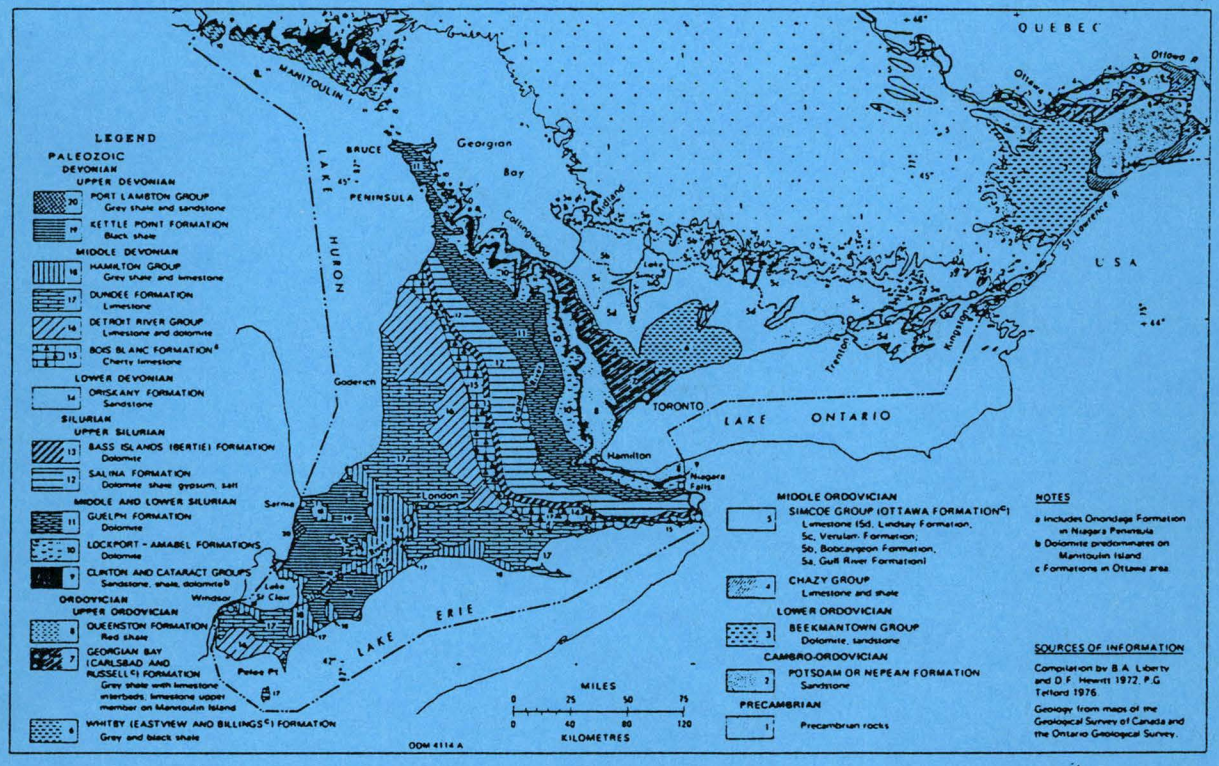
GEOSCIENCE INFORMATION SOCIETY



ACCRETING THE CONTINENT'S COLLECTIONS

Proceedings • Volume 29 • 1998

Proceedings of the 33nd Meeting
of the
Geoscience Information Society
October 25 to 28, 1998
Toronto, Ontario

ACCRETING THE CONTINENT'S COLLECTIONS

edited by

Charlotte R. M. Derksen and Connie J. Manson

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Cover figure: Paleozoic geology of Southern Ontario, *from:* Scott, Dale, 1983, Structural industrial minerals in Ontario. *In* Proceedings of the 19th Forum on the Geology of Industrial Minerals: Ontario Geological Survey Miscellaneous Paper 114, p. 20-32.

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PREFACE

The Geoscience Information Society (GIS) was established in 1965 as an independent, nonprofit, professional society. Members include librarians, information specialists, and scientists concerned with all aspects of geoscience information. GIS has members from academia, business, and government. Members come from all states in the Union and Canada as well as twenty-four other countries; members in France have formed a French Section of the Society.

GIS is a member society of the American Geological Institute (AGI) and an associated society of the Geological Society of America (GSA). The GIS annual meeting is held in conjunction with that of GSA and the papers, forums, and posters about geoscience information are a part of the GSA meeting and abstract structure. Abstracts for the papers contained within this proceedings volume can be found in *Abstracts with Programs – Geological Society of America*, v. 30, 1998.

Oral presentations of the papers in this proceedings volume were given at the 1998 GSA Annual Meeting in Toronto, Ontario, Canada, October 25 through October 28, 1998. This proceedings volume is presented in four parts:

I. Invited papers, presented at the GIS Symposium, "Accreting the Continent's Collections", October 27.

II. Contributed papers, presented at the GIS Technical Session, October 27.

III. Posters, presented at the GSA morning poster session, October 26.

IV. GIS forum sessions

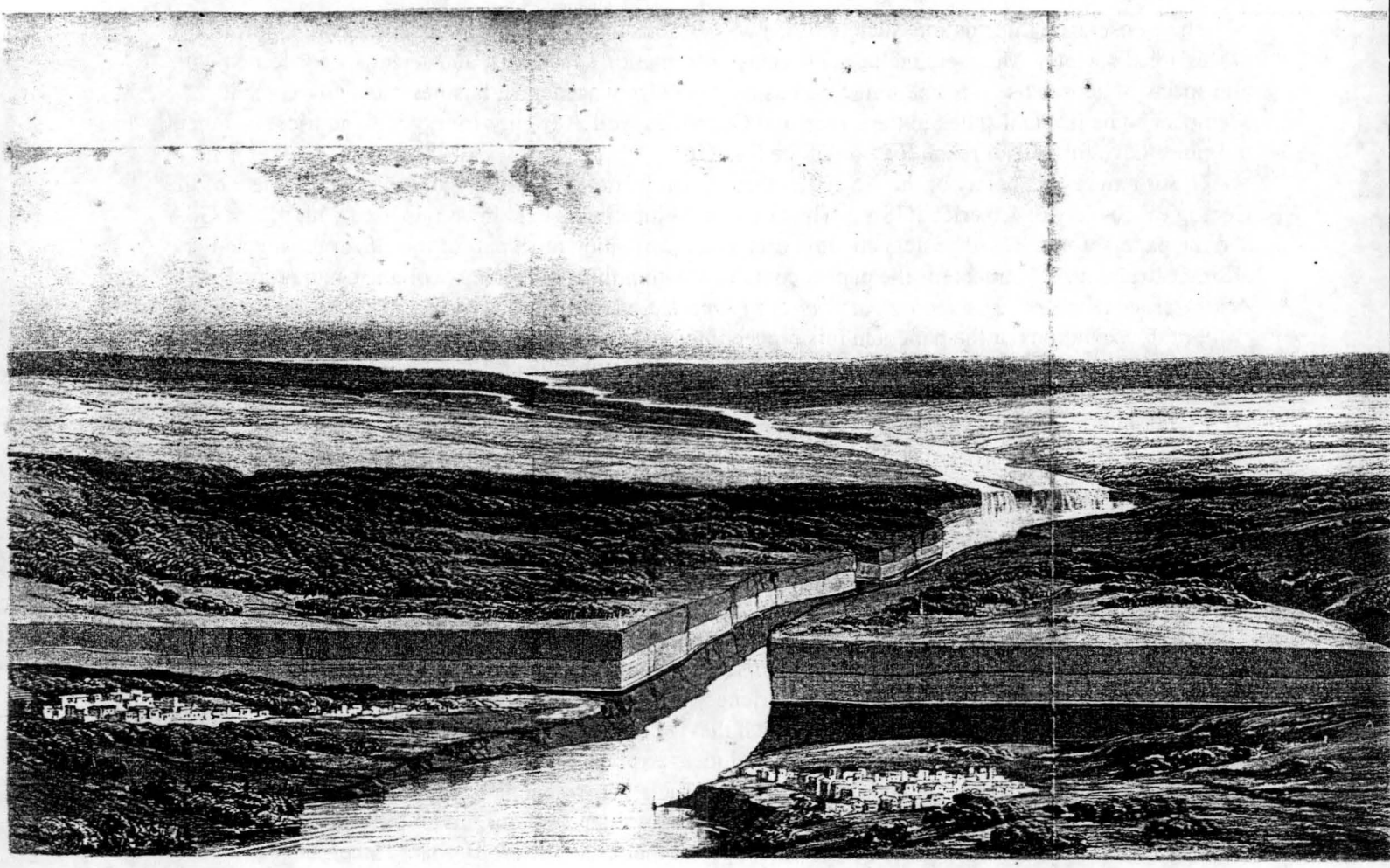
- A. Digital Database Forum, presentations and discussion held October 25.
- B. Collection Development Forum, presentations and discussion held October 26.
- C. Preservation Forum, presentations and discussion held October 27.
- D. Professional Concerns Forum, discussion held October 28 following a special presentation by GIS Fellow Ma. Arlene A. Marzo.

The papers are arranged in the order in which they were given. They have been edited slightly. The authors are solely responsible for the opinions and ideas expressed herein.

The authors are to be thanked both for presenting such well-researched, well-presented, and informative papers at the meeting and for preparing these written versions, under the duress of demanding professional and personal concerns. Special thanks are due to Barbara Haner, the co-convenor for the Symposium, and Barbara DeFelice and Patricia Sheahan, the co-convenors of the Technical Session. Thanks are also due to the leaders of the forums, as well as the many committee members, whose work led to the informative forum sessions.

This volume was prepared at the Washington Division of Geology and Earth Resources, with thanks for their technical assistance. Our thanks also to Jane Ingalls and Juanita Shaikh, Stanford University, for all their help with faxing, fedexing, and photocopying.

Charlotte R. M. Derksen
GIS President 1998-1999



Drawing: Birds-eye view of the Falls of Niagara adjacent country coloured geologically. *from* Lyell, Charles, Sir, 1845, Travels in North America; with geological observations on the United States, Canada, and Nova Scotia: London, J. Murray, 251 p.

Part I: Symposium

"Accreting the Continent's Collections"

co-convenors:
Charlotte R. M. Derksen and Barbara E. Haner
October 27, 1998

ACCRETING THE CONTINENT'S COLLECTIONS: INTRODUCTION

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According to a recent American Association for the Advancement of Science (AAAS) statement on intellectual property rights, "the scientific community endorses the notion that 'full and open access' means making publicly-generated data available either without charge or for no more than the cost of reproduction and dissemination." (AAAS, 1997) According to this AAAS statement, what does "full and open exchange of science" mean?

1. "In all areas of scientific endeavor, full and open communication is critical to the achievement of research and educational excellence.
2. Without affordable data sharing, the peer review and experimental replication science needs for quality control would be seriously curtailed.
3. Without affordable data sharing, the scientific community would be hampered in providing proper education in research methods.
4. Without affordable data sharing, scientists would be restricted in their ability to pursue large-scale, interdisciplinary, collaborative efforts needed in many of today's complex research programs.
5. Without affordable data sharing, public access to scientific data would be restricted."

On the other hand, to quote an American University professor, "we need to figure out how the world changes when information becomes one of the most important forms of wealth and power" (Boyle, 1996). One effect is that intellectual property rights become very important, and now "governments are granting monopolies over information and information products that make the monopolies of the 19th century robber barons look like penny-ante operations." His essay concludes: "Right now, the ground rules of the information society are being laid down by lawyers (strike one) employed by the biggest players in the field (strike two), all with little public debate or press scrutiny. This is bad politics in the thrall of worse economics. We need a politics and a press of the information age. Access to dirty pictures will be little consolation, and speech anything but free, if we let this moment escape our grasp."

As Information Specialists, we observe that the "Information Age" is an environment of tensions: "access versus ownership;" "print and/or paper;" or "open exchange of information" in contrast with "information as a form of wealth and power." How will these and other factors shape and constrain future access to Earth Sciences Information? What effects will policy changes, budget constraints, revisions in agency/survey mandates, electronic publishing, journal cancellations, and staffing shortages have on the information available to earth scientists? What kinds of information might not be available? What steps have been taken or should we be taking to ensure information availability? What can we learn from each other? Are the impacts of technology the same for Earth Sciences literature as for other science and engineering disciplines?

The mission of an earth sciences information center used to be defined as acquiring earth sciences information, preserving that information for future users, and providing access to that information as it was needed. Has the mission changed as the technology available has changed?

Fifteen to twenty-five years ago, we subscribed to serial titles, bought books, and managed collection, staff, and facilities budgets. Once the materials were purchased, they were cataloged and shelved. From our current perspective that now seems relative simple. However, we tend to forget the more difficult parts. Use of indexes was laborious, access to those indexes was often via just first author, first title word, etc. After locating the important reference, if we didn't own the piece, finding and acquiring the item was slow and hit or miss. Geoscience Information Society Proceedings from the 1980's contain papers describing various cooperative projects in which members were engaged, since, even then, few libraries were able to acquire all of the relevant publications (Derksen, 1994). It was, even then, a question of what things should we acquire, which things try to get on demand. Preservation of materials was then a serious concern as well.

We are now in the "information age." What does that mean for us, as earth sciences librarians or as geoscientists, in terms of that mission to provide access to earth sciences information? It can still be defined as acquiring appropriate information, preserving that information for future users, and providing access to information as it is needed. However, technological, discipline, and legal changes have modified what we acquire, how materials can or should be

preserved, what is legal for us and for our user community to do, and how needed information can be accessed.

Earth scientists have always required information in varied formats: maps, well logs, documents, reports, to name a few. The providers or publishers of that information have always been widespread: national government agencies, local societies, universities. The electronic environment will only serve to increase the number and variety of sources and formats of earth sciences information. Are there special areas of concerns or steps particularly relevant to Earth Sciences that we need to be taking? The papers in this volume seek to address several of the issues and/or steps being taken by those of us in the Geoscience Information Society:

1. What kinds of information are geoscientists needing to use? That is, what kinds of information are we needing to provide access/acquire/preserve?
2. What are the aspects of intellectual property questions as they impact geoscientists and geoscience information collections and use?
3. What is actually happening to the collections?
4. What are some of the steps being taken by universities and, particularly by surveys, to continue to provide access to Earth Sciences information?
5. What are the many and varied steps being taken by the GIS members to preserve these materials?

INFORMATION ACCESS

A recent study of science and engineering collections in ten Association of Research Libraries (ARL) determined that "regardless of discipline, libraries are losing strength in their serial collections overall and that all disciplines have been and continue to be subjected to cancellations." (Chrzastowski, 1997) According to this same study – based on data from Faxon – over a three year period the number of Earth Sciences journal subscriptions decreased 14 %, while, during that same time period, the same amount of money was spent on subscriptions. Faxon typically supplies domestic (e.g. US published) titles, which are more likely to be commonly held titles; thus a study of titles supplied by vendors of foreign publications or of titles not typically supplied by vendors, such as regional geological society publications, might reveal even greater decreases. Two points made by Chrzastowski are:

1. "That while we have been 'thinking globally' in our attempts to initiate cooperative collection development, we are definitely 'acting locally' when implementing deselection decisions, the result being duplicative, aggregate science serial subscriptions.
2. When many libraries cancel peripheral journals, those journals needed only occasionally (and which libraries plan to access, not own) become available only through expensive document delivery suppliers, or cease to exist due to lack of subscribers."

The consequences of these trends for earth scientists are that either some serials will not be available in any kind of timely fashion (not to mention immediately or free) or Earth Sciences Librarians will need to take steps to ensure acquisition and preservation of the appropriate titles. Read Lisa Lamb's paper for a geologist's view on how important some of these titles might be for researchers. Michael Noga's paper examines the current state of Earth Sciences collections, with regard to some of these so-called "non-main stream" titles. Linda Musser's paper examines a particular type of material that is in danger of getting lost. The Soller and the Sorensen papers each outline ways surveys are providing broader access to earth sciences information in new and exciting ways. Consortial agreements among universities are described by Joni Lerud. The Collection Development Forum entry summarizes some of the valuable fiscal information provided by the committee for the use of the members, as well as the illuminating debate on these critical topics.

Databases and Search Engines

We've seen a proliferation of databases over the past several years; more recently there has been a proliferation of access mechanisms, particularly for the major database players. Although web search engines continue to proliferate, they don't yet provide the refined search techniques of the professional-level databases. Adonna Fleming's report on the Digital Database Forum summarizes presentations on some relevant Canadian web-based databases available, as well as an electronic-only Paleontology journal. At the GeoRef User's Group, Nancy Blair presented a useful comparison of GeoRef vendors, as well as a contrast of subject retrieval results from GeoRef and other relevant databases. Sharon Tahirkheli's report on the status of GeoRef shows it to be expanding and modifying its coverage, consistent with the needs of the discipline.

Other Access Issues

Linda Newman's paper describes how the new facility at University of Nevada-Reno has been designed to keep pace with the changing information formats. Julie Hallmark examines how users are making use of electronic access.

PRESERVATION AND ARCHIVING

Preservation and archiving of Earth Sciences information has been and will continue to be an ever more critical area for us, one where we, as GIS members, can effectively work together. It is not economically realistic to

rely on the publishers of the commercial materials to archive materials any longer than it is fiscally beneficial for them to do so. Indeed, John Tagler, writing on possible access scenarios to electronic journals available via ScienceDirect, indicated that subscribers would have purchased access to the "current year plus 2 previous years, while all users would pay something for access to older material." The active database "would likely contain 10 years' worth of data" (Tagler, 1998). We should, however, be working together with society, university, and agency publishers to preserve and archive materials published by them, as well as materials central to the performance of their missions. Janice Sorensen's paper also outlines some of these steps. The GIS Preservation Forum proceedings reviews processes being taken by committee members to preserve and archive materials significant for their particular clientele. Lisa Wishard's poster session presents some broader preservation concerns and Pauline Kamel's paper details the multiple aspects of a large preservation project.

Even if the library, the institution, or the agency has purchased and has legal access to older electronic materials, there is no guarantee that those materials will be technologically accessible. The advent of digital information, although heralded by many as leading to the end of libraries as we know them, does not promise permanent, or even long-term access (Crawford, 1999).

INTELLECTUAL PROPERTY QUESTIONS

David Applegate has outlined for us the legal questions and policy developments. Jim O'Donnell and Rebecca Wesley have addressed changes in the law as it pertains to individual researchers and teachers.

CONCLUSION

The proceedings volume closes with an interesting and thought-provoking paper by GIS Fellow Ma. Arlene Marzo.

Scattered throughout this volume are illustrations from several different sources: a thesis, a University press journal, a society journal, a conference proceedings (which is also a provincial survey publication), and a national geological survey publication (which just happens to be also a folded map housed in the pocket of the book). These illustrations and their source publications were carefully chosen because they all are a) illustrations of the geology of the area near Toronto, b) examples of preservation issues of various kinds, and c) examples of the so-called "non-mainstream" publications, of the types that are so heavily used by Earth Scientists. These are the kinds of publications that will require even more effort on the part of library staff to acquire, are not consistently indexed by some of the big indexing services, are not moving through the e-journal route/consortial route, and may, for all of these reasons, become more difficult to keep tabs on, in the years ahead.

Accreting the Continent's collections? What do we mean? Accretion is defined as "the process whereby small particles and gases in the solar nebula came together to form larger bodies, eventually of planetary size." In sedimentary terms a concretion can be defined as "one that grows from the center outward in a regular manner by successive additions of material." Further, "accretionary" is defined by Bates as "tending to increase by external addition or accumulation..." (Jackson, 1997). In library terms, accretion of an Earth Sciences library's collection then would be another way to describe the development and preservation of that collection, bit by little bit: one journal issue, one book, one map, one disk, one file at a time. The sum, therefore, of the Earth Sciences libraries' collections on a continent would equal the concretion of a continent's collections. I submit that it is in the collective accreting of these materials, in whatever format, from whatever venue, that we will consistently be able to provide access to Earth Sciences Information.

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INFORMATION NEEDS OF THE GEOSCIENTIST

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Abstract--Perhaps more than any other scientific discipline, the earth sciences require an extremely diverse array of material, including books, reports, journals, government documents, maps and other types of data from every country in the world. Although electronic formats provide valuable benefits, the most important factor remains the ability to obtain the widest range of material.

First, there is a need for geographic diversity. Geoscientists study problems and regions in every area of the globe. Many areas are remote, are within countries that are poorly accessible due to political reasons, or are regions that have been studied by few researchers. In these instances, the only available information may come from relatively obscure foreign sources. This material may be crucial not only for those studying the area directly, but also for scientists requiring analogs from around the world or looking for global correlations. Thus, it is important to have access to material published from all countries.

Second, the geosciences rely on information published in a variety of formats. Maps, well-logs, reflection seismic profiles, satellite images and panoramic photographs are some of the types of data that are crucial to both research and education in the earth sciences. Although at times this type of information can be effectively studied and manipulated on a computer, it is also necessary to display and view it in its entirety on paper. This is the only way to observe key large-scale features and broad areal trends of detailed data.

Finally, knowing what is available and how to locate it is also imperative. For this reason, it is critical to have easy access to electronic search vehicles, such as GeoRef and Science Citation Index, as well as trained geoscience library staff who understand the diversity of earth science material and how to obtain it.

INTRODUCTION

In order to set the stage for the following papers in this volume which discuss current geoscience information issues and challenges, I discuss geoscience information needs from the perspective of a geoscientist. First, I discuss the variety of materials and resources I used for my thesis research and am currently using for other projects. Second, I present what I think makes the earth science discipline unique compared to other disciplines when it comes to information needs. Finally, I present what other earth scientists perceive as their information needs.

AN EXAMPLE OF MATERIALS USED BY A GEOSCIENTIST...

In this section, I mainly discuss materials I used during my Ph.D. thesis research. I also mention my recent and current work and the resources I've used for these projects. Before I discuss specific resources I used, however, I briefly summarize my project in order to demonstrate why I needed resources from such a wide range of subject areas.

My thesis research involved studying 250-450 million year old rocks in southern Mongolia (Lamb, 1998; Lamb and Badarch, 1997; Lamb and Cox, 1998). The goal of my project was to address key questions about the sedimentation and tectonics of this area during the Paleozoic and their relationship to the larger questions about the geology of Asia. Geologists agree that the Asian continent has grown throughout the Phanerozoic through the development and amalgamation of continental blocks, volcanic arcs and accretionary material and that it is still forming today, with the collision of India and uplift of the Tibetan plateau. Many geoscientists also believe that Asia is the best place to study many of the processes that have formed the earth because it's the youngest continent and many of the rock sequences that record these processes are still preserved. Due to political and geographic access issues, however, many regions of Asia are poorly studied. This is especially true for southern Mongolia, which is one of the most remote regions of Asia and yet, by virtue of it's location in the middle of the complicated geology of Central Asia, is an area that holds the clues to a key part of the geologic history of Asia.

Before I went to Mongolia, I completed a literature search and found several papers that discussed southern

Mongolia. Most of these were written by participants of the Joint Soviet-Mongolian Geological Expeditions who were either paleontologists or mapping geologists. The papers were published in Russian journals, some of which were translated into English. I found a number of existing tectonic interpretations for my area and, although by current standards most of the interpretations were far too detailed for the amount of actual data presented, they were still very helpful. I used these papers to further define my questions and objectives and to plan my field season and determine the most important locations to visit.

When in Mongolia, a large part of my fieldwork involved examining sedimentary rocks, measuring stratigraphic sections and interpreting depositional environments. This included siliciclastic sequences that contained shallow-marine, cross-bedded sandstones; deeper-water, rippled and laminated, thin-bedded, turbiditic sandstones; and slightly metamorphosed, often folded argillitic beds. A number of localities consisted of shallow-marine limestone beds containing bryozoans, corals, brachiopods, gastropods, pelecypods and crinoids. I collected several hundred sandstone samples and then examined thin sections of them under the microscope to determine their composition. I then compared my data to analyzed sandstones of known tectonic settings from previous work.

I also studied a number of volcanic rocks. I performed X-ray fluorescence (XRF) analyses to get the chemical composition of several basalt samples and then compared my data to data from known tectonic settings, similar to the sandstone data. This type of data is presented using a number of different diagrams and for each diagram, I needed to look up the original paper in which it was described to make sure it was appropriate for my rocks. I also radiometrically dated a number of volcanic and plutonic rocks using the Ar-Ar method. One suite of samples I dated came from copper deposits in Mongolia and was part of a project I participated in with a mining company. My thesis results included identifying specific areas of volcanic arc activity at different times during the Devonian through Permian, when southern Mongolia looked something like the South Pacific does today, with active volcanoes, volcanic islands and coral reefs.

As might be expected from a project that involved such a large area and number of topics, a wide range of materials were critical in completing this work. I'll focus on the journals I used, specifically the ones that are referenced in my thesis.

First, I want to point out the journals I used in different subject areas. Table 1 lists the journals that fall within the categories of sedimentary geology, geochemistry and petrography, structural geology and tectonics journals, and mining and ore deposits. Most of the regional geology articles that I needed were in journals from Mongolia and Russia (Table 1), although I also used journals from China and Japan. Although I don't speak the languages of all of these countries and some journals are not translated, they are still very useful: data tables, maps and graphic interpretations often need little or no translation and are very useful.

I also used a number of more widely circulated, general geology journals. To demonstrate this, I compared my referenced journals to the Top 20 most used journals at Stanford University and UCLA (Table 2; Derksen and Noga, 1992). I used more of the Top 20 journals at UCLA than Stanford, 17 compared to 12, and this in part due to the fact that the UCLA library serves a more general geology audience whereas the Stanford School of Earth Sciences has a large petroleum engineering component. Although I used a number of these journals, however, they only comprised about a third of the total number of volumes I used overall (Fig. 1). The less common and more specific journals comprised a majority of my references.

It is also interesting to look at the breakdown of journal use by the country and by type of publisher. Figure 2 shows the countries that published the journals I used. The combined Russia-U.S. category is for Russian journals that are translated and reissued by American companies. Figure 3 shows that most of the journals I used were published by professional societies or government research institutes, the academic organizations of the governments of China, Russia and Mongolia. A few societies are now publishing their journals by using private companies and so that is a separate category.

I also used and referenced a number of books, maps and theses in my thesis. When these are broken down by subject matter, publisher type and country, they show the same diversity as the journals.

Currently, I am working on a project for Conoco, looking at the upper Miocene Stevens sandstones, a subsurface collection of sandstones in southcentral California that has been one of the major oil-producing units in the U.S. in this century. Although an enormous amount of work has been done on this unit, most of it consists of specific articles on specific areas. The goal of the project is to synthesize this literature and compile the first comprehensive description of the unit. For this work, I am using a number of materials including California Division of Oil and Gas reports from the 1930s, 40s, and 50s, and field trip guides published by regional chapters of national societies. The type of data I am examining includes reflection seismic profiles, well-log correlations, and core photos.

I have also used earth science materials for educational purposes. Most recently, I worked with a middle school for

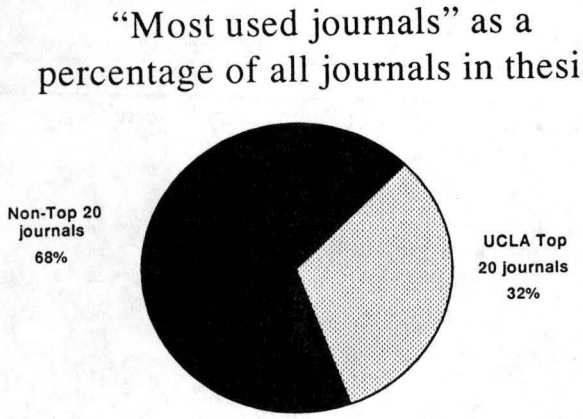
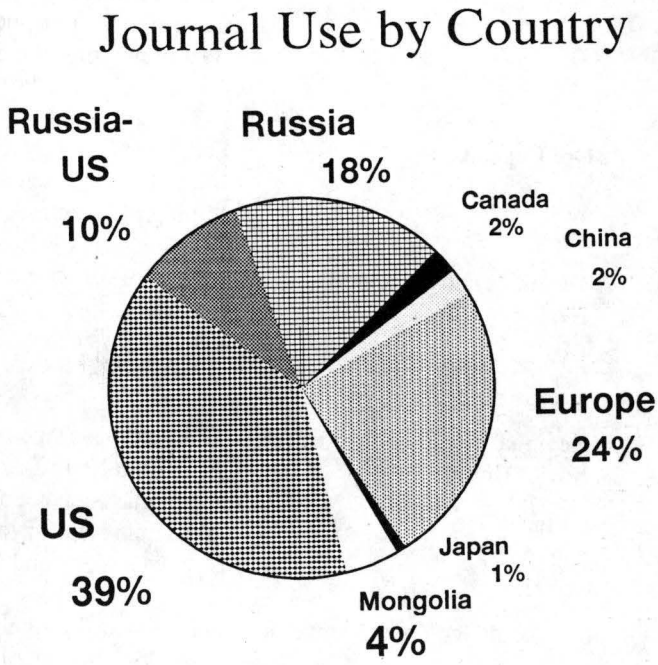


Figure 1. A comparison of journals referenced in Lamb (1998) to UCLA's Top 20 list (Derksen and Noga, 1992).

Figure 2. A breakdown of journals referenced in Lamb (1998) by the country in which they are published.



