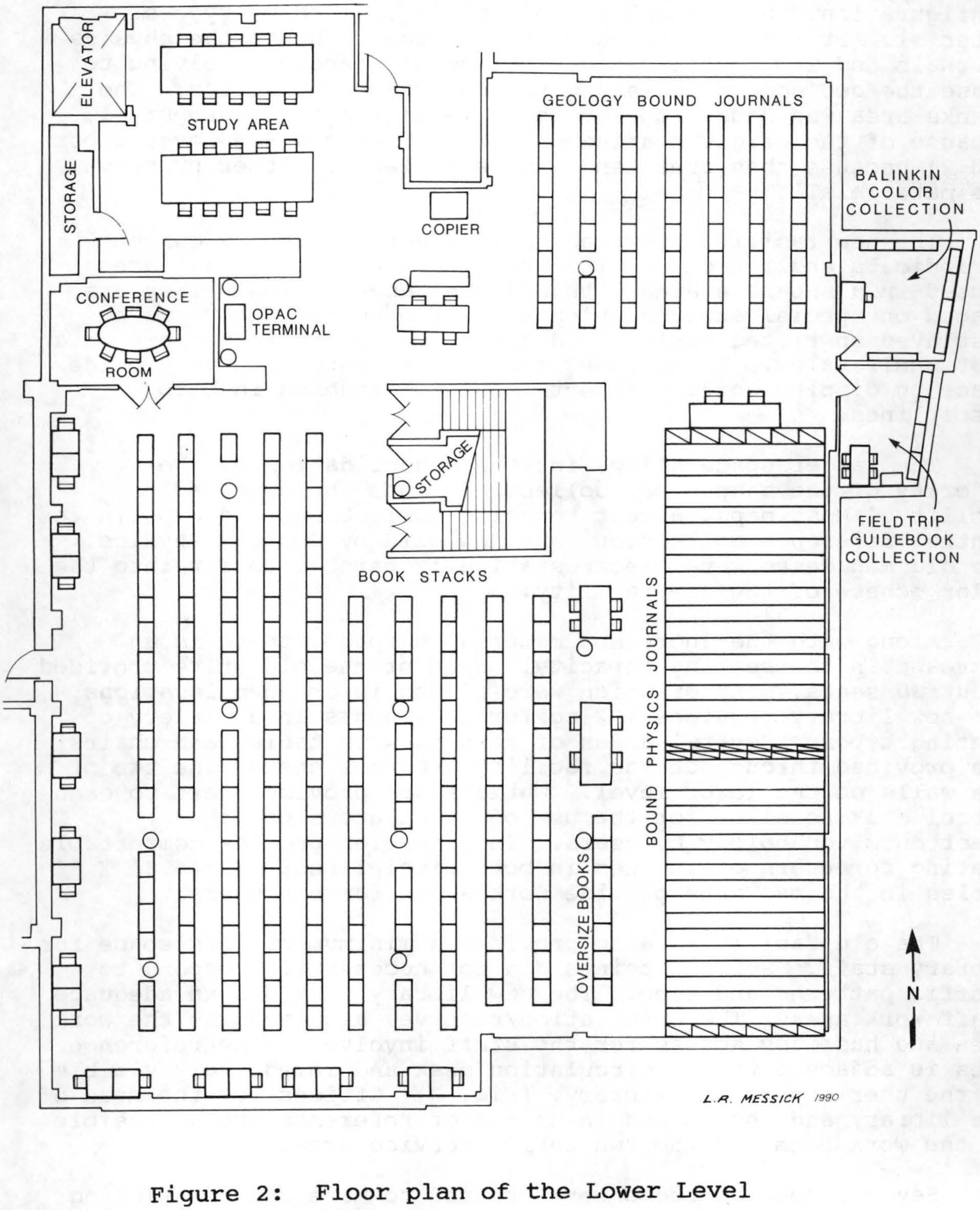


Figure 2: Floor plan of the Lower Level

A major benefit is expanded shelf space. Neither library had any space for collection growth, while the new facility provides growth space for 15-20 years. Because of the original space configuration, the general collection is divided by type of material. It includes the compact storage to house the physics journals and 240 double-faced sections of standard shelving to house the geology journals and the monograph collection. The stacks area was housed on the lower level for two reasons: 1) because of the weight bearing capacity of this grade level floor and 2) because this area tends to be cooler to better preserve the materials.

The new facility provides ample space to display current periodicals and periodical indexes. Current periodicals are housed in a separate area with adjacent user tables. They are placed on special shelves which allow the current issue to be displayed on tilted shelves and the older recent issues are on a flat shelf below. Three index tables were purchased to provide space to display and use recent issues of indexes in both disciplines.

The larger space allows for the consolidation of the majority of the campus map collections into the combined facility. Most maps, except teaching collections and maps in the central reference collection, are now held by Geology/Physics. The old map cases were electrostatically painted to fit into the color scheme of the new facility.

Along with the increased material's space, there is an increase in the seating capacity. Each of the old units provided about 30 seats, many of which were placed in cramped locations. The new library provides 132 comfortable seats in a variety of seating types. Several areas of seating with tables and chairs are provided throughout the facility. Carrel desks line two of the walls on the lower level. Outlets are provided next to each carrel desk to allow for the use of calculators or other electronic technology by users. Index tables provide comfortable seating for users of indexes in both disciplines. Three 4' X 8' tables in the map area provide work areas for map users.

The old facilities also provided a minimum of work space for library staff. Service points did not necessarily respond to traffic patterns and flow. The new library provides an adequate staff work area. The circulation/reserves area adjoins the work area and has easy access for the staff involved. The reference area is adjacent to the circulation desk and immediately visible as the user enters the library. (Fig. 3) Offices for the head of the library and the person in charge of reference are accessible to the work room and the two public service areas.

Several special rooms were created to make use of existing small rooms where walls could not be removed. The rooms housing the Balinkin Color and Light Collection and the S.V. Hrabar Geologic Field Trip Guidebook Collection were small offices in

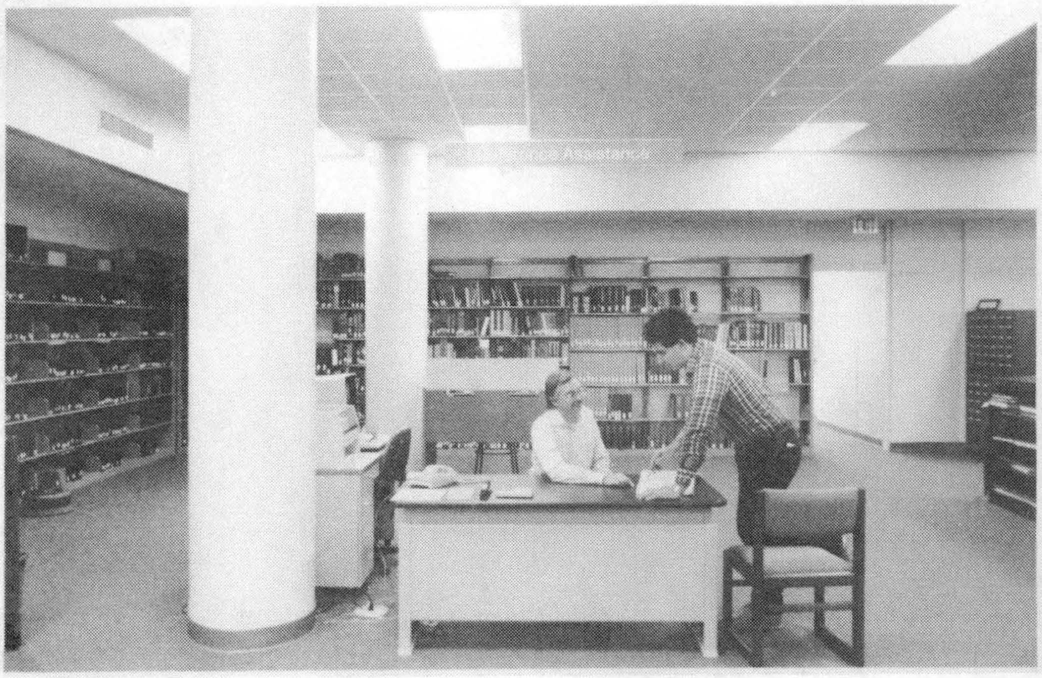


Figure 3: View of the reference area.

the former bookstore. The Conference Room, which seats up to 14 people, is housed in the old computer store. The Faculty Reading Room was created from the former exterior entrance space to the bookstore. This room provides a quiet area for faculty and graduate students to peruse the daily arrivals of journals and new acquisitions. The Online Search Room and an office were carved out of a space between two existing permanent structures.

## Use of New Technology

An exciting new concept in the library is the use of Modulex signage made by the same people who make Lego. The flexibility and durability of this signage product justified its higher purchase cost. The signage in the stacks area is color-coded for each type of material.

The new facility provided the first installation of high density mobile stacks at the University of Cincinnati Libraries. The system, made by Space Saver, consists of 32 double-faced sections mounted on tracks. Two aisle openings provide access to the collection. (Fig. 4) The unit will accommodate up to 50,000 bound volumes in an area 64 feet wide and 16 feet deep. It currently holds the entire physics journal collection of 30,000 bound volumes and provides growth space for approximately 20 years. This high-density mobile system is the largest in the region to be accessible to the general public. During its first year of operation it has proven to be durable and dependable.

Figure 4: View of the high-density mobile stacks.

A security system was installed in the new library to help prevent the theft of materials. The majority of the book and journal collection was tattletaped during the first year of operation.

Other new equipment was purchased for dealing with maps and microforms. An engineering/map copier was purchased for the new unit with special funds. It produces black and white copies of maps 36 inches wide and up to 16 feet in length. A microform reader/printer was obtained to provide better access to the rapidly growing microform collection. This machine has been used by the geologists to copy thin sections as well as to produce excellent quality photocopies of microforms.

## Summary

Careful and detailed planning facilitated the move into the new Geology/Physics Library in late 1989. The new library provides generous and inviting space to accommodate the collections of the two disciplines and the services needed to support them. New technology purchased as part of the project provides the users better access to all types of materials housed in the combined collection.