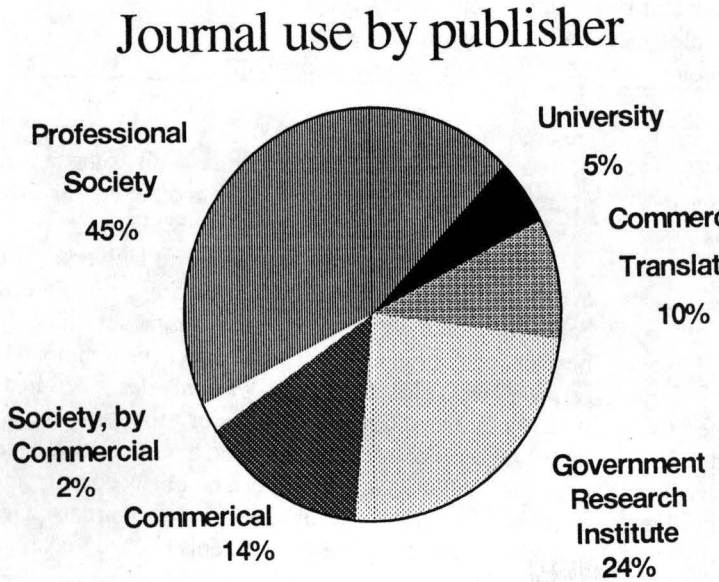


Figure 3. A breakdown of journals referenced in Lamb (1998) by the type of publisher.

Table 1. Journals Cited in Thesis by Subject Area

Subject Area	Journals Used
Sedimentary Geology	Journal of Sedimentary Petrology (now Journal of Sedimentary Research) Marine and Petroleum Geology Sedimentary Geology Sedimentology American Association of Petroleum Geologists Bulletin
Geochemistry and Petrology	Journal of Petrology Petrology Chemical Geology Contributions in Minerology and Petrology Geochimica et Cosmochimica Acta Mineralogica et petrographica acta
Ore Deposits	Economic Geology Journal of Geochemical Exploration Mining Magazine
Tectonics and Structural Geology	Journal of Structural Geology Tectonics Tectonophysics Geotectonics
Regional Geology: former Soviet Union	Transactions of the Institute of Geology and Geophysics Akademia Nauk Doklady Akademia Nauk Geological Institute Transactions Akademia Nauk Izvestiia Geology Series Soviet Geology and Geophysics
Regional Geology: Mongolia	Joint Soviet-Mongolian Paleontological Expeditions Transactions Joint Soviet-Mongolian Scientific Research and Geologic Expeditions Transactions Mongolian Technical University Scientific Transactions Problems of Geology and Paleontology in Mongolia Problems of Geology and Mineral Resources in Mongolia

girls, helping to develop an outdoor science project where the students would collect and analyze data at a natural preserve for use by a local environmental organization and the city of Palo Alto. The types of data needed for this project include geologic and topographic maps and aerial photographs.

THE OPINIONS OF ONE GEOSCIENTIST...

Geoscientists need materials, both common and obscure, from all over the world. They also need materials that come in a variety of formats, many of which need to be available in their hard-copy form. Finally, geoscientists need ways to access this material. Although this last need is one shared by all disciplines, the first two are needs which are unique to the earth sciences.

Geoscientists working abroad, as well as those working in the U.S., often need materials from other countries. As an example, I used maps of Mongolia which were published in Russia and available through Stanford University, but not available within Mongolia itself. Another example is a colleague of mine who worked in Arizona but found that the best analog for his research area came from a mine in the former Czechoslovakia, which was only described in a not widely-circulated Czech journal. For geoscientists trying to understand processes, there is often a need to look at several examples and those examples can be in any country and described in any number of lesser-known journals. Geoscientists often use large-format items to observe key

Table 2. Journals Cited in Thesis Compared to Most Used Journals

Stanford's Top 20 most used journals:	UCLA's Top 20 most used journals:
Journal of Geophysical Research	Journal of Geophysical Research
Nature	Nature
Oil and Gas Journal	Science
Earth and Planetary Science Letters	Geological Society of America Bulletin
Geochimica et Cosmochimica Acta	American Association of Petroleum Geologists Bulletin
Contributions to Mineralogy and Petrology	USGS Professional Paper
Science	Geochimica et Cosmochimica Acta
World Oil	American Journal of Science
Tectonophysics	Earth and Planetary Science Letters
Geological Society of America Bulletin	Scientific American
American Journal of Science	Contributions to Mineralogy and Petrology
Geophysical Journal	Canadian Journal of Earth Science
American Mineralogist	Geology
Geology	Geophysical Journal International
Seismological Society of America Bulletin	Geophysical Research Letters
SPE Formation Evaluation	Physics of the Earth and Planetary Interiors
Geophysics	Journal of Geology
Chemical Geology and Isotope Geoscience	Tectonophysics
American Association of Petroleum Geologists Bull.	Icarus
Water Resources Research	Economic Geology

Note: Journals used are shown in black, those not used are dark grey. Rankings from Derksen and Noga (1992).

Table 3. Use of Library Resources by Geoscientists

How many geoscientists said they use the following resources on a daily or weekly basis?	
Electronic indices and abstracts	81%
Printed indices and abstracts	18%
Printed journals published before 1990	74%
Electronic networked journals	8%

Table 4. Importance of Library Resources to Geoscientists

How many geoscientists said the following resources are important to them?	
Printed library resources	100%
Reference services	93%
Interlibrary loans	85%
Networked indices and abstracts	77%
Networked full-text journals	52%

Table 5. Priorities of Geoscientists

If limited funds prevent full subscriptions to both printed and electronic journals, which scenarios are most acceptable?	
Create an all electronic library with no print equivalents...	17%
Cancel less used publications to pay for electronic and printed versions of heavily used titles...	29%
Continue printed subscriptions and provide electronic access only as funds are available...	71%

large-scale features and broad areal trends of detailed data. Geology offices are often wall-papered with mosaics of geologic maps pinned together to display their research area. This is the best, and often only, way to study a number of features. Maps, well-logs, reflection seismic profiles, satellite images and panoramic photographs are all examples of data that are often processed or examined in digital form but also require a printed format.

As with other scientists, geoscientists need help in locating and obtaining these materials. Search engines and electronic indexes are excellent tools but they cannot replace skilled reference staff who are trained in the earth sciences. It's also important to continue to have an efficient interlibrary loan system. I once used a paper that was about Silurian rocks of southern Mongolia, written by a Russian paleontologist, translated for the Calgary Institute of Sedimentary and Petroleum Geology and then obtained by Stanford University through interlibrary loan. This example illustrates the importance of the concept of a continental collection. What's most important is not immediate or high-tech access to materials but to have the widest range of materials available in some way.

THE OPINIONS OF OTHER GEOSCIENTISTS...

In this final section, I present results from a survey done at Stanford University in the spring of 1998 of science and engineering library users. Of the 835 people who responded from over 18 departments, 62 were affiliated with the geology department and 17 with the geophysics department. I'll present results of those geologists and geophysicists who said they use the library daily.

Table 3 presents the percentage of geoscientists who said they are using various library resources on a daily or weekly basis. Electronic search engines are more popular than printed ones but printed journals are more heavily used than electronic ones. Table 4 shows the percentage of geoscientists who ranked certain resources as important or very important. Using printed materials and being able to find and access these materials received the highest rankings.

The survey also asked the following question: If Stanford cannot provide electronic journals and keep all the current printed subscriptions, which of three scenarios are desirable or very desirable (Table 5)? The preferred course of action is to continue to subscribe to the printed format and provide electronic access only as funds are available.

CONCLUSIONS

The earth sciences require an extremely diverse array of material, from all countries in the world and in all types of formats. New electronic formats have many important uses but cannot completely replace the printed format. The most important need for geoscientists remains the ability to obtain the widest range of material. This includes having effective search tools, qualified staff and reference librarians, and a continental collection that is accessible through interlibrary loans.

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POLICY ISSUES AFFECT ACCESS TO SCIENTIFIC DATA

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Abstract--The digital age has provided scientists with unprecedented capabilities for the production and dissemination of scientific data that form the bedrock of scientific research. However, the digital age has also led to a revolution in commerce, creating entire industries based on electronic data and databases. This article focuses on the policy conflicts that have arisen as a result of commercial sector efforts to maximize intellectual property protections against piracy of their electronic databases, and the scientific community's desire to maintain a legal framework that encourages full and open access to data.

Efforts to establish intellectual property protections unique to databases have been underway both in the United States and internationally for several years. In 1996, the European Union issued a directive establishing such a unique intellectual property protection for databases. Similar legislation has been introduced in the past three Congresses, and a draft treaty developed by the World Intellectual Property Organization in 1996 has yet to be signed.

The database protection issue has yet to be settled in part due to the continued opposition of the scientific community to new forms of protection. With pressure growing for some form of protection, however, the scientific community must develop a clear set of recommendations for future policy that will meet the private sector's need for protection without compromising the needs of scientists for open data sharing.

INTRODUCTION

Most geoscientists recognize that changes in the policies and politics of the federal government can shrink or expand the amount of funds available for research. Geoscientists in the energy and mineral industries are very aware that federal policy dictates their access to public lands and offshore waters for exploration and development. Just so, federal policies can either restrict or encourage the creation, dissemination, and use of the very foundation of research -- scientific data. Science in the United States has flourished in part due to the openness with which scientific data can be obtained, shared, and disseminated. That openness in turn reflects a legal framework in which data are not subject to copyright or other intellectual property protections.

The ability of scientists to produce and share data has undergone a sea change with the coming of the digital age of information technology. International collaboration has been greatly enhanced, and the scope of scientific datasets has grown by orders of magnitude. That same revolution has struck the rest of the world as well, fundamentally changing the nature of publishing and of business as a whole. Indeed, an entire information industry has been created. Where data and databases were once the currency of scientists alone, now electronic data has become quite literally the currency of modern commerce. Such tectonic shifts have placed tremendous stress on the existing legal framework for protecting intellectual property. Copying information has become far easier and can take place on a much larger scale, which means that the potential for data piracy has also experienced a dramatic increase.

This article focuses on how recent efforts by commercial interests to establish greater intellectual property protection for electronic databases have run into opposition from the scientific community, which thrives on the very openness that such policies would limit. In doing so, the article attempts to describe the often tortuous path that efforts to establish new database protection policies have taken over the course of three successive Congresses and multiple international negotiations. Such an objective runs counter to the famous admonition by the nineteenth-century German chancellor Otto von Bismarck that there are two things that people should not see being made: sausages and laws. Nevertheless, exploring the gory details of the policymaking process should provide some insight into scientists' ability to play a role in that process. This issue also demonstrates the limitations on that ability when much more powerful interests are at stake. The treatment here builds on material presented by the author in two earlier columns that appeared in *Geotimes* and *Eos* (Applegate, 1997a; Applegate, 1997b).

THE NATURE OF DATA IN THE DIGITAL AGE

Underpinning all of the discoveries, published papers,applications, and ultimately the societal value of science are the data that form the bedrock of research. Scientists outside the private sector take for granted their ability to share datasets, compare results, and check the data used by others. It is all part of the give and take of science. The value and significance of data are well expressed in a position statement adopted by the American Geophysical Union: "Collection and analysis of Earth and space data are necessary to understand the elements of our natural environment, their interactions, and their changes with time. AGU policy calls for full and open sharing of Earth and space science data for research and education. Such sharing enhances the advance of scientific and technical knowledge for purposes of education, economic advancement, public safety, and national and international security. Since natural phenomena in general do not repeat, Earth and space data should be preserved, documented, and archived for future generations." (AGU, 1997)

Traditionally, geoscience data have been very tangible -- maps, notebooks, rock samples and cores, well logs, and other physical forms. Increasingly, the data used by scientists are produced and stored in electronic form, whether accessed via CD-ROM, computer hard drive, or over the Internet. That in turn has facilitated the rapid dissemination of such data over distributed networks, allowing greater access than ever before -- often in real time -- to the information streaming down from satellites or recorded by seismic monitors or ocean buoys. This communications and technological revolution has also produced databases that are increasingly international, covering vast swaths of the Earth with little regard for political boundaries.

The same explosion in digital information has revolutionized commerce as well, and information has become a very valuable commodity. In the marketplace, the ability to establish proprietary rights over information has become crucial to success in industries such as health care, telecommunications, banking, publishing, and insurance to name only a few. This revolution has fundamentally changed the notion of what constitutes a database. To take just one example, the compact discs and digital video discs produced by the entertainment industry are simply digital databases of music or video. One would expect then that the private sector is eager to see the strongest possible intellectual property rights provided for their proprietary data products.

A BRIEF HISTORY OF COPYRIGHT LAW

The current controversy over what types of information may be protected by intellectual property law is merely the latest round in a long series of debates between those seeking to expand and those seeking to restrict such legal protections. As with most legal issues in the United States, the roots of intellectual property law go back to the Constitution, which in turn reflects a long set of precedents in English law. Article I, Section 8 states that "Congress shall have power...to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." Referred to as the copyright clause, this short passage forms the basis for intellectual property law in the United States. The task of defining what works come under the copyright clause's protection was left to future judges and lawmakers. They are still working on it.

In essence, the debate comes down to what constitutes authorship. One argument holds that effort, or "sweat of the brow," is sufficient to warrant protection. This is known as the "industrious collector" argument after the words of a 1921 ruling by famed federal circuit court judge Learned Hand. The other holds that creativity alone is the crucial test for whether a piece of work or a collection of information rises to the level of authorship and hence protection. Federal courts have ruled in favor of both sides in various cases, creating two lines of precedent with very little guidance from the Supreme Court.

In 1991, the Supreme Court passed down a unanimous opinion in the case of *Feist Publications, Inc. v. Rural Telephone Service Co.* The Court held that a "minimum degree of creativity" was required to meet the constitutional standard for copyright protection. The case involved Feist's attempt to publish a master telephone directory that incorporated the information published in a number of Rural Telephone Service's phonebooks. In the court's view, the simple alphabetization of the white pages in a phone book does not meet the creativity threshold. In contrast, the categorization and design of yellow pages do reach that threshold, and hence yellow pages are subject to copyright protection.

Under the *Feist* interpretation, most scientific databases are -- like the white pages -- simply collections of facts and are not subject to copyright. Taking the case of a journal article, the author's words are subject to copyright protection, but the supporting data are not. Thus, other researchers are free to incorporate that data into their own research and subsequent publication or to use the data to check the accuracy of the original author's results.

Database Protection Gains Momentum in the US and Abroad

The Feist decision sent chills through the private sector at a time when electronic databases were emerging as very big business in many sectors. In response, a movement emerged to establish new intellectual property protections specifically for databases. Separate from copyright, this

unique (or *sui generis*) protection would constitute a major shift in inellectual property law. Copyrights and patents never covered more than a small fraction of the information available in the private sector, nor did they affect information in the public sector at all. Developing a separate protection for databases would potentially bring the vast majority of such information under intellectual property protection. Put simply, the status of databases would shift from unprotected unless proven otherwise to protected unless proven otherwise.

Efforts in the United States mirrored those in other countries, particularly in Europe. The European Union (EU) was the first to adopt *sui generis* database protection as part of a directive to harmonize the intellectual property laws of its member nations. In March of 1996, the European Union issued Directive 96/9/EC on the legal protection of databases. The directive established a protection against copying, adapting, or otherwise making publicly available a "substantial part" of a given commercial database. This protection was provided for a period of 15 years but could be extended for the database as a whole if "substantial new investments" were made in the revision of any part of it. Thus, the 15 year time frame could be extended indefinitely if the database was regularly updated even though the bulk of it might stay the same. Following the precedents of copyright law, the directive provided broad "fair use" exemptions for education and research.

This directive itself did not carry the force of law, but EU countries were given until January 1, 1998 to enact laws consistent with the directive. Once in effect, these laws would only provide protection for databases produced in EU countries and those databases produced in non-EU countries that had similar database protections in place. Because the United States did not have a similar *sui generis* protection for databases, US companies operating in Europe feared that they would be at a competitive disadvantage.

In order to correct the potential reciprocity problem with the EU, the chairman of the House of Representatives Judiciary Committee's Subcommittee on Courts and Intellectual Property, Rep. Carlos Moorhead (R-CA), introduced legislation in May, 1996 to establish a *sui generis* protection for databases in the US. The bill, H.R. 3531, used much of the same language as the EU directive but with narrower exemptions for fair use. It also extended the rolling protection period of the EU directive to 25 years. The bill was actively supported by the Information Industry Association trade group and several major publishers.

At the same time that legislation was being put forward in the United States, the European Union launched an effort to have its database directive accepted into international law by means of a treaty under the auspices of the World Intellectual Property Organization (WIPO), an arm of the United Nations. The United States was represented in the negotiations by the US Patent and Trademark Office, which is part of the Department of Commerce. The US negotiators firmly supported the plan to adopt *sui generis* database protections and proposed much of the language in the draft treaty that emerged in August, 1996. This draft created even stronger *sui generis* protections than had the EU directive and specifically restricted the ability of signatory nations to provide for fair use or other research and education exemptions. A WIPO conference was scheduled for that December to take up the draft database treaty along with two other draft treaties, one on copyright and the other on intellectual property protections for performances and recordings.

Enter the Scientists

All of the developments described above took place with little input from the scientific community either in the United States or in Europe. The tradition of open data exchange and reliance on public sources of support for research both served to insulate scientists from the intellectual property debate as did the remoteness of international and copyright law from the scientific community's sphere of interest. All that changed in late 1996, beginning with concerns raised by the World Meteorological Organization (WMO) over the impact of the EU directive and proposed WIPO treaty for scientific data, specifically meteorological data generated by European meteorological agencies. Recognizing that weather data had considerable value, several European countries were seeking to profit from the data produced by their meteorological agencies. At the same time, these countries were seeking to privatize many governmental functions, including scientific ones, a goal also being championed in the US by the Republican-dominated 104th Congress in the United States. Because climatic modeling requires data from all parts of the globe, this shift toward commercialization of weather data combined with the new intellectual property protections for such data caused the WMO to develop its position in opposition. With the EU directive already in place, attention shifted to the draft WIPO treaty.

The opening salvo for the US scientific community was a joint letter in October, 1996 from the three presidents of the National Academies of Science and Engineering and the Institute of Medicine to Secretary of Commerce Mickey Kantor. The academy presidents urged Kantor to slow down the WIPO process. In their letter, they argued that the treaty would "significantly inhibit researchers seeking to reuse and combine data for publication or for research." Pointing out that the full ramifications of the treaty for the scientific community were not yet known, the presidents urged the US to delay consideration of the treaty until after the upcoming WIPO conference (Alberts, 1996).

The academy presidents based their letter on a National Research Council study that had been underway for three years on the flow of scientific data across international borders. The study's final report, entitled *Bits of Power: Issues in Global Access to Scientific Data*, was released the following April. It was sharply critical of the proposed legal changes, referring to them as "precipitous and radical." The report suggested that improved encryption methods were a better solution to piracy problems associated with electronic databases than establishing new forms of intellectual property protection. The report found no evidence of any commercial harm resulting from current copyright protections, and it endorsed a policy of full and open access for data collected with public funds (National Research Council, 1997).

The report also addressed one of the principal underlying issues bringing scientific databases into conflict with commercial considerations -- the global trend toward privatizing and outsourcing the collection and distribution of scientific data as part of the downsizing of government. Although the goal of such privatization is greater efficiency, the report warned that there was an offsetting consideration, namely the sense that scientific data and understanding represent a public good. The report also argued that scientific databases often represented a narrow market with high acquisition costs, a combination that did not lend itself to the efficiencies gained from free-market competition. Instead, such a market would lend itself to single vendors with the potential for monopoly pricing. As a cautionary tale, the report described the effects of Landsat satellite data privatization in the 1970's. After the government gave a private company all rights to Landsat images, the prices skyrocketed by over an order of magnitude. Whereas the government had sought only to cover its marginal costs, the private company sought to recoup its entire investment plus profit. The substantially higher costs had a long-term chilling effect on the use of Landsat data by researchers and educators.

The Academy letter was closely followed by letters to Kantor, Vice President Gore, and the President's science advisor Jack Gibbons from many scientific societies led by the American Association for the Advancement of Science. In a November, 1996 letter to Gibbons, AGI then-President Edward C. Roy provided a geoscience perspective: "At a time of rapid globalization for scientific research, this treaty could have a chilling effect on data-sharing that is at the very heart of international scientific collaboration." He cited the data-sharing associated with the global seismographic network as an example of an international database that could be jeopardized by the draft treaty's provisions (Roy, 1996).

Based on the objections raised by the scientific community, the White House Office of Science and Technology Policy joined by federal science agencies succeeded in convincing the President's National Economic Council to support a delay in consideration of the treaty. As a result, the chief US negotiator went to Geneva to argue against adoption of a treaty that he had crafted. Most third-world countries also opposed the database treaty, because it could potentially limit their ability to obtain critical meteorological data. The other two treaties under consideration were signed, but the conference ended without considering the draft database treaty, which was left for a subsequent conference.

Legislation in the 105th Congress

By the end of 1996, the WIPO treaty had been successfully derailed. The 104th Congress ended without any progress having been made on the Moorhead legislation and with Moorhead himself having retired. The EU directive was still in place, however, and the American information industry wanted more than ever to establish federal database protections in the US that would meet the EU threshold for reciprocity.

As the 105th Congress convened early in 1997, the chairmanship of the House Subcommittee on Courts and Intellectual Property passed to Rep. Howard Coble (R-NC) who promptly announced that he would work to develop a revised version of Moorhead's bill taking into consideration the concerns raised by the scientific community. He also was aware of legal concerns about the constitutionality of the *sui generis* database protection given that it ran counter to the *Feist* decision's limitation of intellectual property protection under the copyright clause to those databases (such as the yellow pages) that met a threshold of creativity.

In October, 1997, Coble introduced his bill, H.R. 2652, the Collections of Information Antipiracy Act. The new bill retained much of the language of the EU directive and Moorhead's bill. Like that earlier bill, it was designed to meet the threshold for EU reciprocity. The principal difference was that it provided protection for databases without actually establishing a new intellectual property right, thus avoiding a constitutional challenge. The bill did so by prohibiting the extraction or use in commerce of a substantial part of a database *in a manner that could cause harm to the actual or potential market* for any products and services that incorporate that database. By focusing on market harm rather than protection of the database as such, the bill relied on the congressional authority to regulate interstate commerce under the Constitution's commerce clause, thus circumventing the copyright clause altogether.

Coble claimed that his bill addressed the scientific community's concerns with its exemption for "not-for-profit educational, scientific, or research purposes." In addition, the bill's provisions specifically did not apply to databases produced by the government or its contractors, a key

concern with the EU directive. Scientists were quick to point out, however, that the non-profit exemption only applies if the use is "in a manner that does not harm the actual or potential market for the product or service." For many scientific databases, academic and government researchers might well be the principal market. The researchers could then be subject to the bill's enforcement mechanisms including impoundment of equipment and civil and criminal penalties, the last of those not to exceed $500,000 and five years in prison. The bill was also criticized for lacking clear definitions of what constituted a "substantial" part of a database or indeed what constituted data.

In an effort to address some of these concerns, the bill was amended before being passed by Coble's subcommittee. The amendments added definitions and included a provision giving judges discretion to reduce or eliminate entirely any civil penalties "if the defendant was an employee or agent of a nonprofit educational, scientific, or research institution, library, or archives acting within the scope of his or her employment." Another amendment stated that criminal penalties would not apply to those same individuals. Although these amendments addressed some of the concerns of the scientific community, enough concern remained such that most scientific organizations remained opposed to Coble's bill.

That opposition did little to slow the bill's passage through the House Judiciary Committee and subsequently the full House of Representatives in May, 1998. It was then sent to the Senate where, two months later, an identical bill was introduced by Sen. Rod Grams (R-MN). Both bills were referred to the Senate Judiciary Committee, chaired by Sen. Orrin Hatch (R-UT), who scheduled a hearing but then cancelled it as the committee's attention was increasingly drawn to the ongoing impeachment process.

In addition to having to compete with more pressing issues, the bill also faced opposition from the Clinton Administration as stated in an August, 1998 letter from the Department of Commerce general counsel's office to Sen. Patrick Leahy (D-VT), ranking minority member on the Senate Judiciary Committee. The letter stated that in principle the Administration favored a change in the law to protect commercial database developers from commercial misappropriation. It then goes on to oppose H.R. 2652 on several grounds. One of the concerns raised was that the provision exempting government funded databases did not cover the many different cooperative arrangements under which government-funded databases are developed and distributed, thus potentially creating "incentives to 'capture' government information or government-funded data." The letter also emphasized that any legislation should seek to minimize effects on non-commercial research.

Separately, a Justice Department memorandum to the White House Counsel in July, 1998 raised questions about the constitutionality of H.R. 2652, arguing that the use of the commerce clause was not appropriate given that the subject is specifically covered by the copyright clause. The memo also raised First Amendment concerns. Thus, even were the legislation to pass, it would likely have faced stiff challenges in federal court.

With little sign of movement in the Senate, proponents of H.R. 2652 decided to try a different approach to get the bill enacted into law. At the same time that H.R. 2652 was making its way through the legislative mill, so was another bill -- H.R. 2281, the Digital Millennium Copyright Act -- implementing the two other treaties passed by WIPO in December, 1997. The House was poised to pass H.R. 2281, and the Senate had already passed its version of the bill (S. 2037). Because H.R. 2281 also fell under Rep. Coble's subcommittee jurisdiction, he was not only its chief sponsor but was also in charge of steering it through the House debate. In the process of doing so, he successfully convinced his colleagues to adopt an amendment adding the provisions of H.R. 2652 to H.R. 2281. The latter bill was then passed by the House. Since the Senate had already passed its version, and the two versions were different, a conference was held between the two houses to develop a final bill. If the House managers, led by Coble, could get the Senate to agree to their version, then the database protection provisions would go to the President as part of a larger bill that had the enthusiastic support of the entertainment industry, including some of Clinton's biggest contributors.

The principal obstacle to achieving that goal was getting the Senate to agree to the House version. Doing so would deny the Senate Judiciary Committee the opportunity to hold hearings and debate the database measure on its own, an opportunity that Sen. Hatch intended to have. Consequently, the Senate refused to accept the House version, and Coble did not press the case. The Digital Millennium Copyright Act -- without the database language -- was duly passed by both chambers and signed by President Clinton on October 28, 1998 becoming Public Law: 105-304. At the end of the session, H.R. 2652 died.

WHAT HAPPENS NEXT?

Three years after the database protection issue became a topic of concern for the scientific community, the issue is still unresolved. At the start of the 106th Congress in January, 1999, Rep. Coble introduced H.R. 354, which is identical to the House-passed version of H.R. 2652. As is often the case for legislation that fails to achieve enactment into law, the process begins in the next Congress where it left off in the previous one. After making a number of modifications sought by the publishing industry, H.R. 354 was passed by the House Judiciary Committee in May, 1999

and now awaits consideration by the full House of Representatives.

The pressure to pass database legislation in some form is greater than ever. The scientific community's success in delaying action pending further discussion will soon have to give way to development of a clear set of recommendations on how legislation can be crafted that will provide adequate protection for the private sector -- so that companies will be encouraged to invest and disseminate information -- without compromising the scientific community's need for open data sharing.

In order to develop such recommendations, a committee of the National Research Council is examining technical, legal, and policy options that would provide access to scientific data and still protect the rights of database owners (Maurer, 1999). The committee is comprised of representatives from government, the research community, and the information industry. Its final report is scheduled for release in the fall of 1999.

In the meantime, a very different approach to database protection has been proposed in legislation introduced by the chairman of the House Commerce Committee, Rep. Thomas Bliley (R-VA). Opponents of the Coble bill have embraced H.R. 1858, the Consumer and Investor Access to Information Act of 1999, which is co-sponsored by the Commerce Committee's ranking Democrat, Rep. John Dingell (D-MI), and most of the committee's senior members. Crafted to ensure that it would fall within the Commerce Committee's jurisdiction (rather than that of the Judiciary Committee), H.R. 1858 focuses on promoting electronic commerce rather than on intellectual property. It achieves much the same goal as H.R. 354, however, by prohibiting the sale or distribution of a "duplicate" database to compete with an original database, where a duplicate database is defined as being "substantially the same as" the original from which it has extracted information. Thus, duplication is allowed so long as it is not with the intent to compete commercially with the owner of the original database (Folger, 1999). Unlike the Coble bill, H.R. 1858 does not establish criminal penalties, leaving enforcement of its provisions exclusively to the Federal Trade Commission using that agency's authority to curb unfair or deceptive practices.

Both H.R. 354 and H.R. 1858 face considerable obstacles to passage, not the least of which is inaction on the part of the Senate. Although Sen. Haltch had promised a quick hearing on his own database protection bill, he had yet to hold a hearing or introduce a bill by mid-summer, 1999. Any bill must also garner the Clinton Administration's support, which is not yet forthcoming.

Even though much more powerful interests than the scientific community are involved in this issue, the scientists have an advantage in the Constitution's establishment of intellectual property protection " to encourage science and the useful arts." Whatever laws get enacted will ultimately be judged against that standard. The constitutional encouragement of science has proven to be well warranted. A substantial portion of the tremendous economic growth of the last fifty years is attributed to technological advances that in turn came from fundamental scientific research. Future technological and economic growth, including the continued prosperity of the very industries that seek greater database protection, depends on a vibrant scientific enterprise. Scientists have a strong case to make, but they need to take that case to policymakers if full and open access to scientific data is to thrive in a digital world.

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COPYRIGHT FOR GEOSCIENTISTS: WHAT YOU NEED TO KNOW

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Abstract--Every day we make assumptions and decisions based on our understanding of copyright law. Questions arise: Can I put this article I wrote in a collection of photocopies for my students? Is it okay to scan this map and put the image on my web site? How about downloading this image for inclusion in my homepage? Is it okay to copy this book? How about this article in *Nature*? Librarians, as protectors of copyright, have developed some expertise in answering questions like these for geoscientists. This paper presents useful copyright information -- not legal advice -- that will help in daily decision-making for the practicing geoscientist. Among the topics discussed are: What is the concept of "fair use" and how is it interpreted? What are the four factors to consider when deciding if use of a work is "fair"? and What's the difference between owning a copyright and controlling it? In many cases the answers to these questions depend upon the scientist's institution or company, and who he or she is. A better understanding of copyright law will assist both geoscientists and librarians to make good faith decisions regarding intellectual property in print or electronic form.