Acknowledgements--The authors are indebted to Ralph C. Spohn for providing the excellent photographs used in the poster session in Dallas and for this paper. We also wish to thank Lyla Messick for the drafting for the project. We wish to thank William F. Louden, Assistant University Librarian for Planning and Budget, for his outstanding efforts in working with us during and after the project and for reviewing the final manuscript. A special thanks is given to Ginny Wisniewski for her constructive suggestions for the poster session and to Jim Liddle for helping to plan the layout and mounting the materials for the poster session.

# PART IV

## PAPERS PREPARED FOR THE 25TH ANNIVERSARY GALA DINNER, OCTOBER 30, 1990, DALLAS, TEXAS

**EARLY EFFORTS LEADING TO THE FOUNDING OF THE GEOSCIENCE INFORMATION SOCIETY**

Robert (Skip) McAfee*
American Society for Horticultural Science, Alexandria, VA
(*Editor, GIS Newsletter 1965-1972)

On 12 March 1963, Ruth Bristol, librarian for the Virginia Division of Mineral Resources, Charlottesville, wrote me a letter regarding "the status of bibliographic control in geological literature" and asked if I would exchange thoughts with other librarians with similar concerns. She also lamented the "lack of communication among librarians handling geological collections." I replied that I suddenly realized that I had yet to talk to or correspond with any other geology librarian after almost one year in my job as geology librarian at Columbia University. I met with Ruth one month later and thus began the efforts to organize a group of people interested in geoscience information.

Among Bristol's earliest concerns were 1) use of "IBM equipment" to control geological literature; 2) bibliographic control of masters theses and doctoral dissertations in geology (including those in process); 3) case studies of library habits of geologists; and 4) serving as a "coordinating device" for other geology librarians to exchange ideas. My concerns were 1) dissemination of hard-copy materials to the working geologist; and 2) index of guidebooks or proceedings of field trips/conferences.

Meanwhile, the American Geological Institute (AGI), with some slight pushing from Bristol, had become interested in "geological documentation." In May 1964, she was hired by AGI as a "consulting librarian" on a part-time basis to study "the general problems in scientific communications among geologists."

Also concerned with the same problems was the U.S. National Committee on Geology. In 1962, it appointed Herbert H. Hawkes (Department of Mineral Technology, University of California, Berkeley) as chairman of the Subcommittee on Documentation to direct the Study Program in Geological Documentation, a project sponsored by the National Academy of Sciences-National Research Council, with financial support from the National Science Foundation (NSF). The purpose of the project was to obtain facts about the existing documentation services, determine the most effective services, study the use made of these services by geologists, and ask them what services they think they want and what they would be willing to pay. The subcommittee's studies provided a focal point for a series of meetings among a group of geologists, librarians, and documentalists interested in furthering discussion of all problems related to geoscience information.

During this time, Bristol, assisted by Foster D. Smith (director of science information at AGI), planned the first meeting ever of geology librarians, held 10 June 1964 during the Special Libraries Association (SLA) annual meeting in St. Louis. The purpose of the informal dinner meeting (chaired by Bristol and supported by NSF) was to acquaint librarians with AGI's geological documentation activities to identify problems and recommendations for Hawkes' subcommittee. The topics of concern included review articles, services of state survey libraries, geological mapping, abstracting and indexing services, geological thesauri, and standardizing citations. The 31 participants agreed that the nature of library service placed them in a "creative catalyst" position between geologists and the information they need. But there was no discussion of organizing a group of geological librarians.

In August 1964, Bristol recommended to AGI and Hawkes that selected geology librarians be invited to a discussion meeting with Hawkes' subcommittee and geologists interested in working on bibliographic control problems. Hawkes welcomed the recommendation. Thus, an all-day panel discussion, entitled "Geology Library Problems," was held on 21 Nov. 1964 during the Geological Society of America (GSA) annual meeting in Miami Beach. Sponsored by Hawkes' study project and coordinated by AGI, the meeting attracted nearly 40 geologists. It was the first time that geologists, librarians, and documentalists met to exchange ideas.

Ruth Bristol, who moderated the panel discussion, said the meeting was "a spontaneous buildup among geologists and librarians of a feeling for a need to unite to work on their mutual problems." Six geology librarians presented facts and findings on bibliographic control problems: theses by Ellen Freeman (Indiana University); geologic maps by Mark Pangborn (map curator at the U.S. Geological Survey Library); field-trip guidebooks by Florence Hendee (Ohio State Univ.); national and regional centers of information by Marguerite Hanchey (Louisiana State Univ.); providing geologists with hard copy by McAfee; and role of library committees by Harriet Smith (later Wallace) (University of Illinois).

After the session, the librarian panelists met to consider three important matters: 1) continue their assistance to the Hawkes study project (e.g., determining the extent of usage of geology documentation services); 2) extend the application of their expert training and experience beyond Hawkes' subcommittee to the whole geological community (e.g., offering to help AGI and GSA with abstracting and indexing); and 3) form a Continuing Panel on Geology Library Problems--later called the Committee of Eight, consisting of the six panelists at Miami Beach plus Dederick Ward (University of Colorado) and Bill Heers (U.S. Geological Survey Librarian)--with two immediate and specific charges: a) identify study projects and recommendations for use by the Hawkes subcommittee (e.g., the panel recommended that appropriate action be initiated to develop the potentialities of the U.S. Geological Survey Library in the geological community and in proper relation to the sci-tech community); and b) "ascertain from other geology librarians their views concerning the formation of an organization for geology librarians and to take the necessary steps to initiate formation of such a group," affiliated with a professional library society or with a geological organization. The panelists also urged AGI to include librarians in its directory of geosciences departments and to identify qualified geology librarians using various reference sources.

The question of whether an organization of geoscience information should affiliate with an established organization or be independent concerned the Committee of Eight and Bristol from the beginning. It was important to involve practicing and academic geologists in the new group. Essentially there were three options:

**Affiliate with a library or information organization.**

These included:

1) American Documentation Institute (ADI, later American Society for Information Science). ADI included many people working on geological information services and would attract geologists as an "intellectual" organization; however, librarians would not apt to join.

2) Special Librarians Association (SLA). The Geography and Map Division was not too concerned with the earth sciences, but it could be expanded to include those interested in geology library problems; the Division had excellent publications. The Petroleum Section of the Science-Technology Division would be too exclusive. Establishing a Geoscience Division was suggested. SLA Executive Director Bill M. Woods encouraged the group to affiliate with SLA, but membership requirements would be limited to practicing librarians and would exclude geologists.

3) American Library Association (ALA). Despite its emphasis on public libraries, ALA could offer financial support to form a geology subsection under the Subject Specialists Section of the Association of College and Research Libraries: it would be open to anyone interested in libraries, regardless of training or background, but it was felt that it would not attract documentalists and information scientists. Besides, the hierarchical red tape appeared formidable.

4) Comprehensive group of natural resources librarians. Forestry librarians were simultaneously considering forming their own organization.

**Affiliate with a geological or scientific organization.**

These included:

1) American Chemical Society's Documentation Committee. Good group for learning about recent advances in information science, but the subject matter was inappropriate.

2) American Geophysical Union (AGU)

3) Geological Society of America (GSA). It was felt that an information group would be "lost" within such a large organization. Besides, most librarians could not be admitted to GSA.

4) National Association of Geology Teachers (NAGT). Its constitution stated that those "engaged in the gathering and dissemination of geological information" may become members; but NAGT was concerned with elementary, secondary, and undergraduate education (geology librarians did not consider themselves educators) and therefore excluded industry and state survey representatives. Also, there were concerns about being allowed to regroup within NAGT into a special membership category.

5) American Geological Institute (AGI). AGI was an attractive option because, via Geotimes, geology librarians could reach the entire geological community. But affiliation would cost money ($1 per member).

Heers had a disturbing comment: "What geologist ever willingly read a library-type publication, or has time for such dalliance? Not many." But a geologist might read a library-oriented article in a geology journal.

**Form an independent organization.**

In early 1965, Harriet Smith sent a questionnaire to 150 geology librarians and other colleagues concerning the formation of an independent organization of those concerned with geological information. From the 68 responses, there was a strong consensus that such a group be formed, that it affiliate directly or indirectly with AGI, and that it include the term "Geoscience" in its name; e.g., the Association (or Society) of Geoscience Librarians and Documentalists. Membership in the new organization would be drawn from three sources: 1) librarians, whether or not they had professional training or library degrees; 2) documentalists and information scientists, who may have no library training or little concern for traditional library "procedures," but were concerned with control of geological information; and 3) geologists, who may care little for details of the methods or problems concerned with making the literature available but who "want it when they want it."

The big problems were money (lack thereof) and credibility: would a stand-alone group be strong enough and large enough to gain the respect of their geologist colleagues? One survey respondent noted the importance of maintaining "close association with the geologists: they hold the purse strings."

Harriet Smith guided the Committee of Eight during 1965. She grappled with the fundamental question: what kind of organization would provide the best opportunity for improved information exchange in the earth science community?

On 11 June 1965, during the SLA annual meeting in Philadelphia, Bristol chaired a session entitled "Improving Information Exchange in the Geosciences." The 16 participants concluded that association with NAGT would answer that question: it had low dues and easy access to AGI and an established public, and it would accept geologists and librarians. The Philadelphia contingent believed that forming an independent organization would take too long to build membership and delay effective activity; furthermore, funds were not available and there was no certainty that the fledgling organization would attain its goals.

On 6 July 1965, during the ALA annual meeting in Detroit, Harriet Smith convened eight participants to discuss the Philadelphia recommendations. They did not favor affiliation with NAGT because of its non-research, classroom approach. Instead, they preferred to form a separate society or committee that would function independently for a year or two before studying more thoroughly the matter of affiliation. They recommended that the new organization hold its annual meetings during the GSA meeting (thereby assuring the participation of geologists), but use the ALA and SLA meetings to conduct workshops and round-table discussions. Although the new organization would be informal--open to all those involved with geoscience information--it would adhere to an overall outline and perhaps elect one officer and assess minimal dues. Reflecting the guiding hand of Harriet Smith, the Detroit group recommended that the Committee of Eight draft bylaws and a statement of purpose, petition for membership in AGI, recommend to AGI that it appoint a person to coordinate information activities and serve as liaison with geology libraries, continue studying the possibility of affiliation, prepare an inventory of bibliographic and information exchange needs (indicating priorities), and find sources of funds to support and persons to work on specific projects. The proposed name for the new organization: Committee for Earth Science Information Activities (CESIA). The goal: formal organization by November 1965, during the GSA annual meeting.