INTRODUCTION

United States intellectual property law encom-passes copyright, patent, trademark, trade secret, contract law, and unfair competition. If this wasn't confusing enough, international agreements such as the Berne Convention, the Uruguay Round and the Univer-sal Copyright Convention may need to be considered when trying to decide infringement. In addition, the recently-passed Digital Millennium Copyright Act of 1998 certainly must figure into the equation, although exactly how is anyone's guess at this point. Today we will have only a few minutes to cover a few copyright concepts important for geoscientists. At the end, we will give you a URL to go to for more information.

The Random House Dictionary (1987) defines copyright as "the exclusive right to make copies, license, and otherwise exploit a literary, musical, or artistic work". The U.S. Constitution authorized Congress "To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries", which led to the development of a national copyright system.

According to *Britannica Online*, "Historically copyrights grew out of the same system as royal patent grants, by which certain authors and printers were given the exclusive right to publish books and other materials. The purpose of such grants was not to protect authors' or publishers' rights but to raise government revenue and to give governing authorities control over publication contents."

The Berne Convention, adopted by 14 original member states in 1886, provides that each of the contracting countries provide automatic protection for works in the other countries of the union and for unpublished works whose authors are citizens of or residents in such other countries. For more than 100 years, the United States resisted adopting these provisions, but in 1988 the United States approved membership in the Berne Union, effective in 1989. Again from the *Britannica Online*, "United States Copyright Law nonetheless continues to differ somewhat from the general laws of other member countries. One major difference is in the treatment of 'moral rights', which includes the right of an author to preserve his or her work from any alteration. The Berne Convention recognizes such 'right of integrity', while U.S. copyright law does not."

U.S. copyright law protects only the expression of the idea, not the idea itself. An original work is copyrighted as soon as it is created and fixed in any tangible medium, including a hard drive or floppy disk. A copyright lasts for

fifty years beyond the life of the author, after which it is in the public domain. If there are two or more authors, the copyright lasts for fifty years from the death of the last surviving author. For works created before January 1, 1978, a less protective law allowed for copyright to be registered for 27 years with a renewal available for an additional 27. This led to occasional situations where copyright expired before the author did. No copyright notice is required to claim copyright, but if one wants to sue for infringement, the work must be registered with the U.S. Copyright Office.

"Public domain" is an interesting concept and often misunderstood. A work in the public domain can be used by anyone for any purpose: there are no restrictions. Most people think of something being in the public domain if the author has been deceased for a long time, for instance, Darwin's *The Origin of Species*, or Lyell's *Principles of Geology*. Indeed, for works published before 1978, anything was guaranteed to be in the public domain if it had been published 54 years ago.

However, a copyright holder can place a work in the public domain by putting a notice to that effect on the piece. Once this is done, the copyright is forfeited and can never be regained. In the public domain, the work can be altered, charged for, or used as-is *by anyone*. While some authors may be interested in granting non-exclusive rights to others to freely use their works, by and large, authors probably want to retain the copyright. Thus their material will not be placed in the public domain.

To reiterate a couple of points: if a work, either on paper or in electronic form, does not have a copyright notice and does not indicate it is in the public domain, *assume the work is copyrighted.* If one wants to reproduce, use, or share the work, some consideration should be made of whether such use might be an infringement.

FAIR USE

"Fair Use" tries to balance the exclusive rights of the copyright holder with the public's ability to further the state of society through these creations. Essentially, if one wants to use a work suspected of being protected by copyright there are two choices: One is to write to the copyright holder requesting permission to use the work; the other is to consider the use "fair".

What Is "Fair Use"?

There are four factors to consider to determine fair use:

- the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
- the nature of the copyrighted work;the amount and substantiality of the portion used in relation to the copyrighted work as a whole;
- the effect of the copying upon the potential market for or value of the copyrighted work.

We'll consider each of these four factors. As with most copyright questions, these examples are the extremes and many questions lie in between.

The Purpose and Character of the Use

A user wants to create and enhance a digital map by scanning the page and altering it with some software to produce camera-ready copy for a book. This probably is not fair use, since the purpose of the use is commercial, to create a book which will be sold. Using a piece of copyrighted software to produce an original map is fine: the software was published for that purpose. And, if the user wants to take that same altered digital map and use it in a non-profit school project then it is more likely to be considered fair use.

Another example: Can I scan this map (or photo) and put the image on my web site? Probably not, unless (and we've already talked about the rarity of this) the item has been specifically placed in the public domain.

This example also relates to the next consideration.

The Nature of the Copyrighted Work

If the work is factual in nature, use of it is more likely to be fair. Copyright doesn't cover the facts themselves. If the work is fictional, it is more expressive and use of it is less likely to be fair. One other factor to consider is whether the work has been published or not. Use of unpublished works is *more* likely to be an infringement than use of a published work. This may seem counterintuitive at first, but consider the rights of the copyright holder to have control of the first publication or to decide not to publish.

Putting a scanned image on your web site is almost always a potential violation of copyright law, unless you create the image yourself.

The Amount and Substantiality of the Portion Used in Relation to the Copyrighted Work as a Whole

Essentially, this means that the larger the portion of the copyrighted work taken the less likely that the use is fair. The courts also look at which portion of the work is used. "Even if only a small portion of the work is used, if that portion is 'qualitatively substantial', e.g., if the portion used is essentially the heart of the work, that use will be deemed to have been 'substantial', and could go against a finding of fair use" (Carroll).

So, the answer to the question, "Can I put this article I wrote in a collection of photocopies for my students?" is not "Yes" or "No", but "Who owns the copyright?" If you published it in a journal that required you to relinquish

copyright, the answer is almost certainly, "No." If you haven't signed away copyright, you're probably okay

The Effect of the Copying upon the Potential Market for or Value of the Copyrighted Work

Increasingly, this is the most important factor to consider with fair use. Note that this refers to the *potential* market, not the actual market. For example, if a petroleum engineer wanted to digitize some well logs that were available in printed form and put them up on the net, this would remove the potential market of the print publisher. This example, however, is a little tougher: a geologist working for a for-profit company, travels to a local academic library to copy articles not in the corporate library. These same articles might be ordered through a document delivery provider who pays royalties for every article copied. Going to an academic institution may be more convenient for the geologist, but actual revenue may be lost to the publisher.

Consider Fair Use

As you can see, deciding if the use of a copyrighted work is fair can be challenging. It would really help if authors would explicitly state on the work itself what rights are granted to the public. Without a statement from the author, the user is left to ponder the four factors of fair use and try to make a good faith decision in each case.

WHO OWNS THE COPYRIGHT?

This question is not simple to answer. The author or authors of a work are generally acknowledged as the copyright holders until the rights are signed away. One of the most interesting things to note about co-authored works is that each author's signature is binding on all the other authors. So, it is possible for one author to sign away exclusive rights to the work without the other author's knowledge, let alone signatures.

Corporations and universities tend to have different policies on who owns the copyright to works created on the job. Some companies (and even universities) require blanket assignment of copyright upon hiring. Some universities require blanket agreements and then implicitly assign the copyright back to the employees, especially faculty. If the author(s) did not sign a blanket agreement or an agreement for a particular work, then the copyright belongs to the author or authors.

When the author signs over exclusive rights to a publisher, he or she no longer owns the copyright. However, an author can sign over non-exclusive rights to a publisher, which means that the author still owns and controls the copyright. Authors can also choose to distinguish between rights to the print and rights to the electronic. The exclusive rights to the print can be signed over while reserving electronic rights.

But, while publishers, for the most part, still insist on the exclusive copyright being theirs, there are cracks in the wall. Stories abound of researchers who claim that they routinely scratch out the exclusivity clauses of publishers' contracts and still get published, and the American Chemical Society recently announced that authors could post title, abstract, figures and tables of their own ACS papers on their own web site, plus provide a link to the ACS journal web site where the paper appears, so that up to 50 other people can read or print the paper, even though they may not subscribe to the electronic version of the journal.

On the other hand, there are also stories of authors being ordered to take copies of their papers off their own web sites, because they're violating copyright by posting them.

U.S. GOVERNMENT CONSIDERATIONS

There is a myth that all government information is in the public domain. This is not true. Although U.S. government-produced works are generally in the public domain, works produced by independent contractors and works submitted to the government which fulfill the legal requirements of federal grants are copyrighted. So, if you find a government report produced by a university on a government web site it may be copyrighted. Check to see if the copyright information specifically indicates that the report is in the public domain.

CONCLUSION

A lot of intellectual property information can be found in print and electronic form. A good place to start looking for electronic information is the Fair Use site at Stanford University, *http://fairuse.stanford.edu/*. This URL links to many other sites and was designed to answer fair use and other copyright questions. In particular, the site has links to many fascinating articles about copyright.

The information provided here has been intended to inform and stimulate further discussion. There is an intense and growing debate on university campuses as faculty are being encouraged to keep the copyright to their intellectual works, even though most publishers still demand exclusive rights. A recent article in *Science* by twelve scholars (Bachrach and others, 1998) asks that the U.S. government require authors to retain their copyright as a condition of funding; and more recently, the Provost of Caltech went public in *The Chronicle of Higher Education* with a proposal that, instead of Institute authors signing away their copyrights to journals, publishers should be informed that they may publish articles by Caltech researchers only if the authors and the Institute retain the copyright.

One of the most frequent arguments heard against this proposal is that getting permission to copy would then

become a nightmare search for the lost author, but this would not need to be the case: authors could still be linked with the Copyright Clearance Center's billing mechanism, and payments made for copying in excess of fair use guidelines could still be channeled through the CCC just as they are now.

Arguments like this may be fun or frustrating, but being involved in the debate, especially those of us who are researchers, scientists, librarians, authors, or readers, is important. The future of scholarly communication rides on the outcome. Whether you are a geoscientist in industry, government, or academia, we encourage you to join in these discussions.

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NON-NORTH AMERICAN GEOSCIENCE LITERATURE IN NORTH AMERICAN GEOSCIENCE LIBRARIES: HAVE WE SAID GOODBYE TO THE YORKSHIRE GEOLOGICAL SOCIETY?

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Abstract—North American science libraries have contracted the scope of their collections over the last ten years. This trend affects geoscientists especially, because geoscience literature is produced by geological surveys, societies, and other institutions throughout the world. This study identifies current serials from outside the United States and Canada. Holdings of a sample of serials from 50 countries were searched in American and Canadian library catalogs. The results show how much geoscience literature is still being produced outside North America and how much is being collected.

Japan, China, Germany, Brazil, and Poland publish the largest number of noncommercial geoscience serials outside North America. Few come from the Middle East and Africa. Translation journals, some core and near-core journals, and a large number of irregular titles in the sample were cancelled. The sample shows some evidence of cancellation because of distribution problems or changes in pricing. Some of the sampled serials are no longer available in some regions. Also, the mix of titles cancelled before the mid-1980s price increases is different from the titles that were cancelled later. Some specialized titles have been cancelled down to one or two active holdings in North America.

Changes on both the supply and demand sides of foreign geoscience publications are affecting their distribution throughout North America. Some geological surveys have changed their pricing structure considerably. Some have embarked on substantial programs to distribute their publications electronically. Libraries are reducing gift/exchange programs, cutting serials to balance collection budgets, and spending less time on claiming irregular publications. All these factors contribute to reduced accessibility of geoscience publications for North American users.

INTRODUCTION

Consider this scenario. The U.S. dollar falls from a high value. Journal prices rise. The Canadian dollar falls even more. The journal publishing industry consolidates, and prices increase. Library budgets do not increase as fast. Libraries start cancelling journals. What can they cancel? Perhaps a couple $500 to $2000 journals. However, they meet resistance from the faculty. What is left? There are several inexpensive serials from other countries, produced by geological surveys, societies, academies, or universities. Libraries would like to keep these journals, but they must serve the needs of their primary constituencies first. In the long run, these journals and other serials form the collection's diversity and richness. It is this collection richness and the library's services that differentiate one library from another.

Has this scenario occurred, and have North American libraries cancelled much of their foreign literature? Anecdotal evidence from previous Geoscience Information Society meetings would suggest that the answer is yes. This paper will look at the serials holdings of North American libraries to see whether the foreign literature is indeed disappearing from these shores.

METHODOLOGY

For the purposes of this study, North America refers to the United States and Canada. The methodology consists of two parts: 1) identification of the current publications of foreign geoscience literature; and 2) identification of libraries in North America that hold copies of these publications.

This study focuses on noncommercially-published literature. Society-sponsored journals from commercial publishers are included. The publications were identified by looking at publication lists of societies and geological surveys. Some Web sites were searched also. Many less-common journals were identified in a large search of the *Ulrich's International Periodical Directory* database.

The serial titles were searched on the *WorldCat* and *Union Lists* databases of the OCLC *FirstSearch* service. *WorldCat* does not give specific holdings information for journals. A library might have one volume, a partial run, or a whole run of a serial title. The *Union Lists* database indicates whether a library has a current or cancelled subscription at a specific reporting year.

The *Union Lists* database does not give exact holdings for all the libraries listed on *WorldCat* holdings screens. Also, *WorldCat* does not list all libraries that hold at least part of a serial. Some libraries report none or partial holdings to OCLC. If many libraries subscribe to a title, *WorldCat* only lists the holdings in the searcher's region. Consequently, several serials were searched directly in the catalogs of libraries that *WorldCat* and *Union Lists* identified to get a clearer representation of holdings. For example, the Geological Survey of Canada's library holdings were determined directly from their Web-based catalog, because their holdings were not listed in the OCLC databases.

Identification of specific holdings of serials from library catalogs is a slow process for several reasons. First, the catalog may not be available through the Web or a Telnet session. Another problem is the lack of identification of the catalog on the main Web page of some libraries. The libraries appear to de-emphasize their catalogs or give them nicknames which are not identified as the catalogs of their collections.

Interpretation of serial holdings from the individual library catalogs is straightforward, when the library indicates exact bound holdings and the current issue. However, several libraries do not provide detailed displays of their serial holdings, or the entries just state the initial volume received. Some libraries actually note whether the subscription is current, but this is not a common feature. Finally, there is often a note to just "check the shelf" for the irregular serial holdings.

These complications necessitated a focus on a sample of geoscience serials that represented various types of noncommercial publishers and a variety of countries from around the world. One hundred and thirty-two serials from fifty countries were selected. Three translated titles were included with their vernacular editions to check whether there was any difference in their cancellation patterns. Also, several titles were included for Poland to see whether there was a differential cancellation pattern for titles from the same country.

Catalogs of libraries with major geoscience collections were spot checked if their holdings were not included in the OCLC databases. Also, earlier titles of some of the sampled serials were searched, because some libraries did not change their catalog records after the titles had changed. Nevertheless, the holdings of the sampled serials should be considered the minimum number for North America. The results are more useful for showing general trends than specific holdings of the selected titles.

An investigation of the holdings of monographs and maps from non-North American sources was part of the original plan of this study. The complications of identifying serial holdings required a delay and eventual exclusion of this part of the foreign literature from the study. Future research on monograph and map collecting could show whether North American libraries have narrowed their coverage of this part of the geoscience literature.

RESULTS

Sources of Non-North American Geoscience Literature

The geoscience literature published outside North America is quite extensive. Appendix 1 is an estimate of the distribution of current serials produced by societies, geological surveys, academies, universities, museums, and other institutes. Most oceanography, meteorology, engineering geology, hydrology, and mining journals were excluded. Some of the included titles may have ceased. However, the numbers should be considered the minimum, because several of the smaller societies and geological surveys do not publicize their serials widely. Also, the primary sources of the data (publication lists, *Ulrich's International Periodicals Directory*, and WWW sites) are less comprehensive and current for countries outside of Europe, Japan, and Australia.

The largest publisher of noncommercial geoscience journals is Japan. Many Japanese journals cover geophysics, which is not surprising. Most of the titles held by North American libraries publish some or all of their articles in English. The serials that were not found on *WorldCat* came from specialized societies, government agencies, or academic institutes.

China is a leading producer of noncommercial geoscience serials. Most of the titles cover broad topics such as earth science, paleontology, or seismology. At least 15 titles are regional journals. Several come from universities. A few English translations are included in the total with their vernacular editions. Some of the titles were not found in North American libraries or were found just in the Library of Congress or the U.S. Geological Survey Library.

The larger western European countries all publish a lot of geoscience literature. Germany has a large number of titles, because several universities still publish serials and because each state has a geological survey. Small societies in Italy and United Kingdom still produce geoscience titles. The number for France is smaller than expected, probably

Table 1. Distributions of Serials in Sample by Type of Publisher

	Number of Serials (% of total)
Societies	47 (36%)
Government academies and institutes	33 (25%)
Geological surveys	29 (22%)
Universities	14 (10%)
Museums	9 (7%)

Table 2. Distribution of Serials in Sample by Language

Predominant Language of Serials	Number of Serials (% of total)
English	75 (56%)
Spanish	10 (7%)
Russian	6 (5%)
German	6 (5%)
Polish	5 (4%)
Hungarian	5 (4%)
Portuguese	5 (4%)
Chinese	5 (4%)
Czech	4 (3%)
Japanese	4 (3%)
French	2 (2%)
Ukrainian	2 (2%)
Bulgarian	1 (1%)
Italian	1 (1%)
Dutch	1 (1%)

because a number of long-running titles have ceased in the last ten years.

The Scandinavian countries continue to publish several geoscience titles, and the prominent titles are published in English. The eastern European countries publish a large number of titles, particularly in Poland, the Czech Republic, and Slovakia. Since the breakup of the Soviet Union, it is hard to tell which Russian titles are still active. A few titles were identified for the new countries in the Commonwealth of Independent States.

Brazil publishes over half of the South American noncommercial geoscience serials. Many of the South American titles are highly irregular. It is difficult to determine whether they are currently published. Some of the libraries may have closed their holdings without realizing that new issues have been published after a long delay.

The current African titles are published primarily in southern African or Mediterranean countries. Several titles from central and western Africa are not active, but this could be expected from countries undergoing political instability. Research done with international partners is probably getting published outside these countries.

Holdings of Non-North American Serials in North American Libraries

The sample of 132 serials includes a mix of publishers, countries, and languages. Table 1 shows that most of the sample consists of publications by societies and government organizations. The serials come from 50 countries, and the largest group (22 titles) comes from Poland (Appendix 2). English is the predominant language of most of the serials, even though they are published in a diverse group of countries (Table 2). The rest of the serials in the sample usually contain some English, even though it may only be the table of contents.

Appendix 2 is a summary of the basic characteristics of each serial in the sample. The table is arranged alphabetically by country. The age of each title is given along with publisher type, country, and language. The next columns refer to the results of searches on the *WorldCat* and *Union Lists* databases and searches on individual library catalogs. The units are the number of libraries that hold each serial title. Some holdings could not be

determined, and they are listed in the last column, questionable holdings. The column labeled "lapsed" refers to holdings at libraries whose catalogs indicate that they are current subscribers, though issues have not be received for more than a year. Holdings were considered "current" depending on the frequency of the publication and the number of the latest issue received by any of the subscribing libraries.

Cancelled subscriptions are separated into two columns, according to whether the cancellation occurred before 1986 or after 1985. This cutoff date is a dividing line for "recent cancellations," because 1986 is the year when the fall of the U.S. dollar set off an initial wave of large serial price increases. It was expected that the data would reflect more intensive cancellation of foreign serials after 1985.

Overall Cancellation Pattern

Appendix 3 shows the extent of cancellation of the sampled serials over the whole time period. The first group of titles is arranged according to the number of cancelled subscriptions. The second group of titles is arranged according to the percentage cancelled. This is a measure of the extent which each serial was disappearing from North American libraries relative to the total holdings.

The ten serials which were cancelled the most in absolute numbers fall into three groups. The first and fifth titles are translation journals. Translated Russian journals were often the target of cancellation projects in science libraries, and one of the two listed here, the *Moscow University Geology Bulletin* appeared high on a list of geoscience titles cancelled by multiple libraries up to 1991 (Klimley, 1991).

Some titles that may have been considered "core," such as *Eclogae Geologicae Helvetiae*, were cancelled a lot, perhaps because they had were becoming more costly and they had a wide distribution among libraries in North America. In fact, this one and the other two "core" titles, *Norsk Geologisk Tidsskrift* and *Bulletin de la Societe Geologique de France*, have been published for greater than 90 years.

A third group of journals which were cancelled heavily appeared to have distribution problems. *Revista de la Asociacion Geologica Argentina* was considered ceased in one catalog, and the holdings for several other libraries stop at that same time. Yet four libraries have been to obtain current issues. Another example is the *Bulletin of the Polish Academy of Sciences, Earth Science*. Several holdings stop between 1989 and 1991. This could be an instance where a gift/exchange title shifted to a priced subscription.

The other side of Appendix 3 shows the serials that were heavily cancelled relative to their total holdings in North America. The third and seventh titles appear high on the other side of the table. The eighth title, *Geological Survey Report (Victoria)*, appears high on the list, simply because there were only 8 total holdings. The ninth title, *Grondboor en Hamer*, is a Dutch journal that was almost completely cancelled in North America in the mid-1980s.

Polish serials form much of the rest of the list of the 30 highest cancelled titles. This does not mean that Polish titles were singled out more than serials from other countries, because the sample includes a large number of Polish journals. It is interesting to note that over half of the Polish serials were cancelled at rates over 60% of holdings, though the specific cancelled titles do not concern a specific subject or source. Since 1989, several eastern European serials have switched from gift/exchanges to priced subscriptions. There may have been a winnowing of these titles in North American libraries, particularly when the subjects or publishers are more specialized. The irregularity of many titles from this region makes it hard to keep current holdings.

The last point to note from Appendix 3 is the position of the *Proceedings of the Yorkshire Geological Society*. It does appear as the 26th title in the first column. However, it has a strong subscription base in North America, and even with these cancellations, 50% of the holdings are still current. Its publication now by one of the world's leading geoscience publishers will probably maintain its distribution throughout North America.

No relationship was found between the publisher type, language, or country of the sampled serials and the number of cancelled holdings. Some libraries say that they are cancelling long-running regional serials to support the international journals from commercial publishers. No relationship was found between the cancellation of the sampled serials and their age.

Regional Cancellation Pattern

The sample data were recorded by regions (Table 3), as defined on the library server directory of the *Libweb* WWW site (Dowling, 1999). Canadian libraries were grouped into one region, because few holdings were found for most titles. Regional cancellation patterns have an effect on the availability of literature in local interlibrary loan networks and in the availability of concentrated collections that a researcher from the region could visit. Appendix 4 lists the most heavily cancelled titles for each region. Only titles whose cancellation reduced a region's holdings (curr/lapsed column) to five or less were included. Serials that were cancelled five or more times were considered heavily cancelled. The Canadian holdings list includes a lower threshold for both total cancelled and current/lapsed holdings, so that some titles could be listed. Questionable holding were excluded from all tallies.

Table 3. Regions used in Geographic Classification of North American Library Holdings

West	Alaska	Mountain/Plains	Colorado
	California		Idaho
	Hawaii		Kansas
	Oregon		Montana
	Washington		Nebraska
Southwest	Arizona		Nevada
	New Mexico		North Dakota
	Oklahoma		South Dakota
	Texas		Utah
Southeast	Alabama		Wyoming
	Arkansas	Midwest/Great Lakes	Illinois
	Delaware		Indiana
	District of Columbia		Iowa
	Florida		Michigan
	Georgia		Minnesota
	Kentucky		Missouri
	Louisiana		Ohio
	Maryland	Northeast	Connecticut
	Mississippi		Maine
	North Carolina		Massachusetts
	South Carolina		New Hampshire
	Tennessee		New Jersey
	Virginia		New York
	West Virginia		Pennsylvania
			Rhode Island
			Vermont
Canada	all provinces		

The *Proceedings of the Yorkshire Geological Society* appears on the lists for the Northeast and Southeast. Otherwise, there is extensive coverage of this journal in North American libraries, as was noted in comments on Appendix 3. Another British title, the *Mercian Geologist*, has disappeared from the Canadian libraries whose catalogs were searched, but there are still holdings in the United States.

Two titles from the GeoRef priority journals list (American Geological Institute, 1998) appear on some of the regional cancellation lists. The *Bulletin of the Geological Society of Denmark* appears on the Northeastern and Southeastern lists, but other serials received more reduction in coverage. The other title, *Bulletin de la Societe Geologique de France*, appears in a high position only on the Southwestern list. Two "second tier" journals were cancelled heavily in the Southwest also. They are the *Transactions of the Royal Society of Edinburgh Earth Sciences* and *Eclogae Geologicae Helvetiae*. This is partly a function of the initial broader coverage of geoscience journals in Texas libraries as compared to other regions. However, they are among the most expensive serials in the sample, so that might make them cancellation targets.

The three Russian translation journals in the sample have become less available. *Geophysical Journal* was only prevalent in the West, where it became a major cancellation target. Holdings of the *Moscow University Geology Bulletin* were reduced substantially in all regions except Canada, which had few in the first place. *Paleontological Journal* and its Russian equivalent were cancelled heavily throughout the regions, but at least one version was available in each region. It was one of the primary cancellation targets in the sample. Twenty-nine copies were cancelled in the West, Midwest/Great Lakes, and Northeast since 1985, but 25 copies are still available in these regions. Though translation journals are expensive, the relative importance of Russian paleontology would probably preserve *Paleontological Journal* in institutions with paleontology programs longer than other translation journals.

The rest of the titles on the regional lists are primarily mixes of the Polish, Czech, German, and Hungarian serials

and the South American journals with irregular publication schedules. One Japanese title, *Chishitsugaku Zasshi*, appears high on four lists. Its position at the top of the Western list is unexpected, and its availability has been reduced to that of the Midwest and Great Lakes.

Change in the Cancellation Pattern

The regional cancellation pattern showed some evidence of changes in spatial availability of the sampled serials. Appendix 5 shows some evidence of change in the cancellation pattern over time. Two time periods were chosen, the period before 1986 and then afterwards, when serial prices rose sharply and libraries embarked on a series of cancellation projects. Each side of the table lists the serials in the sample that were cancelled frequently during that time period.

Two Russian journals were cancelled heavily in both time periods. Before the recent cancellation projects, the vernacular titles (*Paleontologicheskii Zhurnal* and *Vestnik Moskovskogo Univ. Ser. IV: Geologiia*) were cancelled frequently. After 1985, libraries cancelled the translated versions of these titles more than any serials in the sample. The *Vestnik* was cancelled heavily before 1985, and then the cancellation focus switched to the translated version, *Moscow University Geology Bulletin*. The *Paleontologicheskii Zhurnal* was cancelled often in both time periods, though the cancellation of its English-language version accelerated after 1985. If the ten lapsed holdings of *Paleontologicheskii Zhurnal* indeed represent recent cancellations, then the Russian title has become scarce except in Canada, where there are four subscriptions.

The *Bulletin de la Societe Geologique de France* was cancelled during both time periods, but more often before 1986, by smaller colleges and universities. The greatest change in cancellations occurred with the *Australian Journal of Earth Sciences*. No libraries cancelled the title before 1986. Afterwards it became the fifth most-cancelled title. The journal is still available throughout both the U.S. and Canada, but it has become a cancellation target since 1991, perhaps because of the steady increase in price. Though the *Australian Journal of Earth Sciences* is a society journal, it is published by a commercial publisher.

Geochronique, *Geobios*, *Revista de Micropaleontologia*, and *Geochemical Journal* all were cancelled heavily after 1986, but not much in the earlier period. They probably were considered less useful to their institutions in serial cancellation reviews, because their prices did not increase by large amounts. All are still held widely throughout North America.

Appendix 5 shows the sampled titles that were cancelled frequently. These serials are not necessarily the titles that are disappearing from North American collections. Instead, it is the group of serials whose holdings have been greatly reduced relative to the total number held in North America.

Appendix 6 lists the serials that had the greatest reduction in availability before 1986 and afterwards. Cancellations had the most effect on the distribution of these titles. The two lists of serials are arranged by the percent cancelled in each time period relative to the total available holdings during that period. Questionable holdings are excluded. The main difference between these lists and the lists in Appendix 5 is the lack of the more expensive titles at the top of Appendix 6. Notable exceptions are the *Moscow University Geology Bulletin* and *Geophysical Journal*, both Russian translation journals. They are clearly becoming scarce titles.

Some specialized titles have been cancelled so much that they are currently held by only one or two libraries. These include the *Geological Survey Report (Geological Survey of Victoria)*, *Studia Geomorphologica Carpatho-Balcanica*, *Grondboor en Hamer*, *Garcia de Orta: Serie de Geologia*, and *Annales Uniwersytet Marii Curii-Sklodowkiej Sectio B: Geographia, Geologia.* Claiming problems and changes in gift/exchange status probably caused the large reduction in holdings of *Revista de la Asociacion Geologica Argentina*, *Boletin Geologico* of Colombia, *Journal of the Indian Academy of Geoscience*, and the *Bulletin of the Polish Academy of Sciences, Earth Sciences*.

A closer look at Appendix 6 reveals that most of the serials whose availability was sharply reduced before 1986 did not have large decreases in availability after 1986. Most of these serials had few current holdings after 1985, so that not many new cancellations would be needed to put these serials among the highly-ranked titles on the left side of the table. The serials cancelled after 1985 are, by and large, different titles. This is evidence of the diminishing diversity of geoscience serial collections in North America. Of course, several libraries are responsible for the cancellations on the two lists. For example, two libraries cancelled their subscriptions to the *Mercian Geologist* in 1984, whereas six did so in 1989. Some libraries may think that they have decimated their collections, whereas others have just cropped some of the less common journals and concentrated instead on cancelling expensive commercial publications. Nevertheless, the overall result is a reduction in the richness of geoscience serial collections in North America.

DISCUSSION

The results suggest that current foreign geoscience literature is being reduced in library collections in the United States and Canada. We have not said goodbye to the Yorkshire Geological Society, but several libraries that serve mid-sized geoscience academic departments have definitely cut their holdings of regional geoscience serials.

There was little evidence that libraries were starting new subscriptions to the sampled titles.

The study found some evidence that North American libraries are collecting very few copies of several serials. These titles were identified for Appendix 1, though the currency of their holdings was not verified by searching individual library catalogs. Brazil, Japan, and China publish most of these scarce titles. The U.S. Geological Survey Library and the Library of Congress were often the only holding libraries, though the currency of their holdings was not checked.

An example of a scarce title is the *Records* series from the Geological Survey of Western Australia. The University of Toronto and the Geological Survey of Canada have 4 of the 19 *Records* published in the last three years, but no North American library appears to have a standing order. The results in Appendices 4 through 6 show that several geoscience titles are becoming scarce, at least regionally.

Lack of serial funds is the main cause of a reduction in foreign geoscience literature in North American libraries. However, other factors are involved. Searches in several catalogs showed that not all libraries were keeping up with the irregular publication schedules of some of the sampled serials. For example, seven libraries lack recent issues of *Comunicaciones Paleontologicas del Museo Nacional de Historia Natural* of Uruguay, though ten libraries have received them. The *Revista de la Asociacion Geologica Argentina* is an extreme example. Thirteen libraries stopped their holdings with volume 45 (1990), and at least one indicated that the journal had ceased on its catalog. Yet four libraries have been able to obtain issues through 1998. Claiming the foreign geoscience literature takes staff time, which may be less available in redefined and streamlined libraries.

Another reason that holdings of foreign geoscience literature may be diminishing is the reduction in exchange programs in North American libraries. Exchange programs are labor-intensive operations. Many North American libraries have decided that the exchanged materials are not worth the expensive journals that were requested by the exchange partners (Diedrichs and Davis, 1997). This situation makes the gift/exchange programs at the Library of Congress and the U.S. Geological Survey Library (Regan, 1992) even more valuable.

The availability of foreign geoscience literature is not changing just from developments from the consumers in North America. The producers are changing the way they operate also. Geological surveys in Australia and New Zealand have changed the pricing of certain types of their publications or charge different amounts for foreign customers. Some of the older geological surveys have disbanded their once extensive foreign depository programs. At the same time, geological surveys are taking advantage of the Internet to distribute large data sets that might not have been available before in print publications. A good example is the Geological Survey of Norway's DRAGON site (Geological Survey of Norway, 1998), which provides access to geophysical data. Perhaps the local studies that foreign geological surveys produce will remain in paper, while their data sets and results of their broader studies are published on the Web.

CONCLUSION

The question remains whether the scenario presented in the introduction has resulted in a diminishment of geoscience collections in North American libraries. The sample in this study indicated a continuing reduction in the diversity of collections as reflected by the serial literature. We have not said goodbye to the Yorkshire Geological Society and its *Proceedings*, but there has been a steady cancellation of other foreign titles. Some serials are disappearing from regions, and others are only available in a few libraries across all regions. No specific relationship was found between the type of publisher, language, country, or age of the serials and the cancellation frequencies. However, the specific library holdings of only a few titles from 50 countries were searched in the sample, except for Poland.

Further research on the availability of the current cartographic and monographic foreign geoscience literature in North American libraries may yield different patterns. This study suggests that we have not reached the point where all geoscience libraries have the same collections, but there has been movement in that direction. We are left with the question: where do you find quickly that foreign geoscience publication that is cited infrequently, but has critical data, when it is not available in North American libraries and not on the Web?

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Appendix 1. Estimated Distribution of Earth Sciences Serials* by Country of Publication
***Serials Produced by Societies, Geological Surveys, Academies, Universities, Museums, and Other Institutes**

Continent	Country of Origin	# of Titles	Continent	Country of Origin	# of Titles
EUROPE			**ASIA**		
	Albania	1		Armenia	1
	Austria	14		Azerbaijan	1
	Belgium	7		Bangladesh	2
	Bulgaria	8		China (PRC)	91
	Croatia	6		China (ROC)	5
	Czech Republic	17		Cyprus	2
	Denmark/Greenland	11		India	24
	Estonia	1		Indonesia	20
	Finland	11		Iran	1
	France	25		Iraq	2
	Germany	53		Israel	4
	Greece	2		Japan	127
	Hungary	8		Jordan	2
	Iceland	2		Kazakhstan	1
	Ireland	2		Malaysia	6
	Italy	28		Nepal	1
	Lithuania	1		Pakistan	4
	Netherlands	7		Philippines	2
	Norway	7		South Korea	2
	Poland	41		Sri Lanka	1
	Portugal	3		Turkey	6
	Romania	18		Turkmenistan	1
	Russia	33		Uzbekistan	1
	Slovakia	7			
	Slovenia	2	**AFRICA**		
	Spain	20		Algeria	2
	Sweden	7		Botswana	1
	Switzerland	13		Egypt	2
	Ukraine	6		Morocco	1
	United Kingdom	31		Namibia	4
	Yugoslavia	1		Nigeria	1
				South Africa	16
SOUTH AMERICA				Tunisia	2
	Argentina	11		Zambia	1
	Bolivia	2		Zimbabwe	1
	Brazil	51			
	Chile	7	**AUSTRALIA and OCEANIA**		
	Colombia	6		Australia	22
	Peru	1		Fiji	1
	Uruguay	1		New Zealand	4
	Venezuela	8			
CENTRAL AMERICA, CARIBBEAN, MEXICO					
	Costa Rica	2			
	Guatemala	1			
	Jamaica	1			
	Mexico	9			

Appendix 2. Sample of Non-North American Geoscience Serials

Serial Title	Pubtype	Country	Language	Age	Current	Lapsed	Cancelled Post 1985	Cancelled Pre 1986	Questionable Holdings
Revista de la Asociacion Geologica Argentina	society	Argentina	Spanish	53	4	2	21	20	14
Quarterly Notes (NSW Geological Survey)	govtsurv	Australia	English	29	8	1	7	1	6
Geological Survey Report (Geol Surv Victoria)	govtsurv	Australia	English	31	1	0	4	0	3
Memoirs (Assoc of Australasian Palaeontol)	society	Australia	English	16	15	0	7	1	5
Nomen Nudum	society	Australia	English	27	11	1	9	1	10
Australian Journal of Earth Sciences	society	Australia	English	46	82	1	30	0	18
Mitteilungen der Osterreichischen Geol Gesel	society	Austria	German	91	18	2	5	5	9
Archiv fur Lagerstattenforschung	govtsurv	Austria	German	26	10	0	4	1	5
Geologie (Societe Belge de Geologie)	society	Belgium	English	112	19	1	18	1	12
Revista Brasileira de Geofisica	society	Brazil	Portuguese	17	1	0	3	0	0
Geociencias	university	Brazil	Portuguese	17	13	0	8	0	8
Revista Brasileira de Geociencias	society	Brazil	Portuguese	47	10	0	19	4	11
Paleontologiia, Stratigrafiia I Litologiia	govtacad	Bulgaria	Bulgarian	32	5	2	2	3	10
Anuario de la Mineria de Chile	govtsurv	Chile	Spanish	38	18	0	6	4	7
Acta Geoscientia Sinica = Ti Chiu Hsueh Pao	govtacad	China	Chinese	20	12	7	10	4	16
Acta Geophysica Sinica	society	China	Chinese	51	7	0	16	5	9
Chinese Journal of Geophysics	society	China	English	11	9	1	5	1	5
Acta Seismologica Sinica	society	China	English	19	6	1	10	0	2
Ti Chen Hsueh Pao	society	China	Chinese	18	3	0	4	0	1
Geoscience = Hsien Ta Ti Chih	university	China	Chinese	12	6	0	6	0	2
Ti Chen Ti Chih=Seismology and Geology.	govtsurv	China	Chinese	20	6	3	2	3	2
Boletin Geologico	govtsurv	Colombia	Spanish	46	9	2	4	20	11
Revista Geologica de America Central	university	Costa Rica	Spanish	15	5	1	1	0	6
Geologia Croatica	govtsurv	Croatia	English	52	7	2	2	0	8
Krystalinikum	govtacad	Czech Rep	Czech	37	17	2	11	11	3
Bulletin of the Geological Survey, Prague	govtsurv	Czech Rep	Czech	74	10	3	9	3	8
Journal of the Czech Geological Society	society	Czech Rep	English	43	8	5	2	0	10
Acta Universitatis Carolinae: Geologica	university	Czech Rep	Czech	45	11	8	11	11	11
Sbornik Geologickych Ved: Geologie	govtsurv	Czech Rep	Czech	78	6	4	12	8	10
Bulletin of the Geological Soc of Denmark	society	Denmark	English	105	24	3	9	10	4
Proc of the Estonian Acad of Sci: Geology	govtacad	Estonia	English	43	9	1	0	0	3
Special Paper (Geologian Tutkimuskeskus)	govtsurv	Finland	English	12	14	3	3	3	6
Geobios	university	France	English	31	40	1	22	6	15
Geodiversitas	govtacad	France	English	20	34	1	8	2	13
Geochronique	govtsurv	France	French	17	36	1	26	2	20
Bulletin de la Societe Geologique de France	society	France	English	169	52	2	15	28	15
Geologica Bavarica	govtsurv	Germany	German	50	11	2	5	13	9

Pubtype = type of publisher

Age = no. of years that a serial has been published

Appendix 2. Sample of Non-North American Geoscience Serials

Serial Title	Pubtype	Country	Language	Age	Current	Lapsed	Cancelled Post 1985	Cancelled Pre 1986	Questionable Holdings
Geologisches Jahrbuch Reihe A	govtsurv	Germany	German	27	21	0	14	14	9
Fortschritte in der Geol von Rheinland/Westfal	govtsurv	Germany	German	41	20	1	10	13	10
Geology of Greenland Survey Bulletin	govtsurv	Greenland	English	51	12	3	3	3	9
Acta Geog ac Geol et Meteorol Debrecina	university	Hungary	Hungarian	37	3	2	1	2	3
Magyar Geofizika	society	Hungary	Hungarian	39	4	0	4	0	2
Geofizikai Kozlemenyek	govtacad	Hungary	English	47	7	0	6	5	7
Foldtani Kozlony	society	Hungary	Hungarian	128	6	1	15	15	6
Acta Geologica Hungarica	govtacad	Hungary	Hungarian	47	24	3	26	15	8
Acta Geodaetica et Geophysica Hungarica	govtacad	Hungary	Hungarian	49	10	0	13	5	5
Joekull	society	Iceland	English	48	1	16	5	3	8
Indian Journal of Geochemistry	society	India	English	16	5	0	2	0	2
Proceedings, Earth and Planetary Sciences	govtacad	India	English	65	33	6	17	21	14
Journal of the Indian Academy of Geoscience	society	India	English	40	4	1	1	8	5
Indian Journal of Earth Sciences	society	India	English	27	19	1	15	2	10
Indian Journal of Geology	society	India	English	73	14	0	6	11	6
Irish Journal of Earth Sciences	govtacad	Ireland	English	31	17	6	7	1	9
Geological Suvey of Israel Bulletin	govtsurv	Israel	English	43	23	1	8	11	13
Giornale di Geologia	museum	Italy	English	73	14	0	7	16	6
Memorie di Scienze Geologiche	university	Italy	Italian	87	7	2	6	4	5
Journal of the Geological Society of Jamaica	society	Jamaica	English	41	9	0	9	6	6
Bull of the Nat Sci Mus: Ser C Geol & Paleo	museum	Japan	English	60	18	0	5	7	12
Ganko, Ganseki Kobutsu Kosho Gakkai Shi	society	Japan	Japanese	70	13	0	12	0	4
Chishitsugaku Zasshi	society	Japan	English	106	20	6	25	13	3
Geochemical Journal	society	Japan	English	33	66	3	22	9	15
Paleontological Research	society	Japan	English	64	19	4	6	2	19
Hobetsu Museum Bulletin	museum	Japan	English	15	2	0	1	0	11
Science Reports (Kyushu Univ Dept of EPS)	university	Japan	Japanese	58	25	1	7	2	14
Mizunami Fossil Museum Bulletin	museum	Japan	English	25	4	2	1	0	8
Mizunami Fossil Museum Monograph	museum	Japan	Japanese	19	3	0	0	0	7
Special Papers Paleontological Soc of Japan	society	Japan	English	48	11	4	8	21	9
Fossils = Kaseki	society	Japan	Japanese	39	3	0	2	2	8
Journal of Geosciences Osaka City Univ	university	Japan	English	42	21	4	2	3	13
Kazan = Bull of the Volcanological Soc Japan	society	Japan	English	42	10	0	4	5	7
Qazaqstan Geologiiasy	govtacad	Kazakhstan	Russian	59	4	1	2	2	4
Revista de la Sociedad Mexicana de Paleo	society	Mexico	Spanish	12	1	1	2	0	0
Paleontologia Mexicana	university	Mexico	Spanish	45	15	0	9	26	10
Geofisica Internacional	university	Mexico	English	38	32	0	12	7	7

Pubtype = type of publisher

Age = no. of years that a serial has been published

Appendix 2. Sample of Non-North American Geoscience Serials

Serial Title	Pubtype	Country	Language	Age	Current	Lapsed	Cancelled Post 1985	Cancelled Pre 1986	Questionable Holdings
Notes et Memoires du Service Geol du Maroc	govtsurv	Morocco	French	51	3	5	6	13	7
Communications of the Geol Surv of Namibia	govtsurv	Namibia	English	14	17	3	7	0	9
Scripta Geologica	museum	Netherlands	English	28	16	1	9	3	5
Grondboor en Hamer	society	Netherlands	Dutch	44	2	1	11	1	1
Institute of Geol & Nuclear Sci Monograph	govtsurv	New Zealand	English	6	1	6	3	0	5
NGU Special Publication	govtsurv	Norway	English	12	6	1	9	0	2
Norsk Geologisk Tidsskrift	society	Norway	English	94	45	9	34	15	10
Annales Uniw Marii Curie-Sklodowkiej Sect B	university	Poland	English	53	2	0	11	6	10
Studia Geomorphologica Carpatho-Balcanica	govtacad	Poland	English	32	1	0	6	6	7
Studia Geologica Polonica	govtacad	Poland	English	41	14	4	13	8	9
Polish Acad of Sci Inst of Geophys Pub Ser A	govtacad	Poland	English	36	2	1	5	0	4
Prace Mineralogizne (Polska Akad Nauk)	govtacad	Poland	English	34	2	8	5	7	10
Prace Geologiczne (Polska Akad Nauk)	govtacad	Poland	Polish	39	3	14	5	10	6
Geologia Sudetica	govtacad	Poland	English	35	7	1	15	9	14
Biuletyn Peryglacjalny	society	Poland	English	45	11	2	14	15	5
Archiwum Mineralogiczne	govtacad	Poland	English	74	1	13	7	12	9
Rocznik Polskiego Towarzystwa Geologiczne	society	Poland	Polish	78	24	3	7	14	13
Przeglad Geologiczny	govtsurv	Poland	Polish	46	3	0	7	7	5
Przeglad Geofizyczny	society	Poland	Polish	51	6	1	2	8	2
Przeglad Geodezyjny	society	Poland	Polish	75	4	0	1	2	0
Prace Muzeum Ziemi	museum	Poland	English	41	5	0	3	7	9
Mineralogia Polonica	society	Poland	English	29	3	0	2	6	3
Kwartalnik Geologiczny	society	Poland	English	42	21	0	8	13	11
Acta Geophysica Polonica	govtacad	Poland	English	46	7	3	20	12	7
Acta Geologica Polonica	govtacad	Poland	English	49	9	0	21	15	10
Bull of the Polish Acad of Sci Earth Sciences	govtacad	Poland	English	46	4	4	33	11	11
Folia Quaternaria	govtacad	Poland	English	39	2	3	10	6	6
Acta Paleontologica Polonica	govtacad	Poland	English	43	16	2	13	7	6
Acta Palaeobotanica	govtacad	Poland	English	39	13	1	10	5	9
Garcia de Orta: Serie de Geologia	govtorg	Portugal	Portuguese	26	2	1	1	4	4
Comunicacoes (Inst Geol & Min Portugal)	govtsurv	Portugal	Portuguese	112	12	0	7	5	8
Romanian Journal of Petrology	govtsurv	Romania	English	89	11	3	1	0	5
Paleontologicheskii Zhurnal	govtacad	Russia	Russian	40	9	10	14	15	14
Paleontological Journal	govtacad	Russia	English	40	52	0	43	19	16
Vestnik Moskovskogo Univ Ser IV: Geologiia	university	Russia	Russian	39	16	0	7	15	11
Moscow University Geology Bulletin	university	Russia	English	25	8	2	35	7	2
Zapiski Vserossiiskogo Mineralog Obschestva	society	Russia	Russian	133	13	2	3	5	5

Pubtype = type of publisher

Age = no. of years that a serial has been published

Appendix 2. Sample of Non-North American Geoscience Serials

Serial Title	Pubtype	Country	Language	Age	Current	Lapsed	Cancelled Post 1985	Cancelled Pre 1986	Questionable Holdings
Geologica Carpathica - Clays	govtsurv	Slovakia	English	7	4	3	3	0	6
Bulletin (Geological Survey (South Africa))	govtsurv	South Africa	English	94	18	2	2	12	15
Memoir (Geological Survey (South Africa))	govtsurv	South Africa	English	94	12	1	4	2	0
Geoscience Journal (Seoul, South Korea)	society	South Korea	English	2	5	0	0	0	1
Estudios Geologicos	govtacad	Spain	Spanish	54	12	0	7	13	13
Boletin Geologico y Minero (IGME)	govtsurv	Spain	Spanish	125	8	2	2	7	9
Revista Espanola de Micropaleontologia	govtsurv	Spain	Spanish	30	25	1	26	12	7
Research Papers SGU Ser C Forskningsrapp.	govtsurv	Sweden	English	131	12	1	9	13	7
Eclogae Geologicae Helvetiae	society	Switzerland	English	111	49	1	21	21	8
Schweizerische Palaeontologische Abhand	society	Switzerland	German	125	15	4	16	13	13
Journal of the Geological Sdciety of China	society	Taiwan	English	31	42	4	8	5	25
Turkish Journal of Earth Sciences	govtorg	Turkey	English	7	4	1	0	0	2
Turkmenistan Ylmlar Akad. Khabarlary...Geol	govtacad	Turkmenistan	Russian	39	3	1	3	0	4
Proc of the Yorkshire Geological Society	society	UK	English	128	21	5	13	13	11
Mercian Geologist	society	UK	English	35	9	1	10	8	7
Trans Royal Soc of Edinburgh Earth Sciences	society	UK	English	216	53	0	17	12	14
Mineralogicheskii Zhurnal	govtacad	Ukraine	Ukrainian	20	6	4	5	0	3
Geofizicheskii Zhurnal	govtacad	Ukraine	Ukrainian	20	6	0	5	2	2
Geophysical Journal	govtacad	Ukraine	English	18	4	1	17	1	5
Comun Paleont del Mus Nac de Hist Natural	museum	Uruguay	Spanish	29	5	7	10	3	18
Uzbekiston Geologiia Zhurnali	govtacad	Uzbekistan	Russian	42	2	1	7	5	6

Pubtype = type of publisher

Age = no. of years that a serial has been published

Arranged by total number cancelled

Appendix 3. Largest Cancellation of Geoscience Serials

Arranged by % of total holdings

Rank	Serial Title	Holdings Cancelled Total Number
1	Paleontological Journal	62
2	Norsk Geologisk Tidsskrift	49
3	Bull of the Polish Acad of Sci Earth Sciences	44
4	Bulletin de la Societe Geologique de France	43
5	Moscow University Geology Bulletin	42
6	Eclogae Geologicae Helvetiae	42
7	Revista de la Asociacion Geologica Argentina	41
8	Acta Geologica Hungarica	41
9	Revista Espanola de Micropaleontologia	38
10	Chishitsugaku Zasshi	38
11	Proceedings, Earth and Planetary Sciences	38
12	Acta Geologica Polonica	36
13	Paleontologia Mexicana	35
14	Acta Geophysica Polonica	32
15	Geochemical Journal	31
16	Foldtani Kozlony	30
17	Australian Journal of Earth Sciences	30
18	Biuletyn Peryglacjalny	29
19	Special Papers Paleontological Soc of Japan	29
20	Paleontologicheskii Zhurnal	29
21	Schweizerische Palaeontologische Abhand	29
22	Trans Royal Soc of Edinburgh Earth Sciences	29
23	Geologisches Jahrbuch Reihe A	28
24	Geochronique	28
25	Geobios	28
26	Proc of the Yorkshire Geological Society	26
27	Geologia Sudetica	24
28	Boletin Geologico	24
29	Revista Brasileira de Geociencias	23
30	Giornale di Geologia	23

Rank	Serial Title	Holdings Cancelled %
1	Studia Geomorphologica Carpatho-Balcanica	92
2	Annales Uniw Marii Curie-Sklodowkiej Sect B	89
3	Revista de la Asociacion Geologica Argentina	87
4	Bull of the Polish Acad of Sci Earth Sciences	85
5	Przeglad Geologiczny	82
6	Foldtani Kozlony	81
7	Moscow University Geology Bulletin	81
8	Geological Survey Report (Geol Surv Victoria)	80
9	Grondboor en Hamer	80
10	Acta Geologica Polonica	80
11	Uzbekiston Geologiia Zhurnali	80
12	Geophysical Journal	78
13	Acta Geophysica Polonica	76
14	Folia Quaternaria	76
15	Revista Brasileira de Geofisica	75
16	Acta Geophysica Sinica	75
17	Geologia Sudetica	75
18	Mineralogia Polonica	73
19	Revista Brasileira de Geociencias	70
20	Paleontologia Mexicana	70
21	Notes et Memoires du Service Geol du Maroc	70
22	Boletin Geologico	69
23	Biuletyn Peryglacjalny	69
24	Sbornik Geologickych Ved: Geologie	67
25	Prace Muzeum Ziemi	67
26	Special Papers Paleontological Soc of Japan	66
27	Acta Geodaetica et Geophysica Hungarica	64
28	Journal of the Indian Academy of Geoscience	64
29	Mercian Geologist	64
30	Journal of the Geological Society of Jamaica	63

Appendix 4. Regional Cancellation of Serial Holdings from Sample

Western holdings

Serial Title	Total Cancelled	Curr / Lapsed
Chishitsugaku Zasshi	8	4
Moscow University Geology Bulletin	7	2
Geophysical Journal	7	2
Fortschritte in der Geol von Rheinland/Westfal	7	4
Bull of the Polish Acad of Sci Earth Sciences	6	0
Revista Brasileira de Geociencias	6	1
Acta Geologica Hungarica	6	4
Biuletyn Peryglacjalny	6	2
Special Papers Paleontological Soc of Japan	6	1
Revista de la Asociacion Geologica Argentina	5	2
Acta Geologica Polonica	5	2
Foldtani Kozlony	5	2
Notes et Memoires du Service Geol du Maroc	5	1

Southeastern holdings

Serial Title	Total Cancelled	Curr / Lapsed
Acta Geologica Hungarica	10	2
Bull of the Polish Acad of Sci Earth Sciences	10	0
Moscow University Geology Bulletin	7	1
Acta Geophysica Polonica	7	1
Revista de la Asociacion Geologica Argentina	7	1
Vestnik Moskovskogo Univ Ser IV: Geologiia	6	1
Indian Journal of Earth Sciences	5	2
Geologia Sudetica	5	1
Proc of the Yorkshire Geological Society	5	3
Fortschritte in der Geol von Rheinland/Westfal	5	1
Paleontologicheskii Zhurnal	5	1
Bulletin of the Geological Soc of Denmark	5	3
Kwartalnik Geologiczny	5	2

Southwestern holdings

Serial Title	Total Cancelled	Curr / Lapsed
Trans Royal Soc of Edinburgh Earth Sciences	8	4
Geochronique	7	3
Bulletin de la Societe Geologique de France	7	5
Paleontological Journal	7	5
Eclogae Geologicae Helvetiae	7	5
Chishitsugaku Zasshi	7	3
Schweizerische Palaeontologische Abhand	7	0
Revista Espanola de Micropaleontologia	7	4
Acta Geologica Hungarica	7	1
Moscow University Geology Bulletin	6	0
Acta Geologica Polonica	6	0
Paleontologia Mexicana	6	1
Geologie (Societe Belge de Geologie)	5	1
Bull of the Polish Acad of Sci Earth Sciences	5	0
Revista Brasileira de Geociencias	5	1
Norsk Geologisk Tidsskrift	5	5
Sbornik Geologickych Ved: Geologie	5	0
Geologica Bavarica	5	0
Proceedings, Earth and Planetary Sciences	5	3
Biuletyn Peryglacjalny	5	0
Acta Paleontologica Polonica	5	2
Revista de la Asociacion Geologica Argentina	5	2

Canadian holdings

Serial Title	Total Cancelled	Curr / Lapsed
Acta Geophysica Sinica	4	0
Indian Journal of Earth Sciences	3	3
Geochemical Journal	3	4
Norsk Geologisk Tidsskrift	3	4
Paleontological Journal	3	4
Geologisches Jahrbuch Reihe A	3	1
Giornale di Geologia	3	0
Biuletyn Peryglacjalny	3	0
Mercian Geologist	3	0
Special Papers Paleontological Soc of Japan	3	1

TotalCancel = Total holdings cancelled

Curr/Lapsed = Current + lapsed holdings

Appendix 4. Regional Cancellation of Serial Holdings from Sample

Northeastern holdings

Serial Title	Total Cancelled	Curr / Lapsed
Krystalinikum	12	5
Geologisches Jahrbuch Reihe A	11	3
Moscow University Geology Bulletin	10	2
Acta Geologica Hungarica	9	4
Acta Geologica Polonica	9	2
Research Papers SGU Ser C Forskningsrapp.	9	1
Chishitsugaku Zasshi	8	4
Revista Espanola de Micropaleontologia	8	3
Bull of the Polish Acad of Sci Earth Sciences	8	1
Acta Geophysica Polonica	8	1
Biuletyn Peryglacjalny	8	4
Paleontologia Mexicana	8	3
Geologia Sudetica	7	0
Annales Uniw Marii Curie-Sklodowkiej Sect B	7	0
Acta Paleontologica Polonica	7	2
Bulletin of the Geological Soc of Denmark	6	5
Foldtani Kozlony	6	2
Proc of the Yorkshire Geological Society	6	3
Acta Geophysica Sinica	5	2
Scripta Geologica	5	2
Revista de la Asociacion Geologica Argentina	5	1
Giornale di Geologia	5	1
Przeglad Geologiczny	5	0
Folia Quaternaria	5	2
Kwartalnik Geologiczny	5	1

Midwest/Great Lakes holdings

Serial Title	Total Cancelled	Curr / Lapsed
Revista de la Asociacion Geologica Argentina	16	0
Revista Espanola de Micropaleontologia	9	4
Bull of the Polish Acad of Sci Earth Sciences	9	3
Paleontologicheskii Zhurnal	9	3
Paleontologia Mexicana	9	4
Foldtani Kozlony	9	1
Acta Universitatis Carolinae: Geologica	8	1
Chishitsugaku Zasshi	8	5
Special Papers Paleontological Soc of Japan	8	4
Rocznik Polskiego Towarzystwa Geologiczne	7	4
Acta Geophysica Polonica	7	0
Moscow University Geology Bulletin	6	1
Anuario de la Mineria de Chile	6	3
Schweizerische Palaeontologische Abhand	6	4
Geologie (Societe Belge de Geologie)	5	5
Revista Brasileira de Geociencias	5	3
Acta Geodaetica et Geophysica Hungarica	5	2
Acta Paleontologica Polonica	5	4
Geologia Sudetica	5	2
Kwartalnik Geologiczny	5	3
Research Papers SGU Ser C Forskningsrapp.	5	3
Bull of the Nat Sci Mus: Ser C Geol & Paleo	5	2
Notes et Memoires du Service Geol du Maroc	5	1
Boletin Geologico	5	2

Mountain/Great Plains holdings

Serial Title	Total Cancelled	Curr / Lapsed
Acta Geologica Polonica	7	1
Special Papers Paleontological Soc of Japan	6	2
Revista Espanola de Micropaleontologia	5	2
Studia Geologica Polonica	5	5

TotalCancel = Total holdings cancelled

Curr/Lapsed = Current + lapsed holdings

Appendix 5. Serials in the Sample Cancelled before and after the Mid-1980s Price Increases, Ranked by Frequency of Cancellation