During the summer, Bristol sent another questionnaire to 73 colleagues: the result was overwhelmingly to form an independent organization (only 5 voted to affiliate with NAGT). But Bristol began to question whether an independent organization could survive. She advanced the concept of a strong and active "library center" at AGI whose function would be to coordinate "gradual growth of a pattern of organization and interchange among librarians." She proposed that AGI appoint a professional librarian as a "coordinator" charged to improve communication and information exchange among the geosciences by use of the "library approach." The coordinator would tap geologists and librarians in the organizations where they are already members. NSF seemed interested in this approach. Bristol wondered: would a splinter group of people involved in geoscience information activities be necessary?

On 17-18 August 1965, Ward, McAfee, and Harriet Smith met in Boulder, Colorado. Acting as a "steering committee" for the Committee of Eight, they agreed that based on Bristol's poll an independent organization should be formed by November. They questioned the presumption of such a newly formed organization to suggest to AGI any action, including the establishment of a librarian coordinator positon at AGI; rather, the new organization must demonstrate its worthwhileness, or let AGI seek its advice.

Meanwhile, at AGI, Foster Smith urged that the first order of business was to get organized, then affiliate with an established member society of AGI (he suggested becoming a committee within NAGT). He felt that an independent organization would be too weak, lacking funds, credibility with NSF, and influence with the AGI board. As for the coordinator position, he suggested that it be delayed until AGI could identify qualifications according to need.

Although Ward and McAfee would accept temporary affiliation with NAGT, Harriet Smith strongly disagreed. NAGT was having a hard time making a go of it and its audience (secondary school teachers) did not include the public sought by CESIA (librarians from industry, documentalists, research geologists).

Under the guiding principles that any organization should allow for participation of <u>all</u> those involved in information activities in the geosciences and that the need for communication and cooperation between information people and scientists be recognized, CESIA: a) rejected any formal affiliation on the grounds of restrictive membership requirements or limited scope of interest; b) recommended that an informal but independent society be founded, with one officer, and dues set at $1 to $3; c) recommended that the concept of the coordinator position be dropped; and d) suggested that the society complete a small project to demonstrate its viability, before looking more closely into affiliation with an established organization. Harriet Smith suggested a new name: Association of Geological Literature Specialists.

Harriet Smith recommended that Bristol become the sole officer (president or chairman) because of her "knowledge and experience on the Washington scene"; but Bristol declined--it was clear that she wanted to be appointed librarian coordinator at AGI, although Foster Smith said that no such position was planned. Harriet then suggested Mark Pangborn, who was already in Washington, D.C.

On 12 October 1965, Harriet Smith sent a letter to 100 colleagues (including interested geologists) to invite them to an organizational meeting on 5 November during the GSA annual meeting in Kansas City, Missouri. Smith moderated the meeting (which also included a summary report of the Hawkes study plus a session by Myrl Powell of the Library of Congress on subject headings). The assembled geology and science librarians, geologists, documentalists, editors, and information specialists--numbering about 30--adopted a constitution and completed the organization of an independent group whose purposes would be "to initiate, aid, and improve the exchange of information in the earth sciences through mutual cooperation" and "to deal with the many problems created by the explosion of literature in the geosciences, including that of the shortage of trained personnel to staff geoscience libraries." A nominating committee chaired by Ward proposed Pangborn for President, Harriet Smith for Secretary/President-elect, Harriet Long (Washington University, St. Louis) for Treasurer, and Ruth Bristol as "past President"; the slate was approved unanimously. Dues were set at $5. The new name: Geoscience Information Society.

**MEETING THE CHALLENGE**

Claren M. Kidd*
Geology Library, University of Oklahoma, Norman, OK
(*GIS President 1985)

The Geoscience Information Society has achieved many of the concerns that Ruth Bristol expressed 25 years ago, as reported by Skip McAfee.

**USE OF "IBM EQUIPMENT"**

In 1968, NSF began funding AGI to build an online geological data base. Two years later at the GIS Symposium we learned that the data base would be call GeoRef. In 1971, the USGS had ceased publication of its abstracts and bibliography, and GSA was producing the <u>Bibliography and Index of Geology</u> from AGI tapes. NSF threatened to cancel its financial support of GeoRef in 1972, but more than 200 letters and calls from interested groups and individuals in support of GeoRef impressed NSF, which continued its support for two more yars. GIS's interest was demonstrated in 1972 by its provision of $500 (the Society's balance was $2,631) to help alleviate GeoRef's financial deficit, estimated to be between $200,000 and $250,000. Later that year, GeoRef came up on SDC.

In 1971, AGI invited GIS to form a GeoRef advisory committee to provide liaison with GeoRef users. The committee chaired by Hart Phinney (Princeton University) was not successful in its dialogue with AGI. Perhaps because of this lack of communication a GIS committee, chaired by Julie Bichteler (University of Texas, Austin), was created in 1974 at AGI's request, to evaluate the effectiveness of GeoRef as a "bibliographical reference center for the geosciences and means of automatic information retrieval." John Mulvihill (AGI-GeoRef) asked the Society to advise AGI of the bext mixture of coverage between foreign and domestic serials. He also asked GIS to create a GeoRef user group to establish priorities.