Serials Cancelled after 1985	Freq.	Serials Cancelled before 1986	Freq.
Paleontological Journal	43	Bulletin de la Societe Geologique de France	28
Moscow University Geology Bulletin	35	Paleontologia Mexicana	26
Norsk Geologisk Tidsskrift	34	Proceedings, Earth and Planetary Sciences	21
Bull of the Polish Acad of Sci Earth Sciences	33	Special Papers Paleontological Soc of Japan	21
Australian Journal of Earth Sciences	30	Eclogae Geologicae Helvetiae	21
Geochronique	26	Boletin Geologico	20
Acta Geologica Hungarica	26	Revista de la Asociacion Geologica Argentina	20
Revista Espanola de Micropaleontologia	26	Paleontological Journal	19
Chishitsugaku Zasshi	25	Giornale di Geologia	16
Geobios	22	Foldtani Kozlony	15
Geochemical Journal	22	Acta Geologica Hungarica	15
Revista de la Asociacion Geologica Argentina	21	Norsk Geologisk Tidsskrift	15
Acta Geologica Polonica	21	Biuletyn Peryglacjalny	15
Eclogae Geologicae Helvetiae	21	Acta Geologica Polonica	15
Acta Geophysica Polonica	20	Paleontologicheskii Zhurnal	15
Revista Brasileira de Geociencias	19	Vestnik Moskovskogo Univ Ser IV: Geologiia	15
Geologie (Societe Belge de Geologie)	18	Geologisches Jahrbuch Reihe A	14
Proceedings, Earth and Planetary Sciences	17	Rocznik Polskiego Towarzystwa Geologiczne	14
Geophysical Journal	17	Geologica Bavarica	13
Trans Royal Soc of Edinburgh Earth Sciences	17	Fortschritte in der Geol von Rheinland/Westfal	13
Acta Geophysica Sinica	16	Chishitsugaku Zasshi	13
Schweizerische Palaeontologische Abhand	16	Notes et Memoires du Service Geol du Maroc	13
Bulletin de la Societe Geologique de France	15	Kwartalnik Geologiczny	13
Foldtani Kozlony	15	Estudios Geologicos	13
Indian Journal of Earth Sciences	15	Research Papers SGU Ser C Forskningsrapp.	13
Geologia Sudetica	15	Schweizerische Palaeontologische Abhand	13
Geologisches Jahrbuch Reihe A	14	Proc of the Yorkshire Geological Society	13
Biuletyn Peryglacjalny	14	Archiwum Mineralogiczne	12
Paleontologicheskii Zhurnal	14	Acta Geophysica Polonica	12
Acta Geodaetica et Geophysica Hungarica	13	Bulletin (Geological Survey (South Africa))	12
Studia Geologica Polonica	13	Revista Espanola de Micropaleontologia	12
Acta Paleontologica Polonica	13	Trans Royal Soc of Edinburgh Earth Sciences	12
Proc of the Yorkshire Geological Society	13	Krystalinikum	11
Sbornik Geologickych Ved: Geologie	12	Acta Universitatis Carolinae: Geologica	11
Ganko, Ganseki Kobutsu Kosho Gakkai Shi	12	Indian Journal of Geology	11
Geofisica Internacional	12	Geological Suvey of Israel Bulletin	11
Krystalinikum	11	Bull of the Polish Acad of Sci Earth Sciences	11
Acta Universitatis Carolinae: Geologica	11	Bulletin of the Geological Soc of Denmark	10
Grondboor en Hamer	11	Prace Geologiczne (Polska Akad Nauk)	10
Annales Uniw Marii Curie-Sklodowkiej Sect B	11	Geochemical Journal	9
Acta Geoscientia Sinica = Ti Chiu Hsueh Pao	10	Geologia Sudetica	9
Acta Seismologica Sinica	10	Sbornik Geologickych Ved: Geologie	8
Fortschritte in der Geol von Rheinland/Westfal	10	Journal of the Indian Academy of Geoscience	8
Folia Quaternaria	10	Studia Geologica Polonica	8
Acta Palaeobotanica	10	Przeglad Geofizyczny	8
Comun de Paleo Mus Hist Nat de Montevideo	10	Mercian Geologist	8
Mercian Geologist	10	Bull of the Nat Sci Mus: Ser C Geol & Paleo	7
Nomen Nudum	9	Geofisica Internacional	7

freq. = frequency

Appendix 6. Serials in the Sample Cancelled before and after the Mid-1980s Price Increases, Ranked by Percentage Cancelled

Serials Cancelled after 1985	% Canc	Serials Cancelled before 1986	% Canc
Studia Geomorphologica Carpatho-Balcanica	86	Boletin Geologico	57
Annales Uniw Marii Curie-Sklodowkiej Sect B	85	Journal of the Indian Academy of Geoscience	57
Bull of the Polish Acad of Sci Earth Sciences	81	Mineralogia Polonica	55
Geological Survey Report (Geol Surv Victoria)	80	Paleontologia Mexicana	52
Grondboor en Hamer	79	Garcia de Orta: Serie de Geologia	50
Revista de la Asociacion Geologica Argentina	78	Special Papers Paleontological Soc of Japan	48
Moscow University Geology Bulletin	78	Notes et Memoires du Service Geol du Maroc	48
Geophysical Journal	77	Studia Geomorphologica Carpatho-Balcanica	47
Revista Brasileira de Geofisica	75	Przeglad Geofizyczny	47
Acta Geophysica Sinica	70	Prace Muzeum Ziemi	47
Przeglad Geologiczny	70	Revista de la Asociacion Geologica Argentina	43
Acta Geologica Polonica	70	Giornale di Geologia	43
Uzbekiston Geologiia Zhurnali	70	Geologica Bavarica	42
Foldtani Kozlony	68	Foldtani Kozlony	41
Acta Geophysica Polonica	67	Przeglad Geologiczny	41
Folia Quaternaria	67	Estudios Geologicos	40
Revista Brasileira de Geociencias	66	Vestnik Moskovskogo Univ Ser IV: Geologiia	39
Geologia Sudetica	65	Boletin Geologico y Minero (IGME)	37
Polish Acad of Sci Inst of Geophys Pub Ser A	63	Research Papers SGU Ser C Forskningsrapp.	37
Acta Seismologica Sinica	59	Biuletyn Peryglacjalny	36
Ti Chen Hsueh Pao	57	Archiwum Mineralogiczne	36
Acta Geodaetica et Geophysica Hungarica	56	Indian Journal of Geology	35
NGU Special Publication	56	Bulletin (Geological Survey (South Africa))	35
Sbornik Geologickych Ved: Geologie	54	Acta Geologica Polonica	33
Biuletyn Peryglacjalny	52	Uzbekiston Geologiia Zhurnali	33
Geoscience = Hsien Ta Ti Chih	50	Annales Uniw Marii Curie-Sklodowkiej Sect B	32
Magyar Geofizika	50	Prace Mineralogizne (Polska Akad Nauk)	32
Journal of the Geological Society of Jamaica	50	Prace Geologiczne (Polska Akad Nauk)	31
Revista de la Sociedad Mexicana de Paleo	50	Kwartalnik Geologiczny	31
Revista Espanola de Micropaleontologia	50	Paleontologicheskii Zhurnal	31
Mercian Geologist	50	Fortschritte in der Geol von Rheinland/Westfal	30
Acta Geologica Hungarica	49	Bulletin de la Societe Geologique de France	29
Chishitsugaku Zasshi	49	Geologisches Jahrbuch Reihe A	29
Ganko, Ganseki Kobutsu Kosho Gakkai Shi	48	Fossils = Kaseki	29
Geologie (Societe Belge de Geologie)	47	Rocznik Polskiego Towarzystwa Geologiczne	29
Geofizikai Kozlemenyek	46	Przeglad Geodezyjny	29
Schweizerische Palaeontologische Abhand	46	Acta Geophysica Polonica	29
Paleontological Journal	45	Folia Quaternaria	29
Geofizicheskii Zhurnal	45	Mercian Geologist	29
Comun de Paleo Mus Hist Nat de Montevideo	45	Geofizikai Kozlemenyek	28
Quarterly Notes (NSW Geological Survey)	44	Geologia Sudetica	28
Nomen Nudum	43	Sbornik Geologickych Ved: Geologie	27
Indian Journal of Earth Sciences	43	Krystalinikum	27
Notes et Memoires du Service Geol du Maroc	43	Acta Universitatis Carolinae: Geologica	27
Paleontologicheskii Zhurnal	43	Proceedings, Earth and Planetary Sciences	27
Turkmenistan Ylmlar Akad. Khabarlary...Geol	43	Schweizerische Palaeontologische Abhand	27
Studia Geologica Polonica	42	Geological Suvey of Israel Bulletin	26
Acta Paleontologica Polonica	42	Kazan = Bull of the Volcanological Soc Japan	26

% Canc = percent cancelled relative to total available holdings

ACCRETING THE CONTINENT'S COLLECTIONS
THE CONSORTIA STRATEGY

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Abstract--Academic research libraries once sought to support an array of specialties within and among academic disciplines as well as provide for basic undergraduate and graduate support. America's colleges and universities are now seeking relief from the increasing costs of providing access to the expanding volume of scholarly works. One strategy against this onslaught is the formation of consortia of libraries. The Alliance, formerly the Colorado Alliance of Research Libraries (CARL) banded together in 1978 for the following purposes: 1. To share information concerning acquisitions, services, and procedures; 2. To increase patron access to the collections of Colorado by a) joint acquisition or unusual or expensive library materials, b) the rapid interlibrary loan of jointly acquired materials, and c) the timely publication of guides, catalogs, and finding lists; 3. To sponsor research into common problems; 4. To encourage a high quality of library service to patrons; and 5. To support the efficient utilization of available library funds. Time and technology have changed the details of resource sharing but the principles are the same; today's version of joint acquisitions is often electronic databases. The Alliance's influence on the ways Colorado's libraries do business will be examined.

CONSTORTIA AND COLLECTIONS

Academic research libraries once sought to support an array of specialties within and among academic disciplines as well as provide for basic undergraduate and graduate support. Rising journal costs, the proliferation of new journals, and new electronic journals are making it more difficult for serials acquisition programs to keep up with library users' needs and demands. America's colleges and universities are now seeking relief from the increasing costs of providing access to the expanding volume of scholarly works. In a 1997 informal survey of the libraries in ASEE's Engineering Library Division, 83 percent of the respondents reported canceling subscriptions because of funding concerns. On average, the respondents reported a 19 percent decrease in serials collections in the last five years; this despite the fact that 92 percent of the libraries reported steady or slightly increased budgets from the previous year (Thomes and Clay, 1998).

This situation has been more than 15 years in the making. Not only are journals getting more expensive, they are increasing in number and specialization. Electronic journals are placing even more pressure on strained budgets as demand for remote access and availability of hyperlinks become greater, producing a seemingly permanent imbalance between the funds accorded to research libraries and the volume of scholarly output these libraries are expected to manage.

Libraries now find it necessary to ration their purchases of monographs and subscriptions to journals. Libraries must settle for inadequate assemblages that exist at the intersection of what scholars deem critical and what librarians judge they can afford (Association of Research Libraries et al, 1998). Additionally, libraries are still balancing the cost of staff, equipment upgrades, additional access, and telecommunications concerns. One coping mechanism to these problems is the consortial approach.

Consortia in general

Library consortia generally have the following characteristics:

1. Commitment to an agreed-upon mission statement, usually narrow in scope;
2. Democratic operating style, using committees extensively, discussing issues at great length and making decisions by consensus;

3. Minimal formal structure, except where the consortium was created by statute or is a non-profit corporation;
4. Organized geographically usually within a state or region;
5. Willingness of the members to commit significant amounts of time and staff to consortial activities;
6. Opportunities for professional interaction among peers.

Consortia are many and diverse; probably no two are alike. They were created to deal with specific issues and are often formed and reformed as the emphasis changes. Even when the desire to cooperate is present, cooperation often does not happen as it tends to be hindered by bureaucratic traditions of academic decision making. Yet even with its limitations, the consortia approach is the most promising as the facts of economic life energize the ethic of cooperation (Charnes, 1995).

THE ALLIANCE

In 1974, the Dean of Libraries of the University of Denver (DU) contacted the library directors of the University of Colorado (CU), Colorado State University (CSU), the University of Northern Colorado (UNC), and the Public Library of the City and County of Denver (DPL) to find solutions to shared concerns. From this initial collaboration, the Colorado Alliance of Research Libraries was formed. This group of libraries, later joined by the Colorado School of Mines, sought collective solutions to mutual concerns. In these early days, the motto of "One for all and all for one" seemed to be the watchword of the time.

These informal groups were not unique to Colorado. New technologies had begun to arrive and many libraries realized collaborative action was necessary to comprehend, plan for, and implement those changes. Many of these informal gatherings have evolved into today's library product vendors. Examples are OCLC, VTLS, RLIN and the Alliance's own offspring, CARL.

In 1978, the Alliance considered automating the University of Denver's Penrose Library card catalog. The idea expanded into an Alliance-wide project and the basic research and development for this automation began. Later in this year, the Alliance, known by the acronym CARL, was incorporated as a Colorado nonprofit corporation.

The purposes of the Alliance, as set forth in the original Articles of Incorporation, have remained essentially unchanged, despite significant shifts in the provision of information. The Articles of Incorporation state that its members shall:

"Promote the progress and advancement of Colorado research libraries by

1. sharing information concerning acquisitions, services and procedures;
2. increasing patron access to the collections of Colorado research libraries by:
   a. the joint acquisition of unusual or expensive library materials not available in Colorado,
   b. the rapid interlibrary loan of jointly acquired materials,
   c. the timely publications of guides, catalogs and finding lists;
3. sponsoring research into common problems;
4. encouraging a high quality of library service to patrons;
5. supporting the efficient utilization of available library funds."

Time and technology have changed the details of resource sharing, but the principles are the same. For example, when the Articles of Incorporation referred "to the joint acquisition of unusual or expensive library materials", they meant books, and in fact, the Alliance created a special shared book collection, stored at various selected sites. Today's version of "joint acquisitions" targets electronic databases.

In 1982, the library directors commissioned Ward Shaw of the University of Denver to begin developing a custom-made library computer system to meet the shared specifications of the Alliance members. The prototype CARL PAC (public access catalog) was available early in 1983.

An external party was selected to "market, sell, reproduce, support and maintain the CARL system" but this partnership failed. In 1988, the library directors formed a for-profit subsidiary called CARL Systems Inc. for the purpose of independently marketing the CARL System. The company grew and launched a second major product, a document delivery service using the Alliance-CARL Systems partnership called UnCover. In 1993, the UnCover Company was established as an independent joint venture with B. H. Blackwell Company.

CARL Systems Inc., under its new name CARL Corporation, and the UnCover Company were sold to Knight-Ridder Information Inc. in 1995. There they were aligned with the Dialog product. The whole group was sold to M.A.I.D. in 1997, and renamed "The Dialog Corporation". "CARL" today is a unit of the Dialog Corporation responsible for developing and marketing the CARL integrated library system and UnCover. The sale of the CARL Corporation and UnCover to Knight Ridder resulted in an independent revenue stream benefiting the Alliance. These funds are expended for the good of the Alliance members and are outside the budgetary control of the individual universities.

Since 1993, CARL and the Alliance have been totally separate organizations. The Alliance is an independent member-based consortium. It enjoys the enviable position

of being a 501 (c) (3) nonprofit corporation with a guaranteed flow of revenue. The Alliance has eight members, the original five of DU, CU, CSU, UNC, and DPL plus the University of Wyoming, Colorado School of Mines, and Regis University. There are eleven libraries represented by these eight members, the additional three libraries being the DU School of Law, the University of Colorado Health Science Center and Auraria, a library serving three institutions on one urban campus.

The Alliance is a multi-vendor consortium. Members have formed clusters of smaller groups of libraries which have pooled their resources to centrally purchase and operate selective on-line database packages. The OVID and SilverPlatter systems, currently running at the Alliance central office, are two examples of cluster acquisition.

The Alliance and the Colorado School of Mines Library

The Colorado School of Mines is a public research university with broad expertise in natural resource exploration, extraction, production, and utilization. The School offers the Bachelor of Science degree in engineering, mathematics, and the physical sciences. At the master's and doctoral levels, degrees are offered in mineral economics, engineering, mathematics, and the physical sciences. In addition, the School maintains active research programs in academic departments and affiliated research institutions. The Arthur Lakes Library supports the educational and research programs of the Colorado School of Mines, as well as the needs of an external community of users at the local, regional, and international levels. The Colorado School of Mines, for most of its history, reflects a clear commitment to undergraduate education and the Library collection retains that bias in its retrospective collection. Translation: the collection that supports the graduate and research information needs is not as deep or as broad as desired. The collection also reflects the same stresses regarding acquisition, format, access, and services discussed earlier.

The financial benefits of Alliance membership for the Colorado School of Mines include:

1. Aggressive negotiation as a consortium with database vendors and service providers;
2. Favorable volume pricing by forming specialized "clusters" or by expanding the purchasing unit beyond Alliance members;
3. Provision of services with Alliance staff as lower cost, higher quality, and greater timeliness than from an outside vendor;
4. Savings as a result of centralization;
5. Favorable UnCover document delivery base charges as part of sales agreement with KRII, continuing with M.A.I.D.;
6. Sale proceeds from KRII and ongoing interest income used for the good of the whole; and
7. Grants from outside agencies available only to consortia. Some specific examples include: The CHOICE Database, a selection tool, through the Alliance has resulted in savings of $75 per user per site. OCLC FirstSearch saves $0.25 per search and is funded by the Alliance.

The Library participates in several cooperative projects using shared resources. The SilverPlatter Cooperative Project with the University of Denver and the University of Wyoming is an example. As SilverPlatter includes the GeoRef database, this access is especially critical to the Colorado School of Mines. The Alliance staff provides many of the functions of a Systems Librarian, performing menu maintenance, re-indexing, loader development, and specialized reports. They provide consortial discounts of hardware, barcodes, and peripheral equipment. They conduct vendor negotiations and order placement and tracking. The Alliance does telecommunication consultation, installation, monitoring, and trouble shooting and the Alliance staff works with the campus computing center to ensure a seamless interface.

There is one hardware platform centrally managed by the Alliance as opposed to each site having their own server and staff. The Alliance manages the CARL Integrated Library System for not only the Colorado School of Mines but also Regis University, the University of Wyoming (UW), and Denver Public Library. Both the University of Wyoming and Denver Public Library have collections that augment those of the Colorado School of Mines; DPL's being western history and UW's being paleontology and western geology. Also, other libraries have access to our catalogs. Although this results in increased pressure on reciprocal borrowing agreements in effect within the Alliance and the state, it is a clear benefit to patrons. UnCover is provided through agreements with the Alliance, saving money per article through site license and gateway cost savings.

The bibliographic collections of the Front Range research libraries are rich and varied. It is, of course, incumbent upon the university and public libraries to provide for the information needs of their clientele. However, the Alliance provides the backbone upon which to launch access to not only the Front Range resources but also the world. For example, the University of Hawaii, available through a CARL link, has a rich collection on Pacific Rim geology. Melvyl, the California University System's electronic catalog is also available through this link. Because the Colorado School of Mines has only recently added higher level engineering programs, the University of Colorado at Boulder has been used to supplement our engineering collection at the graduate level.

In contrast, metallurgy does not seem to be found anywhere in the region so the Arthur Lakes Library must concentrate on this particular subject area.

The future of the consortial movement

New consortia are constantly being formed. Some are merely buying cooperatives established to take advantage of volume discounts. At the extreme, these buying cooperatives are "one-offs", formed to acquire one specific product. An example of this is the recent Lexis-Nexis deal reported in Library Journal (St. Lifer and Rogers, 1998). "Lexis-Nexis Academic Universe is now available on 53 percent of U.S. college campuses as of last month, as a result of a contract negotiated between a 'mega-consortia' of universities and Congressional Information Service, Inc. (CIS), a subsidiary of Lexis-Nexis. More than 600 institutions were represented by SOLINET, which acted as a negotiating, administration, and billing agent for 23 library consortia and three individual universities." The Alliance was one of the 23 consortia.

Other new consortia are partnerships formed by an ever-increasing number of libraries which no longer believe that they can independently meet the digital library challenge. The Northeast Research Libraries consortium (NERL), which includes many of the fiercely independent "Ivy League" schools, is an example of such a newly formed group.

This movement toward consolidation also can be clearly seen in the group called "The International Coalition of Library Consortia" (ICOLC), until recently known by its informal name "Consortium of Consortia". Beginning about three years ago among like-minded consortial managers at the semi-annual American Library Association meetings, the group now holds its own semi-annual meetings. There were sixty-three consortia in attendance at the most recent ICOLC meeting, hosted in Denver by the Alliance. Of course, most were from the United States, but there were representatives from library consortia in Australia, Great Britain, Canada, and the Netherlands.

The ICOLC meeting agendas are focused on one overarching issue. Can the power of cooperation be used to benefit institutional partners in the acquisition of digital material? The answer is "yes". In fact, many vendors welcome this important change in the academic marketplace. Centralization benefits them as well. It is very efficient to have one purchase order and a single payment. What had traditionally been a retail business is evolving into the wholesale trade. No longer does the vendor's sales representative need to meet separately with library staffs at school after school, a very pleasant but expensive marketing approach.

The future for consortia is very bright. Because they can be so easily formed, repackaged or terminated and are no longer limited geographically, they can be shaped to meet any particular need. Consortia are adroit. Moreover, there is no need for an institution to limit itself to membership in only one consortium. There are no such rules or legal constraints.

Of course, there are serious general issues about electronic commerce. Issues such as fair use, intellectual property rights, unauthorized users etc. need resolution. But the consortia can assist greatly in dealing with those issues. The ICOLC has already promulgated electronic database licensing principles and is committed to working with the publishing community to create an environment in which the digital library vision can be realized.

The Future of the Alliance

The Alliance's Strategic Plan was recently amended to include the development of the "Colorado-Wyoming Digital Library". The Alliance vision is simple; "One user, located anywhere, accessing all digital material, using a single interface". This is the direction in which the Arthur Lakes Library is moving. The Library wishes to provide future geoscientists easier access to greater resources.

The Colorado-Wyoming Digital Library is made up of four parts. The first is the digitization of existing collections. The Colorado School of Mines is the owner of several important historical and scientific collections in mining, metallurgy, oil shale, wire rope, mining history, and exploration geophysics to name a few. This material can be scanned and electronically stored so that it is available online to CSM students, faculty, alumni, and geoscientists wherever and whenever they need the material.

The second part of the Digital Library is continued enrichment of the suite of commercial full-text databases that are available through the Library. For the reasons already cited, the Alliance has proven how vital it is to cooperatively acquire these electronic databases. Another important menu enrichment feature now under development at the Alliance is the Prospector Union Catalog. Funded in major part by a State of Colorado grant to the Alliance, Prospector will permit the electronic and automatic merging of sixteen library catalogs, including the Arthur Lakes Library. A CSM student will be able to electronically order a book from anywhere in this merged bibliographic catalog and expect to have that book delivered to him at the Arthur Lakes Library within a few days.

The third part of the Digital Library directly addresses the cost crunch. There are strategies that if managed thoughtfully, can result in a lower net cost to an institution for certain types of research material. The key is "access" instead of ownership. If, for example, a specific journal article can be readily identified, accessed and electronically delivered, then perhaps that journal need not be purchased in its more expensive print version. There are several print-

substitution techniques now being implemented within the Alliance which can create significant dollar savings.

The fourth part of the Digital Library seeks to improve the connection between the Library and the classroom. Considerable work is underway around the country addressing this need. Digitization has opened the door to new teaching techniques and new ways to bring the intellectual resources of the library directly to the classroom. The Alliance intends to capture existing best practices and customize them for its member libraries.

CONCLUSION

This is an interesting time for academic libraries. The digital age has changed almost everything and made meeting the demands for contemporary library service very difficult and very expensive. There simply are not enough funds to keep up. But a strategy has surfaced which in spite of the cash crunch, has proven to be extremely successful in accreting the continent's collections. It is the power of cooperation, as manifested through the consortium.

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BUILDING THE NATIONAL GEOLOGIC MAP DATABASE: PROGRESS AND CHALLENGES

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Abstract--The principal stated purpose of the National Geologic Mapping Act of 1992 and 1997 is to build a national archive of geologic and related maps, to be known as the National Geologic Map Database. In 1995, planning began, and in 1996 a project was formed to develop the Database. Information about this project can be found at "http://ncgmp.usgs.gov/ngmdbproject". The Database is designed as a distributed system, through cooperation between the USGS and the Association of American State Geologists. The first phase of the project is to develop a comprehensive catalog of all published paper and digital geoscience maps of areas within the United States. As of Spring, 1998, about 26% of all maps were cataloged and available for search at the Database Web site ("http://ngmdb.usgs.gov"). To support the use of these maps, we have prepared at that URL a Lexicon of Geologic Names. During the remainder of 1998, work will include: development of databases and web pages for paleontology and geologic mapping in progress; enlargement of the map catalog with state geological survey entries; and continued work on the development of various standards and data models to support work on the project's next phase -- on-line access to standard geologic map products.

Both the USGS Strategic Plan and the Geologic Division Strategic Science Team Report support development of a viable National Geologic Map Database. This is one goal among many important management objectives, and limits on staffing and funding will necessitate difficult decisions. Recognition in these two reports of the value of the Database, and its prioritization through the Geologic Mapping Act as an important Federal and State government responsibility favor evolution of the project into a well-supported information resource for the community.

INTRODUCTION

The National Geologic Map Database is the product of two emerging societal trends—public access to the Internet, and the demand for scientific information relevant to societal issues. Historically, the availability of geologic maps and data could be known only by contacting or visiting an agency or institution to order products or conduct a library search. This process was cumbersome and somewhat inefficient. With increased use of the Internet via commonly-available web browsers, the public increasingly finds this approach unacceptable. In response, many agencies and libraries have begun to offer some Internet access to their information.

Geologic map information supplied by the earth-science agencies may or may not be used by the public, depending on its real or perceived utility to financial, environmental, land-use, and other societal issues. In 1990, the Office of Management and Budget questioned the value of geologic maps, and challenged the USGS's geologic mapping program to demonstrate a measureable utility of geologic maps, such that the economic efficiency of certain land-use decisions would be increased if geologic map information were used. The resulting study (Bernknopf and others, 1993) demonstrated this value, and it was clear to all concerned that geologic maps no longer could be justified solely on the basis of anecdotal evidence. Further, it was obvious that to maintain relevance to society and to the increasing number of map users employing geographic information systems (GIS), geologic maps must be produced in digital format.

In 1992, partly in response to these trends, Congress enacted the National Geologic Mapping Act. While asserting that geologic maps are useful and necessary to society, the Act called for increased production of high-quality maps by the state geological surveys and the USGS, through a newly-established partnership, the National Cooperative Geologic Mapping Program. This mapping program was justified in part by development of a National Geologic Map Database (NGMDB), as noted in the Act: "The purpose of this Act is to expedite the production of a geologic-map data base for the Nation, to be located within the United States Geological Survey, which can be applied to land-use management, assessment, and utilization, conservation of natural resources, groundwater management, and environmental protection."

DATABASE DESIGN AND PROGRESS

The Geologic Mapping Act stipulates that the NGMDB will be a national archive of geoscience maps, intended to provide the information needed to address various societal issues. The Act also mandates development of various standards to promote more efficient use of the map information. In mid-1995, the general stipulations in the Act were addressed by the USGS and the Association of American State Geologists (AASG), and the plan for building the Database was summarized by Soller and Berg (1995).

In considering the Act's general requirements for the NGMDB, we were faced with two different design philosophies: 1) a more traditional, searchable catalog of available maps; and 2) a more research-oriented project intended to provide users with access to digital maps via an interactive, map-based display. In discussions with potential users in the public and private sectors, it became clear that the primary goal must be to provide a searchable listing of available maps, and guidance on how to obtain those maps. Because most maps are not in digital form and because many organizations produce and distribute geologic maps, this was the only approach feasible within a reasonable period of time. In time, we may adopt some aspects of the second design philosophy; this will be facilitated by development of standards, an increase in the number of digital maps, research on interoperability among different software and data models, increases in bandwidth, and improvements in client-server software for data display and manipulation.

The NGMDB design consists of several phases. The first and most fundamental phase is a comprehensive, searchable catalog of all geoscience maps in the United States, in either paper or digital format. The users, upon searching the NGMDB catalog and identifying the map(s) they need, are to be linked to the appropriate organizations for further information and instructions for procuring the map. That organization could be a participating state or federal agency, association, or private company. The second phase of the NGMDB project focuses on public access to digital geoscience maps, and on the development of digital map standards and guidelines needed to improve the utility of those digital maps.

In late 1995, planning began on phase one. A web-based prototype catalog became available in 1996. The formation of several Standards Working Groups in mid-1996 initiated work on phase two. In mid-1998, a prototype version of the geologic names lexicon, "GEOLEX", became available at the NGMDB web site. This searchable lexicon is now being populated. It is a consolidated, revised, and error-corrected database derived from the USGS GNULEX and GEONAMES databases. It is intended to be a comprehensive, authoritative listing of geologic names approved for usage by the USGS. Work also has begun on a National Paleontologic Database and a set of web pages to support the Database and to permit searches. A public release is expected in 1999. To provide users with information about current mapping activities, a Geologic Mapping in Progress database has been developed, and will become available in 1999.

Progress on these various aspects of the NGMDB is summarized in Soller and Berg (1997 and 1998). Further and more current information can be found at the NGMDB project-information web site, at <http://ncgmp.usgs.gov/ngmdbproject/>. The NGMDB home page, with access to the map catalog and other features is at <http://ngmdb.usgs.gov/>.

THE NGMDB MAP CATALOG

As already noted, the map catalog is the most fundamental aspect of this project. It provides users with a listing of maps specific to their interest, and where to obtain them. If a map is in digital format and available for download, links will be provided to the appropriate site. We have made significant progress toward completion of the map catalog, but still have many maps yet to record. A graphical estimate of the number of maps entered, and remaining, is provided on the catalog search page (figure 1). In 1999, we plan to include nearly all USGS maps in the catalog, and will then work closely with all state geological surveys to include their maps. This effort will be aided by a newly-developed web-based data entry form. This form enables our cooperators in the state geological surveys and university libraries to contribute map records directly into the catalog.