In 1983, the GeoRef User Group, chaired by Nancy Pruett (Sandia National Laboratory, Albuquerque), was formed as an ad hoc committee; eventually it became an important GIS standing committee. Although officially a GeoRef Advisory Committee, the GIS User Group is composed of GIS members. In 1988, the User Group's Serials Task Force, chaired by Charlotte Derksen (Stanford University) compiled a list of core journals for immediate indexing into GeoRef. Among the User Group's other tasks were setting GeoRef priorities, evaluating online searching costs, and the elmination of duplicate citations. In 1976, John Mulvihill organized the first "Online Search Workshop," which included a description of terminology and a section on searching both GeoRef and TULSA. GeoRef grew during the 1980's as it extended its data base back to 1785 and entered into an agreement with the Bureau de Recherches Geologiques et Minieres (BRGM), the

Centre National de la Recherche Scientifique (CNRS) and the Bundesanstalt fur Geowissenschaften und Rohstoffe (BGR). Each maintains and builds their own data base and shares the tapes. The French and Germans are responsible for adding European references and AGI supplies North American references. As 1990 began, GeoRef was available via SDC, DIALOG, and STN. Also in 1990, the entire GeoRef file became available on two CD-ROM disks through Silver Platter. During the latter part of the 1980's, GIS invited data base and CD-ROM vendors to the annual meetings to describe their products at data base forums. The User Group also held GeoRef Workshops at these meetings. Both have attracted GIS members and GSA geologists.

**BIBLIOGRAPHIC CONTROL OF GEOLOGICAL THESES**

Following the bibliographies produced by Halka and John Chronic, GIS Thesis Committee Chair, Dedy Ward (University of Colorado) compiled a list of graduate theses and dissertations that appeared in a 1965 issue of Geoscience Abstracts; in 1969, AGI published a list of 1965 and 1966 thesis; and a list of those accepted between 1967 and 1970 was published in 1973 as GSA Special Paper number 143. In 1975, the GIS Thesis Committee reported that AGI would collect bibliographic information about theses from geology graduate programs and would enter those into GeoRef. The Committee felt that a separate list would not be needed. Later GIS members realized that many departments were not submitting their data, and that some data which had been submitted to GeoRef and its hard-copy equivalent, the Bibliography and Index of Geology (BIG), were not in the data base. There was not a comprehensive list of graduate theses. Members of a newly appointed Thesis Committee began data collection in the late 1970's. By the early 1980's the committee, chaired by Vivian Hall (University of Kentucky), had collected bibliographic information on titles dated through 1978. For several years, the Society debated what to do with this wealth of unindexed information on cards. In 1984, the Society decided that it could not afford to go back and do the indexing nor could it absorb the cost of data entry for the 31,000 titles. The Executive Board dissolved the committee. The data have since been added to GeoRef. AGI will have a paper copy of the cumulative list of the theses and dissertations included in GeoRef available for purchase in 1990. AGI now requests information about each year's theses acquired from either the geology library or the university department and then enters it into GeoRef. Beyond AGI and GeoRef, Society members have been involved with producing regional or state lists of theses--for example, Marilyn Stark (Colorado School of Mines) on the Rocky Mountain region; Connie Manson (Washington State Department of Natural Resources) on the state of Washington; and Janice Sorensen (Kansas Geological Survey) on the state of Kansas. Ruth Bristol's goal of having bibliographic control of theses has improved.

**CONCERN FOR UNDERSTANDING GEOLOGISTS AS LIBRARY USERS**

In 1974, GIS members Julie Bichteler, Aphrodite Mamoulides (Shell-Houston), and Robert and Marjorie Wheeler (Lamar University) presented oral testimony before the National Commission of Libraries and Information Science (NCLIS). The Commission was especially interested in geoscientists as users and how they differed from other scientists. Marge Wheeler talked about the use of maps, core samples, the value of older and foreign material, and the necessity of geographic access. Other members addressed GeoRef funding, the recognition of USGS as the de facto national geoscience library, the importance of state surveys being included in the geoscience network and the importance of environmental and energy aspects of geoscience information. A written report was submitted to NCLIS that included chapters by Julie Bichteler (introduction and an evaluation of GeoRef), Marjorie Wheeler (user needs and information problems), Dedy Ward (an anlysis of printed bibliographic services in geology), and Sara Aull of the University of Houston (a national network of geoscience libraries). The 1986 Symposium entitled "The User and Geoscience Information" also dealt with Ruth Bristol's third concern. GIS developed the 1982 "Symposium on Geologic Hazards Data," and the 1988 "Symposium on Individual Workstations" specifically to appeal to both the information specialists and geologists. By developing such dual-interest symposia, GIS members learn more about geological subjects, more about the geologists' professional interests and how they utilize a specific body of literature, and what they are like as individuals. Several geologists have presented papers at our GIS symposia and technical sessions. A study by Bichteler and Ward published in the Special Libraries (v. 80, p. 169-178) investigated the information-seeking behavior of geologists.