To conduct a catalog search, the user specifies the search criteria (figure 1). These criteria may include one or more of the following: map theme, geographic area, state, county, author, title, map scale(s), map series number, bounding coordinates, or product format. The NGMDB

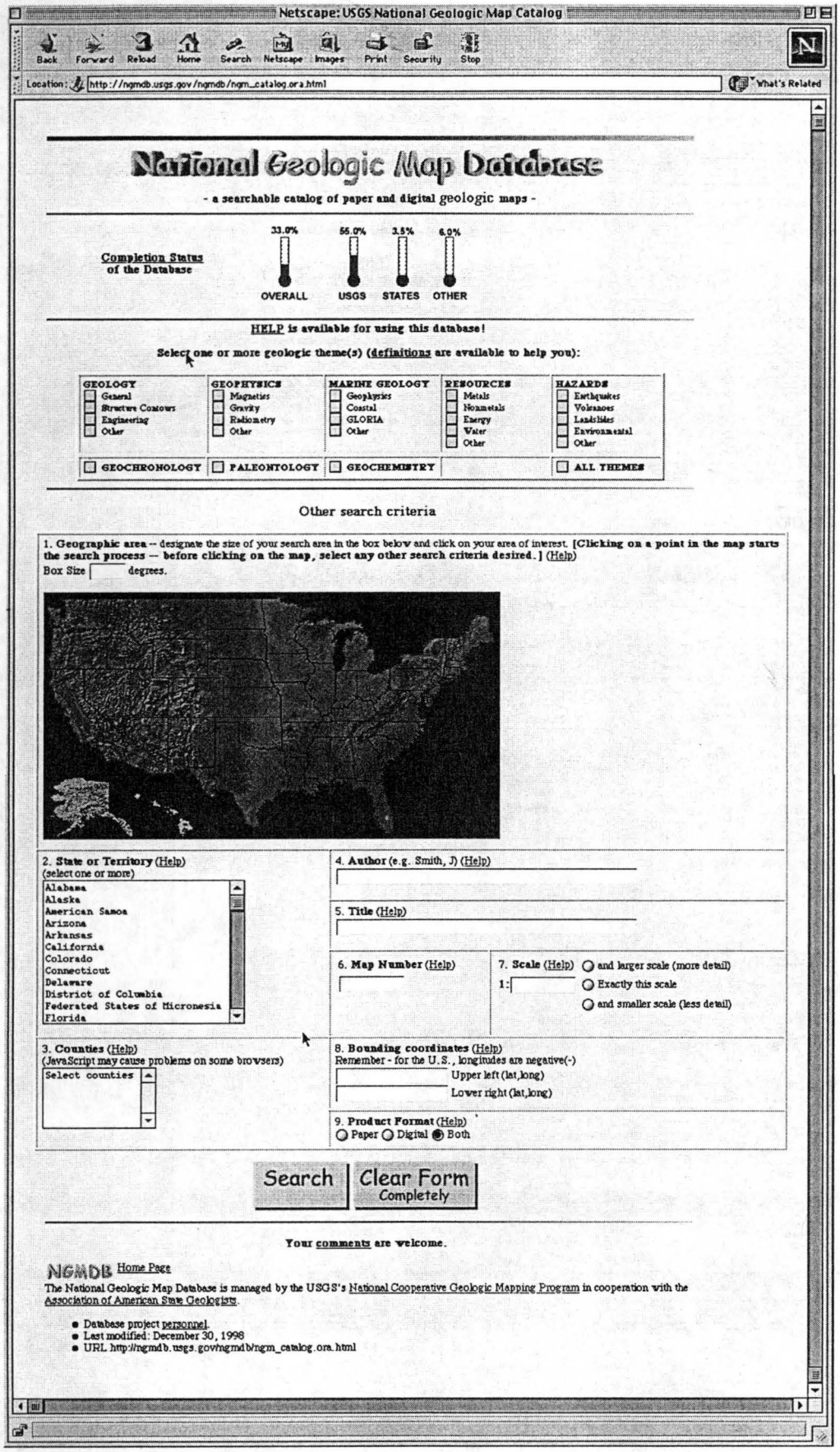

Figure 1. The National Geologic Map Database's map catalog search page. This page contains the catalog search form and completion status. (Available at http://ngmdb.usgs.gov/ngmdb/ngm_catalog.ora.html)

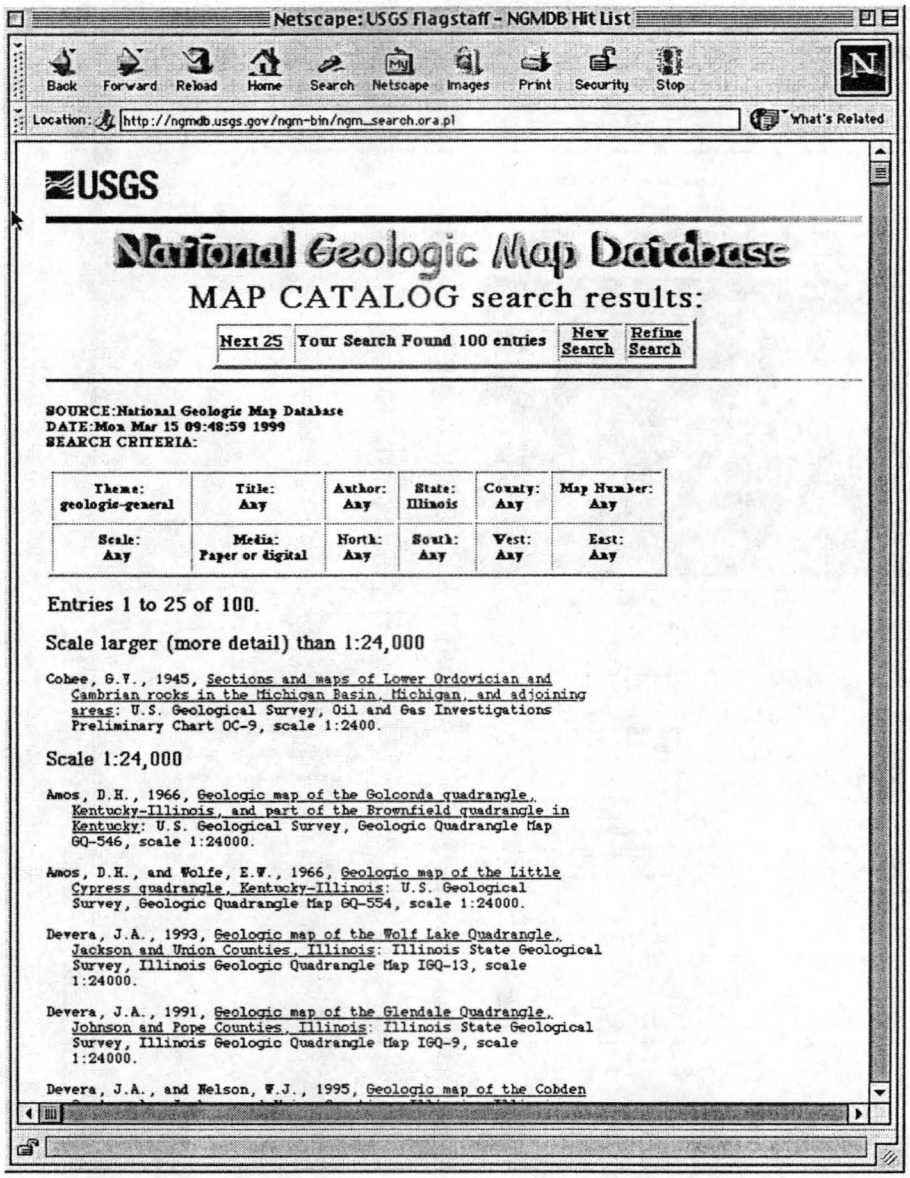

Figure 2. The NGMDB returns a "hit list" of maps that meet the search criteria; the list is provided in a standard bibliographic format and sorted by map scale, author, and date.

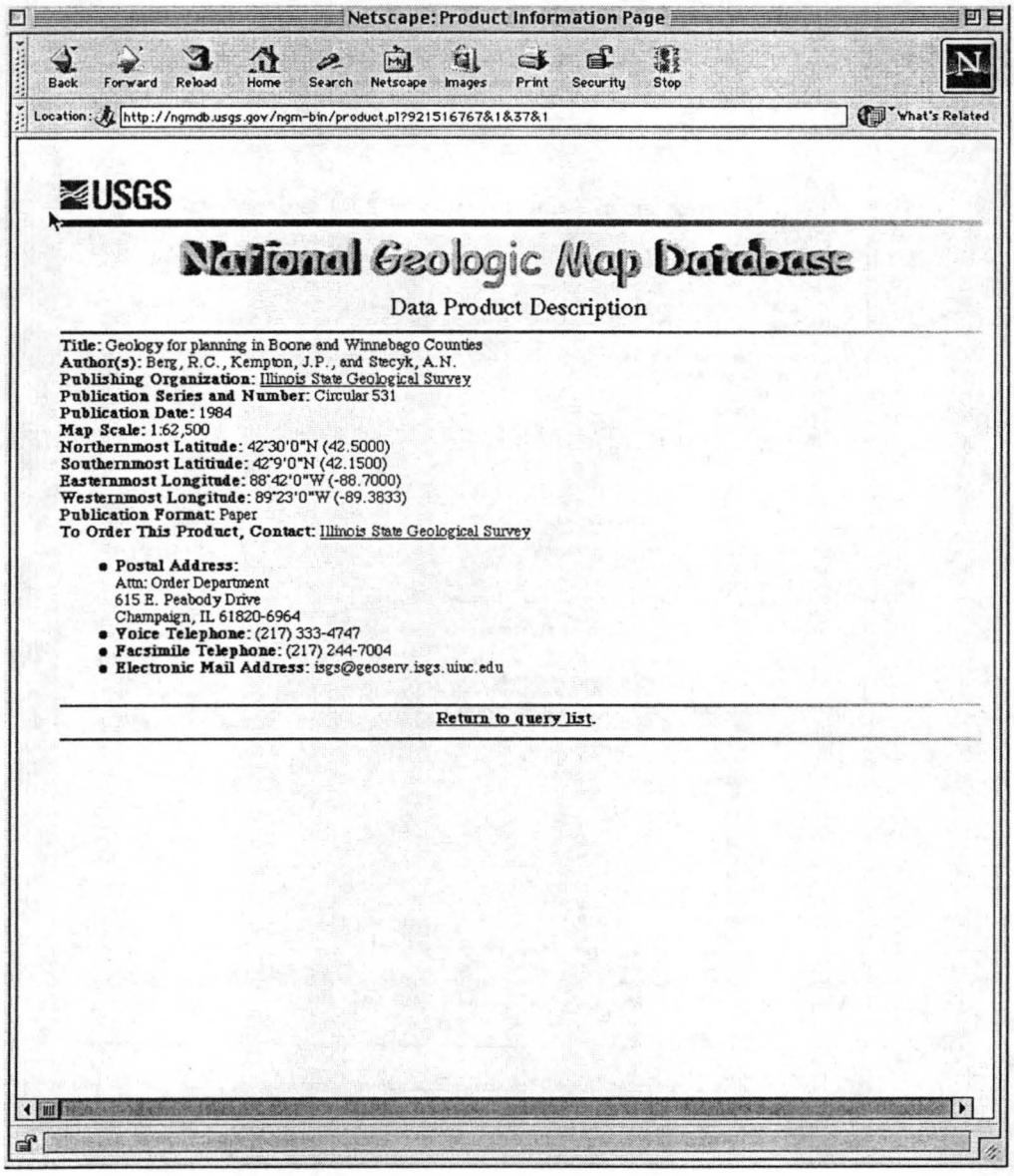

Figure 3. When the user selects a map from list in figure 2, this Product Description Page is shown. This page contains typical bibliographic information and links to the agency that produced the map.

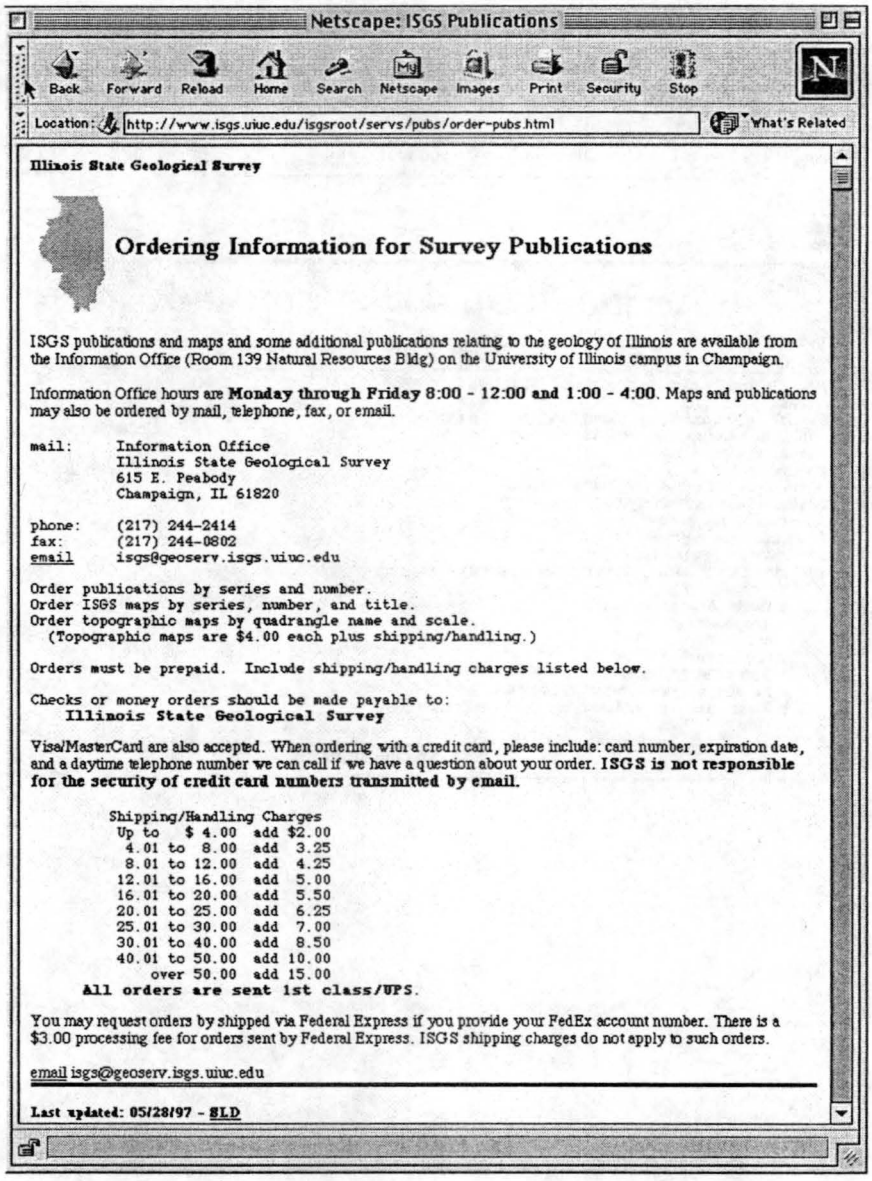

Figure 4. From the Product Description Page (figure 3), the user may want to find product-ordering information. By selecting the link for the line "To order this product, contact:", they are sent to this page from the Illinois State Geological Survey web site.

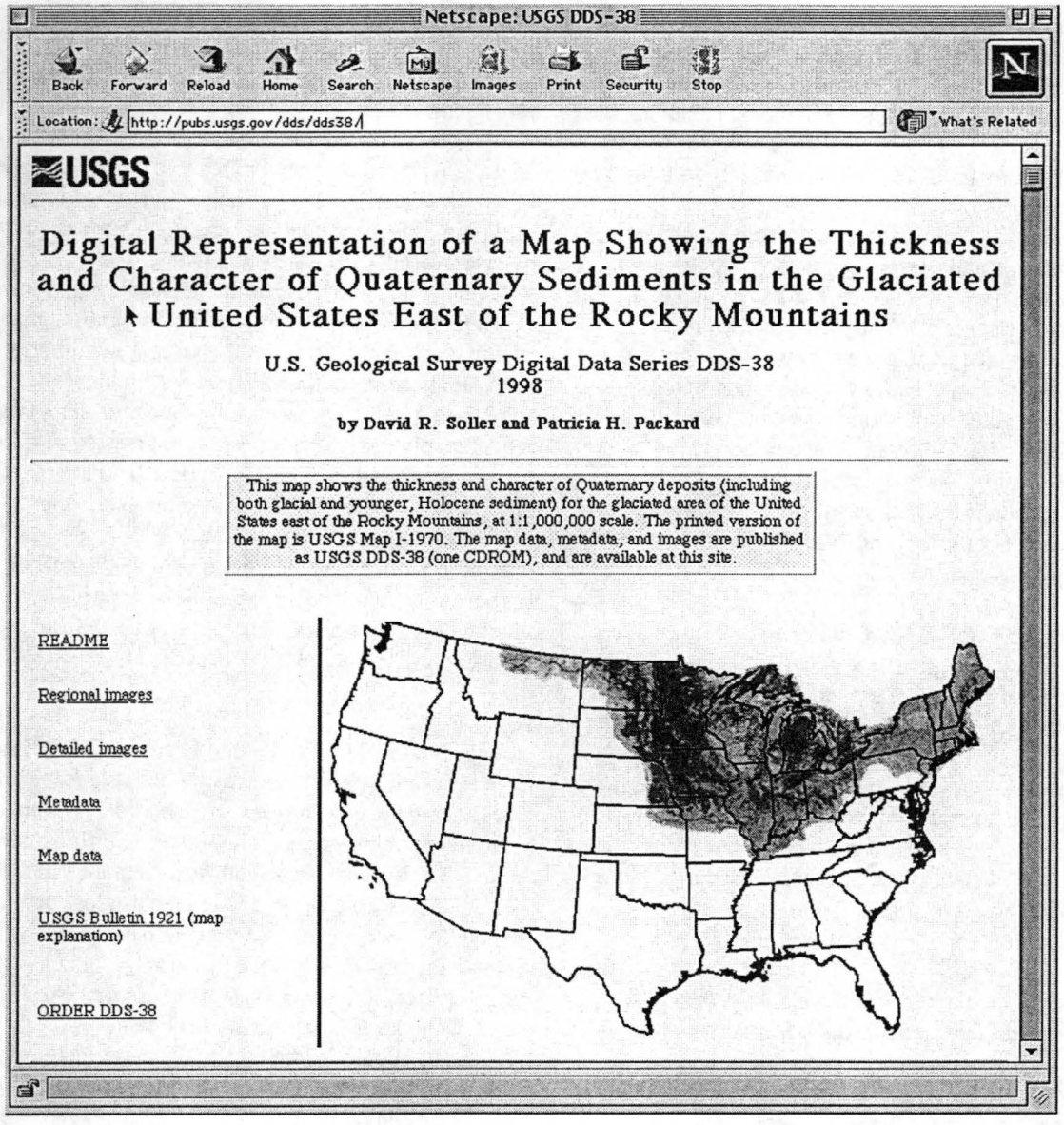

Figure 5. A USGS web site where online map data and supporting information are available directly from the Product Description Page. (Available at http://pubs.usgs.gov/dds/dds38)

returns a "hit list" of maps that meet the criteria; the list is provided in a standard bibliographic format and sorted by map scale, author, and date (figure 2). The user may download to a file the entire list, if they choose. When the user selects a map from the list, a Product Description Page is shown (figure 3). This page contains typical bibliographic information and links to the agency that produced the map. If the agency has a map sales web page, we link to it. Figure 4 shows the Illinois State Geological Survey product ordering web page, which is linked from the Product Description Page.

In the near future, the catalog will contain most of the newer USGS map publications that are available in digital format. For these products, the Product Description Page will provide links to the metadata and to the map data online. Figure 5 shows a USGS site where online map data and supporting information are available directly from the Product Description Page.

We have received from users various suggestions for improving the design and content of the map catalog pages, and have made the appropriate changes. For example, Charlotte Derksen (Branner Library, Stanford University) suggested that, especially while the catalog is incomplete, we provide a listing of map series that are found in the catalog. This page, the "completion status of the map catalog" is now provided. We are now working to implement a suggestion that the Product Description Page include a notification if the map is "in stock" and available for purchase, or "out or print" and available at libraries only.

SOLICITING ADVICE AND COMMENTS

The NGMDB is designed as a tool useable by a wide audience ranging from the research geologist to the general public. Website usage statistics, while notoriously difficult to interpret, can at least provide a general summary of the user community. As shown in figure 6, the NGMDB is used mostly by the general public and the private sector, to help answer a variety of general and specific questions about geology and the availability of maps. Understanding their needs and interests is critical to the success of the NGMDB, just as it is for any library or public-service venture.

We actively solicit advice from the public, through a web-based comment form, and through formal and informal presentations and discussions with potential users. For example, in May, 1998, we held a public forum to evaluate the development plan for the National Geologic Map Database. Forum attendees represented various groups that use geoscience maps, including private industry, non-governmental organizations, K-12 and undergraduate education, libraries, state and local government, professional and trade associations, academia, and the

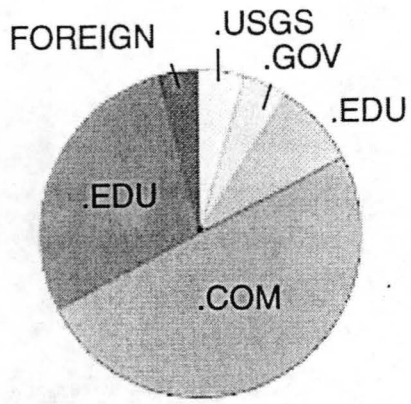

Figure 6. Classification of NGMDB users, derived from website logs.

federal government. Their advice was woven into the NGMDB work plan, and has helped justify additional effort on certain aspects of the plan, specifically the development of standardized, digital geologic maps.

Almost unanimously, forum attendees urged the NGMDB project to accelerate completion of the map catalog, and then to provide more access to digital geologic maps. Implementation of advanced techniques for web-based, interactive display and query of maps was seen as a relatively low priority. We were urged to develop closer ties to the American Geological Institute (specifically, to their GEOREF database) and the Alexandria Digital Library project. Preliminary discussions with these groups have now been completed, and we are working to develop useful links or data-sharing with those two important databases. The results of this forum will be published in 1999 as a USGS Fact Sheet.

SUMMARY

The National Geologic Map Database is intended to serve the public, as a reference tool and as a mechanism for coordinating the development of standards. We are trying to improve public access to the scientific information needed to help address societal issues. In the NGMDB project, and especially within the map catalog, the library community has the expertise needed to significantly improve the content and style of information delivery. We encourage you to contact us, to offer advice. Specific questions about the map catalog's content (or offers of assistance!) should be directed to the coordinator of that effort, Nancy Blair (USGS Western Region Chief Librarian, nblair@usgs.gov).

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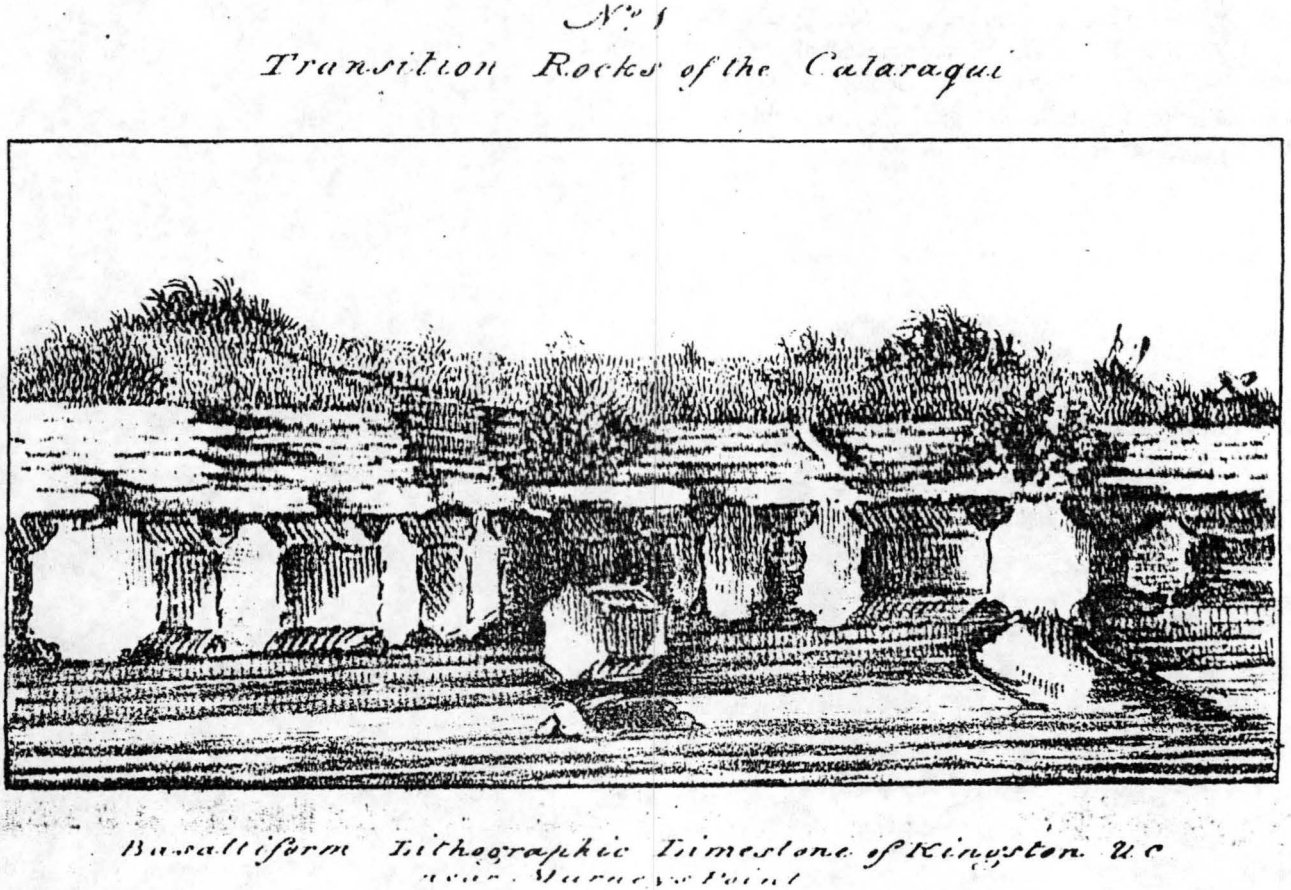

Drawing: Basaltiform lithographic limestone of Kingston U.C. near Murney's Point. *from* Bonnycastle, R.E., 1836, On the transition rocks of the Cataraqui [Ontario]: American Journal of Science, v. 30, p. 233-248.

THE DISSEMINATION OF INFORMATION AT THE KANSAS GEOLOGICAL SURVEY

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Abstract--A primary function of the Kansas Geological Survey is the collection and dissemination of geologic information. The results of geologic research, either in the form of data sets, published reports, or maps are available to the public, as mandated by state law. This information supports research conducted by Survey staff, the petroleum industry, environmental and water-related consultants, and the general public. The development of the Internet now allows for global distribution of information such as on-line publications, maps, and journals, as well as petroleum- and hydrologic-related data resources. Electric log header information for a portion of the Survey's collection and some well locations files are also available. Hydrologic data, including water well drilling records, water-level measurements, and reports/maps from programs, such as the Dakota Aquifer Study, can also be accessed electronically. Electronic access is especially important because the greatest need for water-related data comes from western Kansas and the Survey is located in eastern Kansas. Future projects include electronic access to complete electric logs, driller's logs, measured sections, out-of-print publications, and stratigraphic nomenclature for Kansas. Networking of these data, and links to related sites, is a necessary component of this process. The addition of the staff directory for the Association of American State Geologists to the Survey's homepage permits connecting to other geological surveys with electronic resources. Making geologic information available to a rapidly growing society continues to be a critical issue. However, enhancing this process provides a service to the citizens of Kansas, and research interests as a whole.

INTRODUCTION

In 1866, the "First Annual Report on the Geology of Kansas" was published. The report's author, Benjamin F. Mudge was a professor of Geology and Natural History at the Kansas State Agricultural College, and the first appointed state geologist for Kansas. Since that time, an impressive number of reports and maps describing and evaluating geologic findings in Kansas have been produced at the Kansas Geological Survey. Reports and maps are focused primarily on geologic and hydrologic surveys, oil and gas exploration, geophysical studies, geochemical analyses, and mineral resources. Geologic data such as petroleum and hydrologic records, corings, core samples, and production statistics are also available. Access to reports, maps, and data supports research conducted in Kansas by the petroleum industry, environmental and water-related consultants, the general public, and Survey researchers.

The collection and archiving of geologic data, and the published results of research at the Survey is mandated by state statute. The majority of published reports and maps are still produced in hard copy format. Unpublished documents that are part of the open-file collection and out-of-print publications are also available for the most part in hard copy format. The majority of the data records pertain to the oil and gas industry and water-related records. Electronic access to information is possible through the Survey's homepage on the World Wide Web. Although not required by state statutes to make geologic information accessible electronically, the Kansas Survey supports this effort, viewing it as a service to the citizens of Kansas and as a valuable tool for the research community at large.

DISSEMINATION OF INFORMATION

The dissemination of information at the Kansas Geological Survey is the responsibility of the Publications and Public Outreach Section. Public outreach/education, editing and graphic arts, Web administration, publication sales, and library services are the support areas provided for in this section. The Publications and Public Outreach Section provides, of critical importance, the mechanism that allows results of research in the form of reports and maps to be available for dissemination. Both hard-copy format and electronic access to this information provides a major service for research, economic, and the public needs of the State.

Publication Sales Office

The Publication Sales Office is the primary distribution center for hard-copy published reports and maps produced at the Survey. Reports are printed in quantities as determined by production costs and estimated use. Maps, on the other hand, have been printed on-demand using electrostatic plotters since 1988. All published reports and maps are peer-reviewed and edited. There are four series into which documents are classified: Bulletin Series, Technical Series, Educational Series, and Map Series.

The Bulletin Series is reserved for major works of reference that will have a long shelf life. Examples of titles in the bulletin series include: Bulletin 237, *Geophysical Atlas of Oil and Gas Fields in Kansas*, which contains twenty-six papers that study the application of reflection seismology for petroleum exploration in the mid-continent, and Bulletin 239, *Perspectives on Sustainable Development of Water Resources in Kansas*, which contains ten papers that address the importance of sustainable water development for Kansas from different hydrologic settings. Reports assigned to the Technical Series are less extensive studies, that may not have the shelf-life of the Bulletin, but not necessarily less technical in content. For example, Technical Series 7, *Surficial Geology and Stratigraphy of Russell County, Kansas*, describes the geology of that county and accompanies Map Series 37, *Geologic map of Russell County, Kansas*. Technical series also include statistical summaries, such as Technical Series 12, *January 1998 Kansas Water Levels and Data Related to Water-level Changes*. Reports included in the Educational Series, and Public Information Circulars are directed to semi-technical or non-technical audiences. Educational reports such as *Kansas Rocks and Minerals*, which includes general descriptions of rocks and minerals and tells about the geologic history of Kansas, is used by schools. Public Information Circulars, usually four to six pages in length, discuss issues of current interest. As an example, PIC 5, *Hugoton Natural Gas Area of Kansas*, discusses the history of the largest natural gas field in North America, including not only the geology of the area, but it's economic importance to the state. Maps published in the Map Series include *Geologic Map of Kansas*, and *Oil and Gas fields Map of Kansas*. A catalog of publications is produced annually and is free of charge. Orders for reports and maps are shipped to the customer via standard shipping methods.

Survey Library

The Survey's library is responsible for the collection, management, and distribution of open-file documents. Open-file documents are non-reviewed reports and maps submitted, for the most part, by Survey researchers. The open-file system provides an easy and efficient way to make results of current research available to the public. Approximately 1200 reports are on file, and include project reports, such as Open-file Report 98-2, *The Kansas River Corridor: its Geologic Setting, Land Use, Economic Geology, and Hydrology*, as well as annual reports from the Dakota Aquifer Program. Theses and dissertations, maps, presentations, data sets, guidebooks, computer documentation, and several computer programs are available as well. The majority of the documents are in hard-copy format and are photocopied upon demand. Computer programs are distributed either on diskettes, or may be sent via ftp (file transfer protocol) to the customer. In order to spare unnecessary production costs and to keep storage space to a minimum, only a very few reports are ever printed in large quantities.

To a certain degree, open-file materials fall all to easily into what is known as 'gray literature.' A fairly good example of this would be geology field trip guidebooks. Since guidebooks are not always produced for formal publication, and many times are made available only to field trip participants, survey authors are required to open-file their guidebooks. This invitation has also been extended to geological societies and academic institutions. For example, for the past six years the Kansas Academy of Science has filed their annual multi-disciplinary guidebook as an open-file report. The Survey assumes the responsibility for archiving as well as distribution of the guidebook. Open-file reports are included in the bibliography of Kansas geology, and a new catalog of available titles is compiled every two years. When referenced in the *Bibliography Of Kansas Geology*, the original source is mentioned, but availability of the document is referenced to the open-file series number.

The library loans out-of-print Survey publications at no charge. Since many of the Survey's older Bulletins, such as geology and ground water surveys for a particular county, are still heavily used by environmental consultants and geologists, and are no longer available for purchase, loaning provides a valuable service. There is no service charge attached to the loan and since Survey materials are not copyrighted, photocopying is permitted to the borrower.

Data Resources Library

The Data Resources Library houses the Survey's extensive collection of records related primarily to the oil and gas industry. Additionally, hydrologic data, benchmark data and stratigraphic files are also maintained in the library's collection. At present, the library has the responsibility for archiving and making accessible to the public nearly a million records.

Information from the oil and gas industry in Kansas that includes driller's logs and electric well logs, are required by law to be submitted to the Kansas Corporation Commission by the well drillers, prior to being deposited

with the Survey. After being reviewed by the Commission, records are placed on permanent file with the Survey. These records are critical to petroleum-related research in the state, and heavily relied upon by the petroleum industry, independent consultants, and Survey researchers.

Water-well completion records (WWC5s), required by state law to be submitted by water well drillers to the Kansas Department of Health and Environment, are reviewed at Health and Environment prior to deposit at the Survey. Filing WWC5s with the Department of Health and Environment began in 1975. Information provided on a WWC5 is well location, type, use, casing, and nearest source of contamination. Lithology is included, but water quality data is not. Nearly 120,000 records are on file, and the Survey has the legal responsibility for making the paper copy available for public use. WWC5s are used heavily by the Survey's geohydrology staff, environmental agencies, and other water-related agencies in the state such as the Kansas Water Office, and the Division of Water Resources, Kansas Department of Agriculture.

Information housed in the Data Resources Library is non-circulating. Records can be examined on-site and non-proprietary documents can be photocopied. Data and information available in the Data Resources Library is included in the catalog of publications.

Web Resources

Researchers at the Kansas Geological Survey have relied on computers to analyze and correlate data for many years. With funding from the U. S. Department of Energy for the construction of the "Digital Petroleum Atlas," a new perspective on how information and data can be made electronically accessible via the World Wide Web came into being. Although the World Wide Web was still in its relative infancy in 1994, it has proven to be an extremely effective way of accessing Survey publications, maps, and searchable databases on a more global platform.

Some electronic resources currently available on the Survey's home-page (at http://www.kgs.ukans.edu) are: *Current Research in Earth Sciences*, an on-line journal focusing on current earth science research; petroleum-related open-file reports; educational books, such as *From Sea to Prairie; a Primer of Kansas Geology*; Public Information Circulars; oil and gas field maps; and catalogs of publications.

Searchable data bases include the on-line version of the *Bibliography of Kansas Geology*, *Core Library index*, *Rotary-Cutting Samples Database*, *WIZARD-the KGS Water Information Storage & Retrieval Database*, *Electric Well Logs Database*, the *Plugged Well Database*, and water-well completion records. The databases are easily search by legal description, township, section, and range, or by county. In the case of the electric logs, only header information is available at present. Systems to connect this information to logs that are in digital form are being designed. There is a program in place to scan, and to post on the Website, several hundred driller's logs for the southwest part of Kansas, where the Hugoton gas field is located.

The database for water-well completion records is currently maintained by the Kansas Department of Health and Environment. Information stored in that database has been transferred to the Survey. Numbering over 118,000 records, information can be retrieved by county, or by legal description (section, township, range). Other hydrologic data, such as water-level measurements, and reports/maps from programs from the Dakota Aquifer Study, can be accessed as well. With the Survey located in the eastern portion of the state, it is especially useful to industry and individuals in the western part of the state where the majority of need for water-related data comes to have electronic access to record files.

Networking

Networking to related sites works to the advantage of most users accessing the websites. The web environment expands the information accessed to not only those resources available at the Survey's Website, but guides users to related sites. For example, the Association of American State Geologists' staff directory can be accessed through the KGS homepage. Attached to each state's staff listing is a connection point to their homepage, if available. This connecting point allows for networking between state geological surveys throughout the country. Another example involving state agencies are those connecting pointers used when accessing petroleum information. Users can access the Kansas Corporation Commission's homepage where laws and regulations can be located. The same is true for water-related information where connection pointers to the Kansas Water Office, Department of Health and Environment, and other water-related agencies within the state are available.

Future projects that include using the Web for the dissemination of information are being explored by the survey. The mission of the Data Resources Library is to have all records available electronically at some time in the future. This is definitely not a job that will be accomplished overnight, but prioritizing records, based upon current research needs, is an acceptable method of meeting the mission. High priority has been given to providing electronic access to records pertaining to the Hugoton gas field area, an area where an extensive research endeavor has been given support by the State of Kansas. Economically an important area within the state, the Hugoton gas field has literally thousands of records associated with it. Plans for a searchable database, that includes location information on

driller's logs, attached to scanned images, and electric log header information attached to digitized logs, as well as any other data related to the Hugoton field, are under design.

Another area of interest is in placing still critical out-of-print bulletins on-line. The first title to be processed is KGS Bulletin 176, *Geohydrology of Sedgwick County*, published in 1965. The geologic map that accompanies the bulletin is already available on-line, and the text portion of the report is being scanned. A sensitive area where water issues are concerned, of quality as well as quantity, Sedgwick County has the largest population of any county in the state. The economy and sustained quality of life is strongly dependent upon ground-water issues. Making the Sedgwick County report available on-line provides a service to the public, as well as serving as a demonstration to test the difficulty of making such publications digitally available. It will also be the testing ground to see how heavily this information will be used. Eventually, we would envision a time when all out-of-print KGS publications will be available electronically.

CONCLUSION

The Kansas Geological Survey has long been recognized as a vital research center by private users, industry, and state/federal agencies and has continued to make geologic information available for research, to the citizens of Kansas, and for a rapidly growing society. Regardless of form or format, the KGS holds the responsibility for the collection, archiving, and dissemination of geologic information within the state. Enhancing the dissemination process, by whatever means, provides invaluable information for research interests as a whole.

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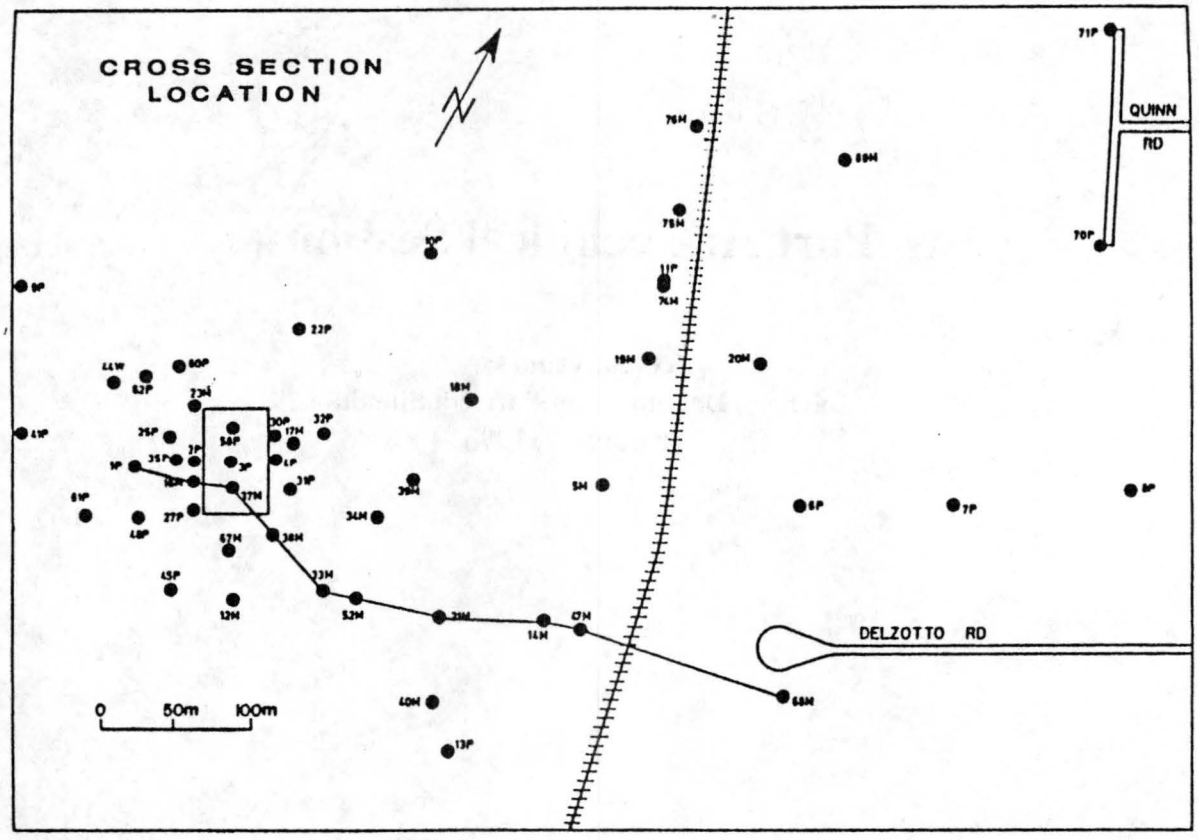
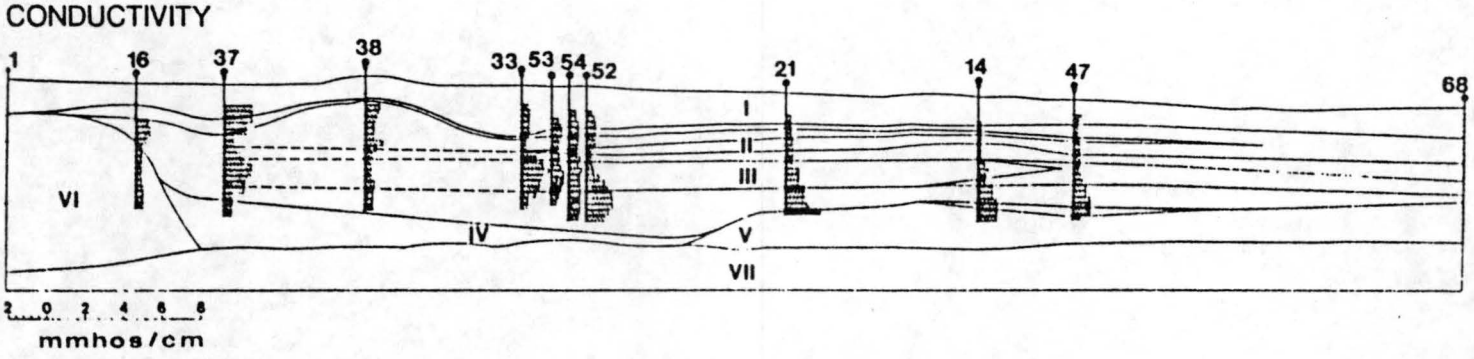
Part II: Technical Session

co-convenors:
Barbara DeFelice and Patricia Sheahan
October 27, 1998





Map and section: Specific conductance profiles along a cross section through the Gloucester site, 1982, showing inferred layering of hydrostratigraphic units. *from* Bahr, J. M., 1984, Hydrostratigraphic interpretation and ground water flow modelling of sedimentary deposits in the vicinity of Gloucester Landfill, Ontario, Canada: Stanford University Master of Science thesis, 90 p.

BUILDING A GEOSCIENCE LIBRARY FOR THE NEXT CENTURY

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Abstract--The family of John Mackay returned some of the fortune made on the Comstock to Nevada in the form of the Mackay School of Mines building. Today, the Mackay School of Mines is a 'center of excellence' in a building on the Historic Register, with a library both physical and virtual to serve the next century.

This paper focuses on the development of a *facility* which was almost considered for demolition, given the requirements of seismic retrofitting. The structure was rebuilt in a method nearly unique for an historic building, using a 'base isolation' method to ensure seismic stability and the interior was renovated to modern code requirements. The geologic re-engineering of the structure will be highlighted with slides taken above and below ground, often on hard-hat tours. But bricks and mortar do not a library make; the structure needed electronic enhancements to meet 21st Century technological expectations: the University's first 100Mb ethernet network was installed linking 30 terminals with either Pentium 33s or 166s which share five networked HP LaserJet 5N printers. The HP NT server and CD-ROM tower provide the backbone to remote access to the earth science resources of the DeLaMare Library. This virtual information center reaches beyond the continent to provide access to geoscience materials.

INTRODUCTION

John Mackay made his fortune on the Comstock. In 1908 the family of this Irish immigrant returned to Nevada some of the $100 million dollar silver and gold fortune he made from the Virginia City mines. The leading architectural firm of Stanford White of New York City was commissioned by the Mackay Family to design the Mackay School of Mines building, a classic 1908 Georgian structure which complements the statue of Mackay sculpted by Gutzon Borglum, later of Mount Rushmore fame. Today, the Mackay School of Mines is a 'center of excellence' whose heart and core originated with this building situated on a tree-lined Quad and now listed on the national Register of Historic Buildings. This building contains a library both physical and virtual to serve into the next century.

In the early days of the University, founded in 1874, as many as 25 percent of the students studied mining. Nevada had been allowed dispensation to the Morrill Act of 1862 which granted public lands to state schools for agriculture and mechanical arts: Nevada substituted mining for mechanical arts.

I do not intend to focus on the typical evolution of a departmental library, although it happened, but on the magnificent and creative redevelopment of a *facility* which was almost considered for demolition, given the requirements and costs of seismic retrofitting. Although the Mackay Mines building was built to modern standards in 1908 for $50,000, the stone and rubble foundations and brick masonry were without reinforcements. This historic building once included not only classrooms and offices but also labs and fire-assay facilities and a basement partially dug over the decades by mining students and often flooded--even in a dry state, and home to non-reading creatures.

FUNDING

The building renovation was completed in stages as funding became available. Federal and private grants funded the initial reconstruction of the building which began in 1990. Four more years passed after the reconstruction and downward extension of the foundations and exterior before an additional $3.5 million was made available to complete the library portion, appropriately from donations from Nevada mining companies, private individuals in mining, and profits from mining royalties held by the University. No state tax funds were used.

RENOVATION OF THE BUILDING

At the beginning of this decade, the overall structure was rebuilt on a foundation using a method nearly unique for an historic building. This 'base isolation' method has been used more in Japan and Europe to ensure seismic stability and prevent damage to the interior, but rarely in the United States (figs. 1 and 2). This method should withstand earthquakes up to 7.5 on the Richter scale. Nevada is nearly as seismically active as California, although it receives far

less notoriety. The base isolation method separates the building from the earth and acts like shock absorbers.

Reconstruction

A construction moat was dug around the entire building. The original simple rock foundation was reinforced with a new foundation resting on 64 'base isolators' or 8 inch thick rubber and steel cushions and 44 'sliders' or Teflon pads to soften the jolt of an earthquake and allow for movement as a unit. The new foundation will help strengthen the building while isolating it from the ground. The building is literally detached from the ground to compensate for the brick masonry which has no reinforcement in the walls. The Mackay Mines building is the only structure in Nevada and only the second historic building in the United States seismically retrofitted in this manner.

Steel beam supports were placed beneath existing floors and new trusses added to existing bearing walls. The final outer walls retain a narrow moat perimeter to create a one-foot clear space between the basement wall and the ground.

Library Completed

In the first phase of renovation, the rear of the building, where most of the library would eventually be located, was completely gutted below the roof line. Where there had been no basement originally, students had literally dug one while practicing their mining skills. A little more organized excavation was needed to provide an additional full floor for the library.

The final phase of construction, the completion of the new library, began in November 1996 and the Mines Library, incorporating the Engineering Library, returned to its original home in July 1997. The library portion consists of 22,000 assignable square feet on 4 floors. Previously the Mines Library, temporarily located for nineteen years on the ground floor of the Main library, had less than 8,000 square feet. The Engineering Library, located in the Engineering building, had less than 6,000 square feet.

Historic preservation stipulations often met head-on with modern needs and code demands, both mechanical and physical, such as handicap requirements. The front of the building, the original portion of 1908, had to be restored to its original design of rooms and floors and the external structure and appearance, could not be altered. Windows were even restored where they had been replaced with doors. The rear portion, the primary location for the library, acquired new floors and walls. The original atrium, simply a center of additions to the building, was glassed on the top floor and included in the library space. The building was lavishly trimmed with oak and the water fountains in the library are, appropriately, gold-plated. (Furnishings and equipment for the library totaled approximately $700,000.)

KECK GRANT

But bricks and mortar do not a *modern* library make; the structure needed electronic enhancements to meet 21st century technological expectations.

The DeLaMare Library, in conjunction with the Mackay School of Mines, was awarded a grant from the W. M. Keck Foundation to purchase the infrastructure to create the 'W. M. Keck Earth Sciences and Mining Research Information Center.' This virtual 'Center' is the navigational gateway for researchers seeking access, both on-site and from remote desktops:

1. to databases served up by the Library,
2. to the geospatial data on the web server and the internet map server,
3. to metadata indexing for the geospatial research network.

We are currently in the process of deploying web-based thin client/server systems to allow multi-platform remote access to bibliographic, spatial and numeric databases that are just now being loaded on the CD-ROM tower on the HP NT server.

The University's first 100Mb Ethernet network was installed in the DeLaMare Library, linking 42 terminals with either Pentium 133s or 166s which share five networked HP LaserJet printers. Seventy 'wet' carrels contain 30 workstations, 25 of which are for public use. Five terminals located in the Ansari Map Library within the DeLaMare Library, have larger monitors to accommodate the GIS projects to be executed on them and are also linked to a laser color printer. The HP NT server and the 200 disc CD-ROM jukebox tower provide the backbone to provide remote access to the earth science resources of the DeLaMare Library.

Network-Based Information Center

The new DeLaMare Library was conceived as a 'network-based information center.' As envisioned by the 'Library Automation System Design' outlined 4 years prior to the move, the goal was to 'add access to mining and engineering databases and to deliver the access tools...directly to the desktop of researchers.' One of the facets of the Design involved promotion of 'interagency networking ... to promote collection and dissemination of information and encourage the mounting and access of information resources through library mounted CD-ROMs, databases, and internet sources, all coordinated by Library staff.' The implementation of this design was expected to occur over three years and has just begun to be initiated this spring.

* * * *

John Mackay's company laid the first transatlantic telegraph cable. What a magnificent progression in the field of technology from that cable to the Ethernet as we prepare to enter the 21st Century.

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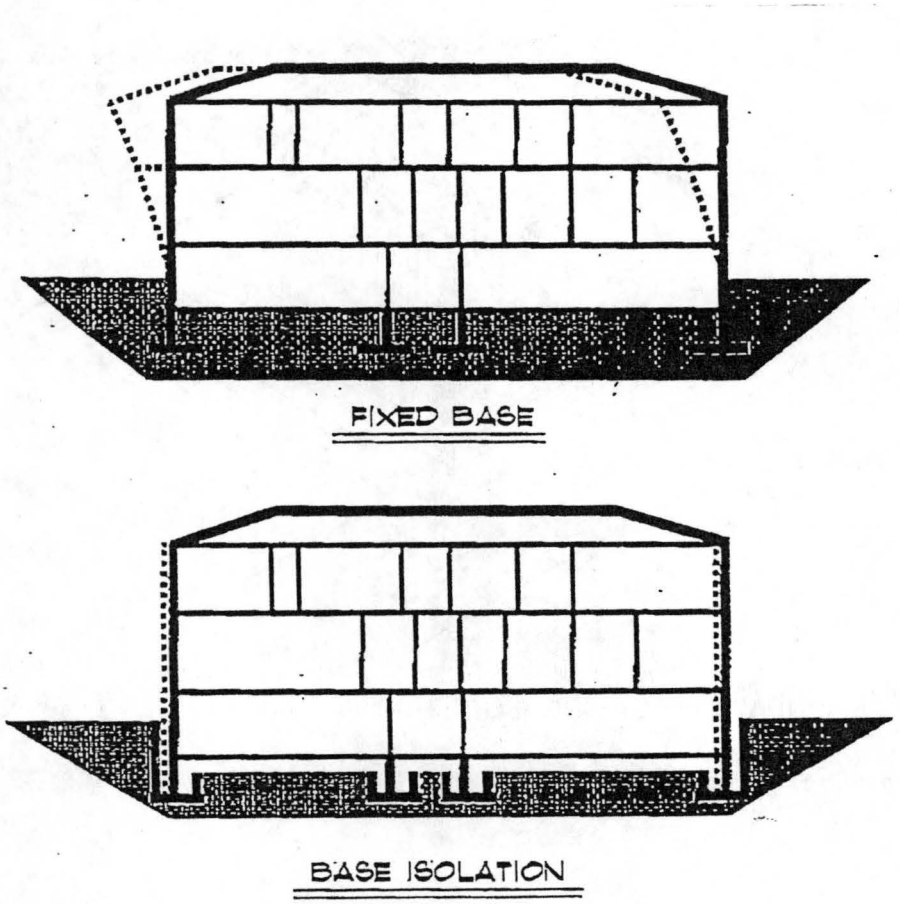

Figure 1. Comparison of fixed base and base isolation building methods.

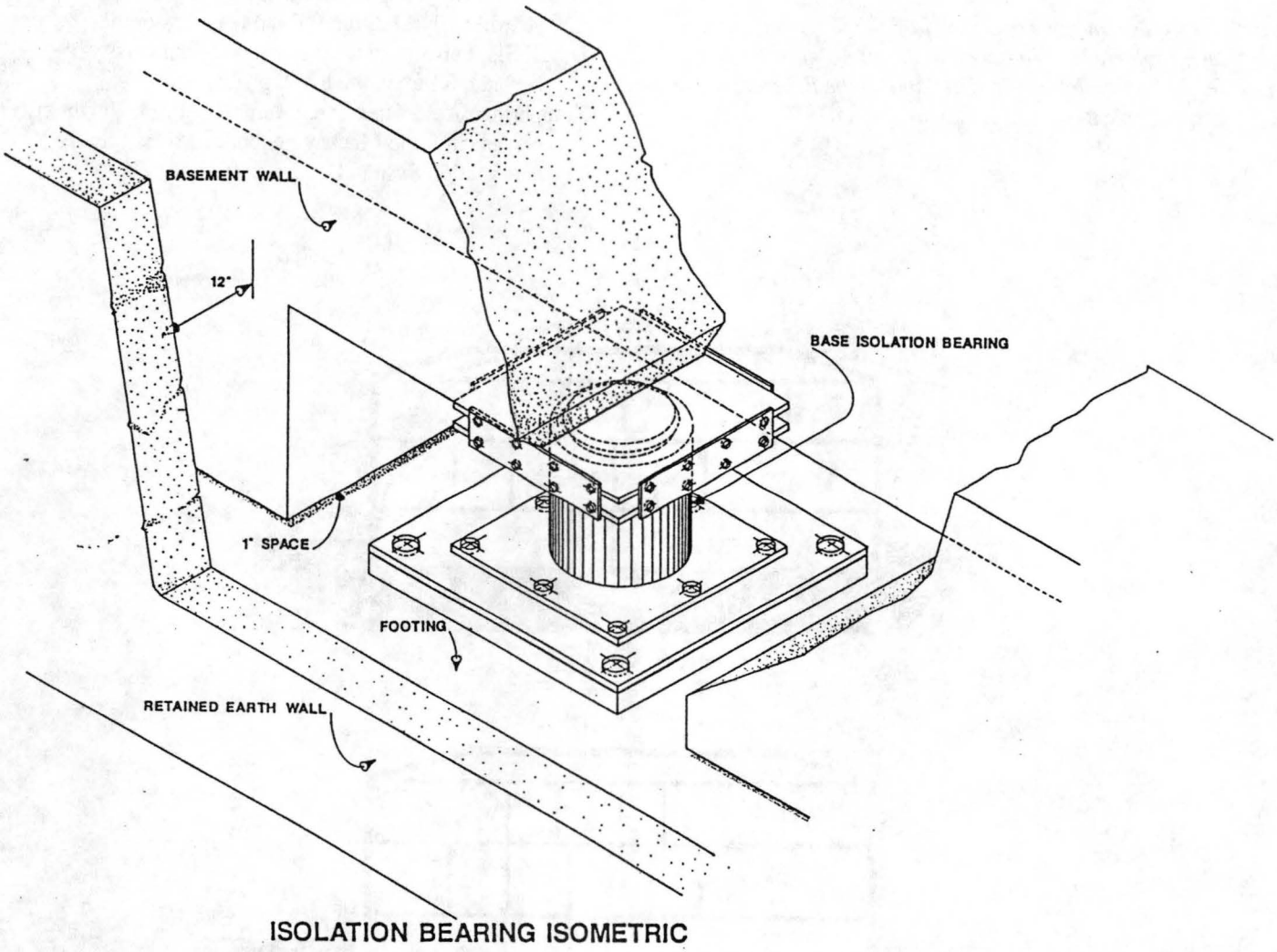

Figure 2. Sketch of isolation bearing isometric.

GEOSCIENTISTS' ACCESS AND RETRIEVAL OF JOURNAL ARTICLES IN AN ELECTRONIC WORLD

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Abstract -- This research investigates the methods of access and retrieval of journal articles which were cited during 1998 by geoscientists from academia, government, and industry. These citations, originally published during 1995-97, were chosen from the bibliographies of current articles in twenty selected journal titles. As a group, these twenty journals were chosen with the goal of representing variety and quality. Each of 107 authors received a personalized letter and brief questionnaire which addressed methods of access and retrieval of one of their cited articles. A very large majority of those participating in the study reported that they used traditional (nonelectronic) methods for both access and retrieval. They also commented on problems and issues in geoscience communication which concerned them. The data provide a snapshot of current information-seeking behavior which may aid in collection development decisions. The return rate of 74% suggests a high level of concern among geologists for their journal literature.

INTRODUCTION

The accelerating adoption of technology, as well as constraints and challenges within our traditional journal systems, continues to revolutionize scientific communication in all disciplines. Higher prices for subscriptions, cancellation of print titles by libraries, increasing availability of electronic journals and indexes, and new communication patterns facilitated by the Internet create a constantly-changing environment for our users. The present research focuses on the geosciences, specifically, the extent to which new trends in geoscience journal publishing, access, and retrieval affect the geologist's information-seeking behavior.

Recent research in these areas has emphasized the effects (and perceptions) of the rapidly-increasing electronic journal access in the sciences from the points-of-view of authors, publishers, and users. (See, for example, Morton, 1997; Resh, 1998; Holoviak and Seitter, 1997; Carr et al, 1997; Holoviak, 1998.) However, much of the commentary on these topics has addressed innovations which are in place or at least technically feasible, as opposed to the actual behavior of the end user.

It is critical that information specialists be aware of the communication patterns of their users and the real problems which they encounter when attempting to deal with systems at their institutions. To investigate these issues, it seems advantageous to contact users directly and ask specific questions. Such was the methodology used in this study. The high rate of return of the questionnaire, which included extensive comments from participants, is evidence of considerable concern and interest on the part of our end users with regard to their journals.

METHODOLOGY

Following a research methodology developed in earlier work (Hallmark, 1994), the author chose twenty geoscience journals from which articles would be selected. These journals, listed in Figure 1, were the source of the corpus of 107 articles which were published between March and August, 1998. Authors of these articles represented academe, business, and government, and all were U.S.-based. The motivation of the geographical restriction was to remove possible variables which might have resulted from a mix of countries and electronic cultures, as well as to avoid practical issues such as foreign postage for return envelopes or delay in receiving questionnaires returned from abroad.

From each of these articles, one citation, published in 1995, 1996, or 1997, was selected. This group of citations represented 53 different journal titles, 56% of which were available electronically from 1995- . The first author (or "corresponding author") of each of the 107 articles received a personalized letter requesting their participation in the project. An example of the letter appears in Appendix 1.