**"COORDINATING DEVICE" TO EXCHANGE IDEAS WITH OTHER GEOLOGY LIBRARIANS**

Attending GIS annual meetings is perhaps the most effective method of attaining this goal. Although fewer than half of the membership are able to attend in a given year, those who do spend much of their time outside the formal sessions networking with each other. A second method of communicating is through the informative, quarterly GIS Newsletter. Issues contain committee reports, news of members, reviews, announcements of vacant positions, officers' columns, annual-meeting minutes, materials for sale and exchange, meeting announcements, new publications, letters to the editor, and an occassional short paper on a timely topic. GIS has compiled and distributed numerous membership lists and three directories of geoscience libraries. In addition to the telephone, electronic mail and facsimile machines (FAX) usage is growing.

**DISSEMINATION OF HARD COPY MATERIALS TO THE GEOLOGIST**

This was one of McAfee's concerns, interlibrary loan (ILL) has become much more successful with the use of the networks such as OCLC, RLIN, and WLN: we can quickly discover who has the item and if they will send it. Reciporcal borrowing privileges among consortia of libraries have cut costs, recently, the use of overnight mail and FAX has drastically reduced turnaround time. GIS members occasionally use their networking skill to bypass ILL formalities if the need is urgent.

**LIST OF GUIDEBOOKS/PROCEEDINGS OF FIELD TRIPS AND CONFERENCES**

McAfee's other concern has become one of GIS' most significant contributions. John Chaffin (Mobil-Dallas) chaired the first guidebook committee, created in 1966. It was charged with giving bibliographic control to guidebooks and other ephemera and in 1968 produced the first union list that included 218 main entries from 23 participating libraries. Five editions have been compiled by subsequent GIS committees and are described and listed in another section of this booklet. The sixth edition is currently being compiled by a 12-member committee chaired by Richard Spohn (University of Cincinnati). Recent committees, which work closely with AGI, have held marathon, informal meeetings at the annual meetings to resolve problems and collate information. AGI adds each citation to the GeoRef data base and prints out both a cumulative list of guidebooks and each library's holdings list. Both lists are sent to all participating libraries.

Along with capturing old guidebooks not included in previous editions, correcting errors, and identifying new geological collections, the committee is identifying elusive ephemeral geological literature to build a more comprehesive bibliographic data base. It became apparent to GIS members that formulation, presentation, and dissemination of standards for geological field-trip guidebooks might help create a more easily identifiable, more marketable, and longer lasting publication. In 1985, an ad hoc committee chaired by Claren Kidd (University of Oklahoma) wrote standards for authors, editors, and publishers of guidebooks. A revised version is now available. Adherence to these guidelines will be an ongoing goal for GIS, although the task should become easier as a larger number of authors, editors, and publishers begin to indirectly use the standards by modeling after guidebooks they know. At the 1989 annual meeting, a GIS workshop, co-chaired by Rosalind Walcott (SUNY-Stony Brook) and Claren Kidd, highlighted the efforts to advertise GIS' guidelines for guidebooks. Papers describing characteristics that information specialists want and need in order to make this format available were presented. Additionally, descriptions of how to conduct a good field trip were presented by experienced field trip leaders.

GIS as an organization has assumed numerous other challenges over the past 25 years.

**GOVERNMENT PUBLICATIONS AND MAPS**

The distribution of U.S. government publications, especially maps, has improved through the efforts of the Cartographic Users Advisory Council (CUAC). The council has two members from each of the following organizations: GIS, Special Libraries--Map and Geography Division, American Library Association--Map and Geography Division, and the Western Association of Map Librarians. One of CUAC's first goals was to get USGS maps and open-file reports into the depository library system. USGS open-file reports became depository items in 1981, although those which are electronically formatted are still excluded. With Gary North (USGS) as an ally, CUAC has convinced government mapping agencies such as the USGS, the Defense Mapping Agency, the Bureau of Land Management, and the National Oceanographic Survey, to include their maps as depository items to be distributed by the Government Printing Office.

The handling of maps has continued to be a recurring challenge. In 1980, Susan Klimley (Columbia University) called the first of several informal meetings to discuss problems and possible solutions of maps in libraries. Hart Phinney (Colorado School of Mines) revealed in 1983, that with online cataloging, map useage increased substantially at CSM. In 1984, Susan Klimley chaired an ad hoc committee to propose suggestions for a change in University Microfilm International's practice of filming maps in segments. During the middle 1980's Jean Eaglesfield (MIT) several times decried the lack of a current national atlas of the United States. Pleas to the USGS have been aired, but this publication seems to have a low funding priority even though the existing atlas was published in 1970. The 1985 Symposium, "Maps and the Geoscience Community," included papers on the use of maps in the classroom and in business, the status of government mapping, the historical development of geological maps, preservation, and the user. Acquisitions, bibliographic control, cataloging, preservation, and storage remain concerns. With the advent of newer technologies, maps will continue to be a topic of great interest for us and our users.

**GIS ON THE INTERNATIONAL SCENE**

As a result of a 1975 London lunch with Anthony Harvey and Judith Diment (both of the British Museum of Natural History), Dedy Ward returned to the GIS Annual Meeting in Salt Lake City with a proposal for a 1978 international meeting among information specialists. GIS liked the idea of cooperating with the Geological Society of London's Geological Information Group (GIG), and planning began for the 1978 meeting. In 1976, GIS was asked to send a representative to the International Geological Congress (IGC) in Sydney, New South Wales, to consider the formation of an organization similar to GIS within the IGC.

GIS considered the IGC proposal and formation of an international federation of geoscience information societies. Our membership concluded that organizing committees from each geoscience society should work together to hold an international meeting every four years. In 1978, 190 participants from 22 countries attended the First International Conference on Geological Information in London, England. Subsequent meetings convened in Golden, Colorado (1982), with 170 participants from 16 counties; Adelaide, South Australia (1986), with 130 participants from 13 countries; and Ottawa, Ontario (1990), with 307 participants from 41 countries. As a result of these conferences, GIS membership has grown more international and working groups have sought to: 1) coordinate the placement of our duplicate materials in needy libraries around the world (Susan Klimley); 2) assist with the editing, publishing, and translating of geological literature (Julian Green, Harvard University); and 3) investigate the need for data bases and to identify data base advisers or consultants to develop them.

**LIBRARY OF CONGRESS SUBJECT HEADINGS**

Subject access has frequently been mentioned in formal papers and in conversation. In 1966, the Subject Heading Committee, chaired by Harold Siroonian (Columbia University), decried geology subject headings as inadequate. Perhaps comments from that committee contributed to the expansion and changes that appeared in the 1973 Library of Congress Subject Division Schedule Q. Nine years later, Dena Fracolli (Montana Tech) again brought up the issue of LC subject headings, and in 1984, Elizabeth Morrisett (Montana Tech) chaired a committee to advise LC of problems and to suggest changes. The membership became much more aware of the problem, but significant changes in LC subject headings did not occur.

**COLLECTION DEVELOPMENT IN GEOSCIENCE LIBRARIES**

In 1964, the Committee of Eight discussed plans to assess collections held in geologic information centers. Three years later, Mark Pangborn, Jr. compiled, A Buying List of 100 Good Books for the High School Library, published by GIS and NAGT. In 1973, a GIS committee developed a technique to evaluate geoscience collections by assessing their ability to meet users' needs. "Collection Development in Geoscience Libraries" and "Collections for the Future" were the topics for the 1979 and 1987 GIS Symposia, respectively. In informal sessions at the annual meetings, GIS members continue to discuss collection development activities.

**GEOLOGIC DATA BASES, NON-BIBLIOGRAPHIC INFORMATION**

Several speakers delivered papers about numerical data bases at the 1976 technical sesion. In 1984, Uni Rowell, GIS president, urged GIS members to "become more familiar with non-bibliographic public data bases and to approach their producers, managers, and established users to join GIS and share their knowledge with us and to work with us for an improved distribution and increased usage of these dormant geological data bases." In the Proceedings of the 3rd International Conference on Geoscience Information (1986, p. 52-68) Dedy Ward and Richard Walker noted that the members of the Geological Society of London's GIG and the Australian Geoscience Information Association (AESIS) were more involved in the production and utilization of these numeric data bases than their U.S. counterparts. Therefore, their organizations contributed more papers on this area of geoscience information compared to those by GIS members.

## GIS IN FUTURE YEARS

What is the future for us? The goals that Skip McAfee and Ruth Bristol enumerated are concerns which will always need attention, and we will probably never completely attain them because our clients and technology continue to change. I'm sure we will continue to track the escalating prices of journals as has the committee headed by Jule Rinaldi (University of California-Berkeley). How can the escalating prices be slowed? What formats and new means of access will the future bring? Will local-area networks be widespread and will the leasing of online tapes be financially feasible to libraries with moderate budgets? Will we be writing our own grant proposals to support our libraries? What preservation methods will be developed, and will we have the funds and staff to utilize them?

Finally, why is GIS still a viable organization and why has the membership pulled together to address the previously described goals during the past quarter of a century? I think, fortunately, it's because we have continually enlisted members committed to improving service to the geoscience community. The members work outside the organization to make our work easier by compiling reference materials such as Dedy Ward, Marjorie Wheeler, and Robert Bier's (USGS-Denver) superb, Geologic Reference Sources, 2nd edition, 1981, or as organizational, cooperative projects such as the guidebook union lists. As you scan the list of executives who have guided the society, you recognize names that you probably perceive as experts. Then, when you look at the total membership, you realize that these are professionals who actively participate in several library organizations. Among this group are those who challenge us to do more or to do better; there are visionaries; and their are those who can translate concepts into workable projects. We are willing to commit our time to the planning, execution, and completion of projects that individually interest us. We work hard, but we enjoy what we do. Geoscience is a vital force in today's society, and we enjoy being an important part of it. We enjoy each other's companionship and respect each other's abilities. When we complain to each other, I think, we are really seeking answers to questions, solutions to problems, and a friend's sympathetic ear. There will continue to be professional challenges for us to undertake in our attempt to "Initiate, aid, and improve the exchange of information in the earth sciences through mutual cooperation..." and "...to deal with the many problems created by the explosion of literature in the geosciences...." Congratulations, GIS'ers, you have accomplished a lot, but there are future challenges that remain to be assumed. Continue to seek their resolution energetically.

Author's note: I hope that my perceptions, memories, and understanding are somewhat accurate. I am sure that there will be those who wonder why I left out items--it was not intentional --I did what I believed to be most important or most noteworthy. I would like to acknowledge the help of Julie Bichteler, John Mulvihill, and Dedy Ward for their contribution to the compilation of this history.

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