Accompanying the letter was a questionnaire (termed a "brief form" in the cover letter to imply a less ominous and time-consuming procedure), along with a self-addressed,

Figure 1. Journals Used In The Study

AAPG Bulletin
American Journal of Science
American Mineralogist
Bulletin of the Seismological Society of America
Bulletin of Volcanology
Deep-Sea Research
Economic Geology
Geochimica et Cosmochimica Acta
Geophysics
Ground Water
GSA Bulletin
Journal of Geology
Journal of Geophysical Research
Journal of Hydrology
Journal of Paleontology
Journal of Petroleum Geology
Journal of Sedimentary Research
Lithos
Pure and Applied Geophysics
Science

postage-paid envelope (see Appendix II). The questionnaire included two check-lists which provided options for the authors to indicate:

* how they first learned about the article they cited
* how they actually obtained it

Finally, the questionnaire included open-ended questions concerning:

* problems encountered in using electronic journals
* how the Internet had affected their access and retrieval of journal articles
* whether their institution offered any kind of training

Participants also described their specialty in geoscience and the number of years they had worked as a professional (an indirect way of estimating their age).

RESULTS

The return rate in the study was 74%. The original 107 questionnaires dealt with a total of 53 cited journals. Returned questionnaires represented 46 of these 53, a very wide variety of geoscience journals.

Many of the 79 geoscientists who responded offered lengthy and detailed remarks, facilitated by the open-ended aspects of the questionnaire. Of the returned questionnaires, 56% dealt with citations from journals available electronically somehow on the Web. All of the titles are published in print (paper) format. Although 56% of them are available electronically, obviously not all are necessarily available to a given individual, as access usually depends on whether the scientist's institution has subscribed.

Access and Retrieval

Figures 2 and 3 illustrate access and retrieval of journal articles. Two of the 79 respondents accessed their citations electronically; only one geologist retrieved the citation electronically. However, 72% of the respondents overall stated that they do indeed use the Internet to access articles. (*GeoRef*, *Current Contents*, *ChemAbstracts*, and the U.S. Geological Survey web page - were all mentioned.) There is almost no difference in the extent of use of the Internet for journal access between those who have been in the field less than 5 years (80%) and those who reported working 6-15 years (81%). However, this percentage dropped to 69% for geologists who reported working longer than 15 years.

It is interesting to compare the data for access and retrieval in Figures 2 and 3 to results from earlier research on geoscientists which is summarized below (Hallmark, 1994).

Access

Colleague - 37%
Reference in the Literature - 28%
Browsing/Personal Journals - 26%

Retrieval

Library - 49%
Reprint/Preprint - 35%
Personal Journal - 9%

In the earlier study, "references in the literature" played a more significant role in access since the corpus included relatively older citations. (Recall that in the current research, citations examined were no more than three years old.) Similarly, personal journals in the present study played a greater role in retrieval; given the relatively recent dates of the citations, they were more likely to be near at hand in the office. Electronic resources are currently slightly more significant, moving up from 0% for both access and retrieval in 1994 .

A common pattern among the more than half who presently use the Internet to access articles was that, after locating a desired citation, they would then go to their institution's library, their personal journals, or colleagues (to request reprints) to actually retrieve the article. Several commented that they had become more efficient and tended to spend less time in the library than formerly. For some, this situation did not necessarily seem an improvement:

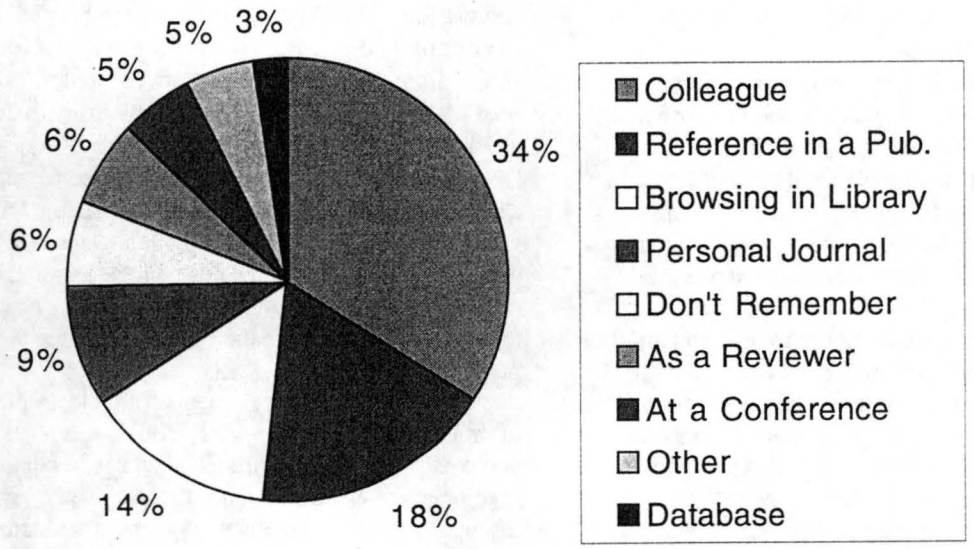

Fig. 2. Journal article access

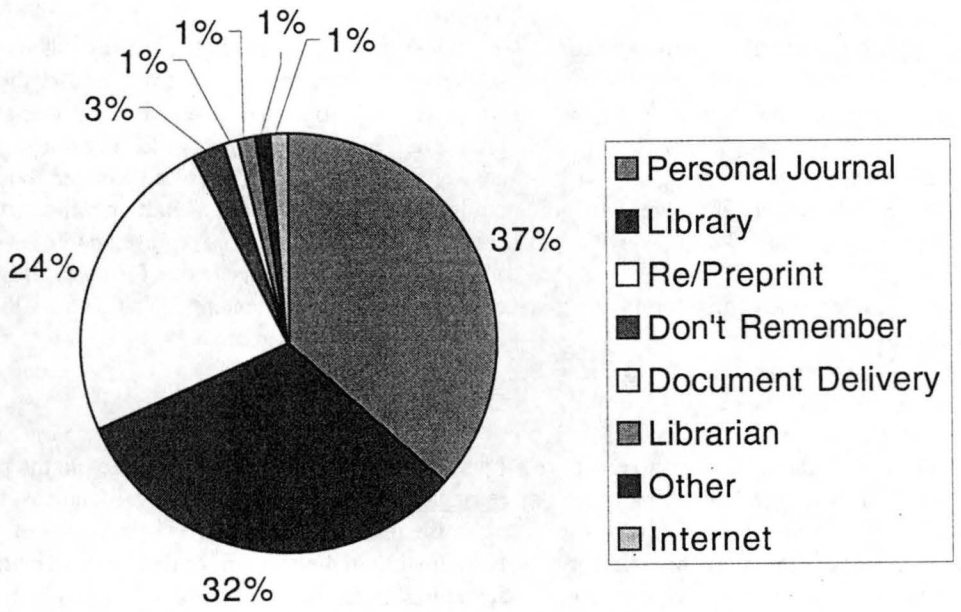

Fig. 3. Journal article retrieval

- "I no longer have to go to the library so much. It's more efficient. In some ways that's not so good--I only retrieve what I know about."
- "I've been getting lazier about going to the library, which actually isn't a good thing, since I miss reading as wide a range of articles as I should."
- "I access material from my office, then decide whether or not I want to go to the library for a paper copy"
- "Our library started to cancel subscriptions that are too expensive (such as Elsevier journals) and use the argument that there is electronic access, but I have difficulties accessing electronic journals. Apparently, one can access with the correct privileges from the computer at my desk, but I have to go to the computers in the library. At this point I wish there were a hard copy in the library; it would be faster to photocopy."

The first two remarks reflect the decreasing influence of serendipity as a significant factor in discovering interesting journal articles, a situation to which several respondents alluded.

Only 4% of the respondents stated that they use the Internet to retrieve articles. And a rather surprising 28% don't use the Internet at all for access or retrieval.

Problems

One-third of the returns described problems with access, downloading, and formatting electronic journal articles. Difficulties with access included limited availability of electronic backfiles, particularly annoying for geoscientists, given their need for older material relative to other disciplines. And search engines are often problematic:

"Commercial search engines, even when using the 'advanced features,' cast too broad a net. [I often feel I'm wasting my time.] I always find hits which I don't know why they are there."

A geologist in his early 30s described frustration with passwords, also commented upon by others:

"I have 'subscribed' to *Nature*'s home page. I did this to check for current articles every week in this journal. I find the process somewhat cumbersome because I needed a password, and it took about 10 times to enter an acceptable password. In the future I need this password to re-logon. I have already forgotten what I used. Bottom line -- it is still easier and more efficient to go to the library; however if the Internet were easier I would use it."

Respondents provided numerous examples of problems which they dealt with routinely in retrieving articles. Crashes of various sorts--Acrobat Reader, Netscape, the Mac--were a common complaint, as was unacceptably slow downloading. Respondents found graphics often difficult to deal with, whether downloading or formatting for electronic submission. Many wanted more training for such activities as printing PDF files and formatting graphics for electronic submission, as well as downloading graphics.

When geologists described problems with downloading articles, words and phrases such as "slow," "frustrating," "too much time," and "irritating" appeared frequently. Of course, it is more likely that dissatisfied users will take time to comment; the two-thirds of the respondents who did not elaborate extensively on problems in access and retrieval may have been happy with their experiences or were among the 28% who do not use the Internet at all for these purposes.

Frequently-missing elements from electronic versions of articles include discussions, replies, and maps. Many geologists join their librarian colleagues in bemoaning the high prices of electronic journals. And some expressed disappointment with the lack of access for electronic journals unless a subscription has been placed:

- "For many journals if you or your library does not subscribe to the journal you will be denied access to that journal."
- "I get frustrated that not all journals are free."
- "I'm annoyed at having to subscribe to e-journals when all I want to do is browse 1 or 2 articles or download them."

Training

Twenty-two percent of the returns stated that their institution offers a training program, or they thought there was a training program or probably there was a training program. That the remainder of the participants had no answer to this question makes one wonder about the publicity (or lack thereof) for training opportunities which are provided by the libraries represented in the study.

Perhaps one geologist spoke for many of his or her colleagues with the statement, "What I really love is one-on-one help from my librarian."

CONCLUSION

Based on this investigation, one can conclude that the Internet is having no measurable effect on the physical retrieval of journal articles in the geosciences, but is having a significant effect on access. The majority of geoscientists participating in the study have developed a pattern of searching for useful references on various Internet sites and then retrieving articles in their library (either in the collection or through document delivery). The Internet's role in enhancing communication and collaboration among colleagues has revolutionized scientific communication in recent years. It is obvious that this aspect of Internet use has had an enormous effect in facilitating awareness,

recommendations, and exchange of preprints and reprints among colleagues.

A similar study of other disciplines, of course, would likely result in very different findings. Physicists, for example, are heavy users of their preprint databases (refereed or not). The author is currently undertaking a similar study of chemists which may also provide some interesting contrasts.

Enhanced and expanded training for our users is a critical need. The frustration encountered in downloading, formatting graphics, printing PDF files, etc. was dramatic. And more publicity for the training that is offered is critical, as so many participants in the study really had no notion whether or not their institution made training available. Finally, given the wide variety of problems and frustrations expressed by participants in the study, our users clearly would appreciate more pne-on-one personal assistance, a point which has frequently been made in user studies.

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APPENDIX 1
Example of Letter Mailed to Geoscientists

[letterhead]

September 25, 1998

Dr. Igor I. Mazin
Naval Research Laboratory
Washington, D.C. 20375

Dear Dr. Mazin:

In your recent article, "Possible polytypism in FeO at high pressures," published in July this year in the *American Mineralogist*, you cited the following reference:

> Manga, M. and Jeanloz, R. (1996) Implications of a metal-bearing chemical boundary layer in D" for mantle dynamics, Geophysical Research Letters, 23, 3091-3094.

I am investigating the ways by which geoscientists first become aware of and then actually obtain the journal articles which they cite. I am also curious whether the Internet and new electronic alternatives adequately substitute for journals which have been cancelled in libraries.

Studies such as this one which contribute to our knowledge of the information-seeking behavior of scientists should provide useful data for improving access to the journal literature, so critical to the scientific endeavor. Would you please take a moment to complete the enclosed brief form and return it to me in the self-addressed envelope? If a co-author came up with this reference, please forward this request to that person.

Thanks very much for your help.

Sincerely,

Julie Hallmark
Professor
hallmark@gslis.utexas.edu

APPENDIX 2
Questionnaire

I FIRST LEARNED OF THIS JOURNAL ARTICLE THROUGH:

_____ a reference in a publication which I read

_____ a suggestion, reprint, or preprint from one of my colleagues

_____ a suggestion from a librarian or other information specialist

_____ reviewing the article for a refereed journal

_____ a seminar or conference which I attended

_____ an electronic database such as GeoRef or ISI's *Science Citation Index*

_____ a printed (traditional) abstracting/indexing service such as the *Bibliography and Index of Geology*

_____ an automated current awareness or SDI (Selective Dissemination of Information) service, such as Carl Uncover/Reveal, in which references are sent to me automatically based on my subject interest profile

_____ a traditional current awareness service such as *Current Contents* or other table of contents service (print, CD-ROM, etc.)

_____ browsing in the library (current journal area, etc.)

_____ browsing in one of my personal (paper) journals

_____ surfing the Internet

_____ don't remember

_____ other (please explain)

I OBTAINED THIS JOURNAL ARTICLE THROUGH:

_____ my library, which subscribes to this journal

_____ my personal journal collection

_____ document delivery service or interlibrary loan through my library

_____ full-text journal file on the Internet

_____ electronic copy from a web site (other than that of a journal) such as a personal site maintained by the article's author

_____ my personal database of potentially useful citations

_____ preprint, reprint, or other photocopy

_____ a librarian who gave it to me without my specific request

_____ don't remember

_____ other (please explain)

——

What is your specialty? Please be as specific or as general as you wish.

How many years have you worked as a professional geologist or geophysicist?

_____

Please describe problems, if any, you have encountered with accessing, downloading, and formatting electronic journal articles (completeness? software for graphics?).

Does your organization offer training sessions to aid users in dealing with formatting or other obstacles connected with electronic files?

Please tell me the most significant effect that the Internet has had on your <u>access</u> and <u>retrieval</u> of journal articles?

MINE MAP REPOSITORIES IN PENNSYLVANIA AND THE UNITED STATES

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Abstract-- Since the 1800's Pennsylvania law has required mine operators to deposit a map of the mine with the local mine inspector. Drawn by mine operators and engineers using whatever materials were at hand - cloth, canvas, paper, etc. - these maps are unique in the level of information they contain. The materials upon which they are drawn, their age, size, and unique content combine to make mine maps a valuable resource for engineers, geologists and homeowners. Mine maps are housed in various locations throughout the state of Pennsylvania, in state and federal repositories, libraries and private collections. This paper highlights the value and condition of mine maps and describes the state and national mine map repositories.

INTRODUCTION

Pennsylvania is an old state, over 200 years old and mining has always been a major industry in the state. Throughout most of its history, Pennsylvania led the nation in mineral production. It is also one of the most heavily populated states in the country. Combine a large, growing population with extensive historic mining operations and you can expect some conflicts.

Knowledge of the location and extent of previous mining activities is of great importance to a variety of populations. Certainly homeowners want to know if there is a mine under their house. Realtors are interested for reasons similar to the homeowner. Mining companies, using new extraction techniques, can potentially re-mine previously mined areas. Planners and engineers need to know for project decision planning. Government inspectors need to know for reasons of health and safety, rescue operations and environmental quality. Geologists are interested for reasons of mineral reserve estimation, sample collection and exploration.

There are few libraries that collect mine maps, however, various repositories do exist. This paper will describe repositories in Pennsylvania, the maps in these collections and their storage, and discuss the status of mine map repositories in the United States at large.

PENNSYLVANIA REPOSITORIES

In the late 1800s, the legislature of Pennsylvania enacted various laws pertaining to coal mining. As part of these laws, it required the mine operator to "make an accurate map or plan of the workings... at a scale of 100 feet to the inch". The map was required to show various details such as slope and passages. The law further required that a certified copy of the map must be deposited with the inspector of mines in that district. Non-compliance could result in closure of the mine. In cases of mine abandonment or completion of mineral extraction, a final certified map was also required. Laws such as this can be found in other states, though specifics such as scale will vary.

Certainly, many mine operators complied with the laws during operation. Unfortunately, given human nature and the sometimes adversarial relationship between mine inspectors and operators, deposit of maps upon abandonment was not automatic. Indeed, once you start to ask, it isn't uncommon to hear of maps being destroyed rather than deposited. One inspector interviewed described a company that burned all its maps rather than send them to a repository.

There are currently five mining districts in Pennsylvania but only two repository locations. Active mine maps are kept by the inspectors in each of the five regions while maps of abandoned mines are sent to one of the two repositories. The eastern repository located in Pottsville holds maps for mines of anthracite coal and other non-coal minerals; the western repository located in Uniontown holds bituminous coal mine maps. The Pottsville facility houses approximately 1200 maps and the Uniontown facility holds nearly 3000 maps. These repositories are overseen by the Pennsylvania Bureau of Deep Mine Safety.

The eastern repository is located in the basement of a converted Packard-Hudson garage in downtown Pottsville. The rolled maps are filed alphabetically by mine name on industrial shelving. A 1905 map showing the anthracite

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coal fields of Pennsylvania is used as the index to the coal maps in the collection as few new anthracite mines have opened since that time. A card index was created at one time however the information is quite dated.

Anthracite maps use color to indicate various seams and while generally not overly wide (usually not more than 54 inches) they can be extremely long, ranging from one foot to over twelve feet in length. The maps were drawn on a wide variety of materials, depending on what was available at the time such as velum, linen, drafting paper, blue line prints on newsprint, and canvas.

The western repository in Uniontown is also located in a basement. Maps are stored as folded bundles in drawers. An index is maintained and copies of many of the maps are available in monochrome aperture card format. These maps are also drawn on a variety of materials but are generally much larger in size. Bituminous maps are large in both dimensions, with some as big as twenty feet by thirty feet!

Unfortunately, these repositories do not have all the maps of mines that ever existed in Pennsylvania. In some cases, unique maps can be found in the collections of other state agencies such as the Pennsylvania Bureau of Abandoned Mines and Reclamation, the U.S. Office of Surface Mining Reclamation and Enforcement - Pennsylvania Field Office, the Pennsylvania State Archives, the Pennsylvania Geological Survey, and the mining district offices. Additionally, unique maps are owned by mining companies, libraries and citizens.

Given all these players one might expect that there would be a high degree of cooperation between these agencies. Unfortunately this is not the case. Most do not know which collection has what map and there is some reluctance to even share collections. This situation is apparently not uncommon in other states.

NATIONAL REPOSITORIES

At the national level, the National Mine Map Repository (NMMR), located in Pittsburgh, PA, collects and archives mine maps for all the United States. Operated by the U.S. Office of Surface Mining Reclamation and Enforcement (OSMRE), it was established in 1970 by the U.S. Bureau of Mines to collect maps of abandoned mines. From 1970 to 1983 there were four regional offices located in Pittsburgh (Pa.), Denver (Co.), Spokane (Wa.) and Juneau (Ak). In 1986 the Bureau of Mines closed these

Table 1: Holdings of NMMR by state as of June 1997[2]

Alabama	353	Kentucky	4,587	North Dakota	5
Alaska	2	Louisiana	0	Ohio	7,703
Arizona	927	Maine	541	Oklahoma	731
Arkansas	360	Maryland	558	Oregon	333
California	232	Massachusetts	60	Pennsylvania	11,293
Colorado	7,036	Michigan	10,795	Rhode Island	0
Connecticut	475	Minnesota	3,066	South Carolina	54
Delaware	4	Mississippt	84	South Dakota	751
District of Columbia	0	Missouri	8,456	Tennessee	1,155
Florida	0	Montana	727	Texas	1
Georgia	743	Nebraska	0	Utah	647
Hawaii	0	Nevada	940	Vermont	114
Idaho	577	New Hampshire	230	Virginia	8,283
Illinois	2,670	New Jersey	378	Washington	502
Indiana	2,625	New Mexico	121	West Virginia	45,458
Iowa	2	New York	1,184	Wisconsin	504
Kansas	537	North Carolina	1,598	Wyoming	550

operations and the OSMRE took over the Pittsburgh collection and operation. The collections at Denver and Spokane were moved to Pittsburgh in 1996; the Juneau collection remains in Alaska.

The NMMR collection consists entirely of aperture cards and microfilm. Mine maps are photographed using a planetary camera with monochrome film. There are over 300,000 images representing over 130,000 mines. Most of the maps are of underground mines, primarily coal but all types of mines can be found. The index maintained by the NMMR is a searchable database with fields for mine name, owner, UTM coordinates, quadrangle name, mineral type, and so forth. Currently, the NMMR staff is converting the aperture cards to image files by scanning them at 300 dpi and storing them as TIFF images. Their goal is to make their collection available via the Web in 1999.

Despite the size of the collection, it is not comprehensive. As shown in Table 1, some states have sizeable maps on file while others have few to none. If the example of Pennsylvania is any indication, many other states are even less organized with their mine maps. Given their unique and valuable nature, it behooves us all to do what we can to preserve these materials for future use.

References

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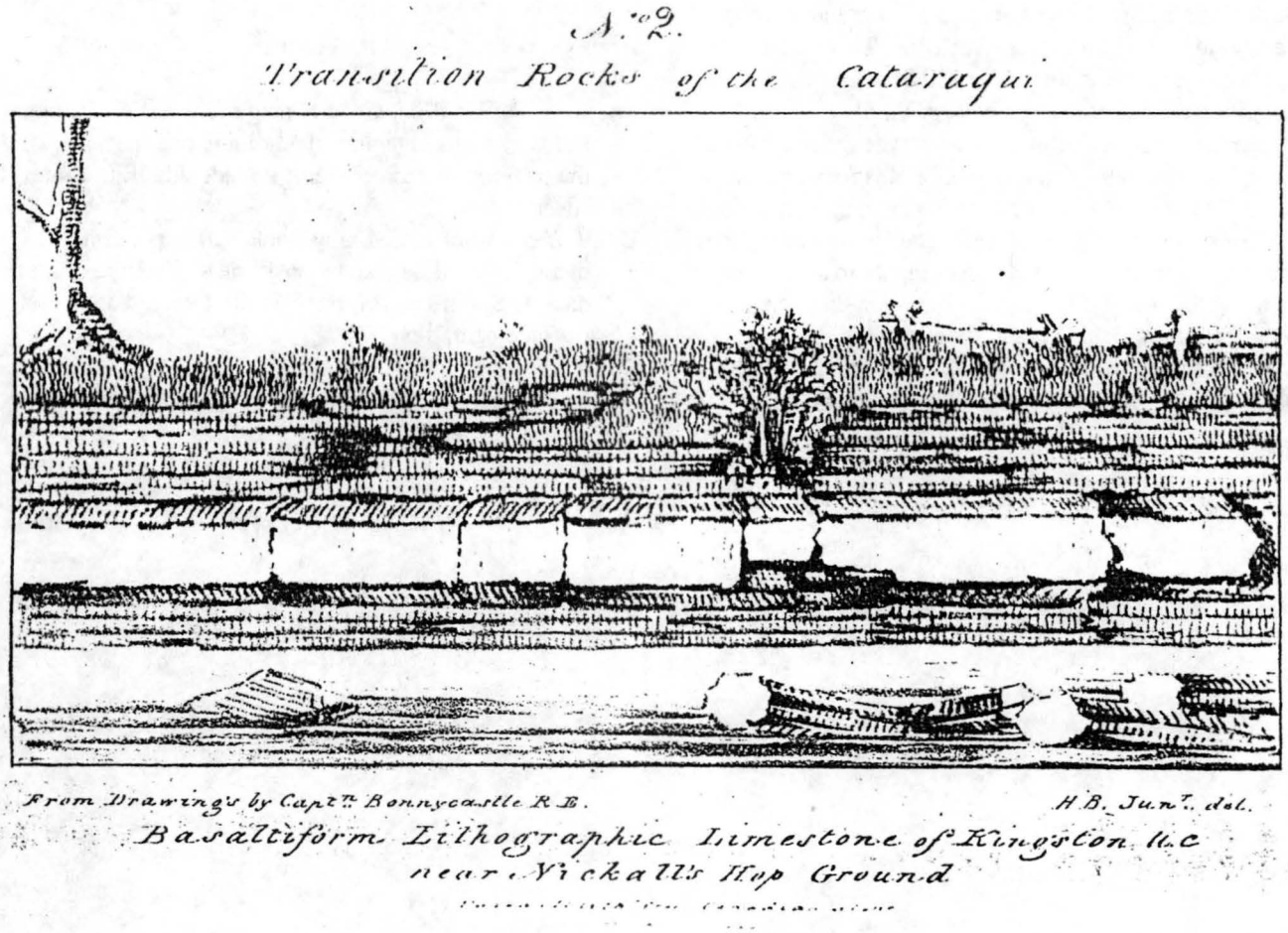

Drawing: Basaltiform lithographic limestone of Kingston U.C. near Nickall's Hop Ground. *from* Bonnycastle, R. E., 1836, On the transition rocks of the Cataraqui [Ontario]: American Journal of Science, v. 30, p. 233-248.

Part III: Poster Session

October 26, 1998

DEVELOPMENTS IN THE PRESERVATION OF GEOSCIENCE LITERATURE

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Abstract--The usefulness of the geoscience literature can be measured in centuries rather than in decades. Unfortunately the bulk of the historic geoscience literature has been published on acidic paper with the result that materials are crumbling on library shelves. In addition, many volumes contain maps and illustrations often produced in color and printed on folded sheets that are either bound into the text or housed in pockets in the binding. The inclusion of these oversized, color, folded maps and illustrations have made it impractical for geoscience materials to be preserved en mass by libraries. Instead, much geoscience material has had to be preserved piece-by-piece. As a result the majority of the geoscience literature has been passed over in preservation efforts to date. Recent technological advances, however, offer some economical and viable solutions for preserving this literature. Several new technologies are described and summarized. International initiatives underway to preserve the geoscience literature are also described.

THE CHALLENGE

The frequent presence of folded pages, plates, oversize maps and illustrations, many in color, has made geoscience materials difficult to preserve; thus it has frequently been omitted from preservation efforts within libraries (Wishard & Musser, 1999). The non-traditional format of geoscience literature not only precludes using standard preservation treatment, but also in many cases hastens its demise. For example the binding on oversized volumes frequently degrades faster than those of standard sized volumes, while folded plates often crack and disintegrate along fold lines. Affordable technologies for preserving color images were not readily accessible until recently.

Other factors contributing to the challenge of preserving the geologic literature are patterns of its use, as well as the period during which the bulk of the classic works were published. By the nature of the discipline, the literature of the field remains viable for longer periods of time than does that of most scientific fields. It is not uncommon for researchers and scientists to use literature published centuries ago--geologic maps prepared during the original survey of a nation or region, analysis of core samples and specimens, and paleontographic plates and renderings all convey information as relevant today as when they were prepared or photographed decades and centuries ago. In addition, the period during which geological publications saw their largest growth, 1860-1950, coincides with the period, during which most publications were printed on acidic paper. Thus a viable and important literature remains unpreserved, and slowly disintegrating on library shelves worldwide.

This poster presentation was an effort to raise awareness of the affordability and variety of treatments that are currently available to treat this unique literature.

PRESERVING THE ORIGINAL DOCUMENT

The techniques outlined in Table 1 strive to preserve the original document through reinforcing the document (encapsulation, binding, backing, phase boxes) or by neutralizing harmful elements in the document's environment (deacidification, cleaning). Examples at the poster session included a map that had been encapsulated (in-house) with a sheet of alkaline buffer paper. There was also a photographic display of an oversized atlas volume of which each sheet was deacidified and encapsulated and then all of the sheets were re-bound into a post-bound volume.

TRANSFORMING THE ORIGINAL DOCUMENT

Table 2 contains average costs for transforming a document. A transformed document can be a facsimile photocopy (black and white or color) or print based upon a digital scan or film of the original document. Transformed documents could also exist in a completely new medium such as a digital file, a photographic print or negative, as well as on microfilm (monochromatic or color). Examples of filming that were included in the poster session included a color microfiche image of an oversized atlas volume and a black and white film aperture card image of an oversized mine map. There was a color photocopy of a small (8.5 inches by 11 inches) map as well as a color photographic print of an oversized (36 inches by 42 inches) map. Two color digital images were also included. (One of the digital

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Table 1. Preserving the Original Document

Costs to preserve an original document	
Mass deacidification (<100 vols.)	$20/volume
Mass deacidification (100+ vols.)	$16/volume
Deacidification, spray treatment, map	$15/sheet
Encapsulate single map, in-house	$5-14/sheet
Encapsulate single map, out-source	$11/sheet
Binding single book (avg. size 9"x12"x2")	$10/volume
Postbinding map sheets (25 sheets/vol., incl. deacid. & encapsul.)	$225/volume
Phase box, brittle text (avg. size 9"x12"x2")	$18/volume
Phase box, brittle text (oversized material)	$20-45/volume
Phase box & tubes, brittle & rolled maps	$15-40/sheet
Surface clean, repair by professional conservator	$25-75/hour
Reback maps with linen, etc.	$500-1,000/sheet

Table 2. Transforming the Original Document

Costs to Transform an original document	
B/W photocopy, book (<11"x17", avg. 300 pg.)	$20/volume
Color photocopy, book (<11"x17")	$1-2/page
B/W photocopy, map (>11"x17")	$3/sheet
B/W photocopy, map (<11"x17")	$.20/sheet
Color photocopy, map (<11"x17")	$1-2/page
Digital scan-to-print, book (<11"x17", avg. 300 pg.)	$80/volume
Digital scan-to-print, map (<11"x17")	$10/sheet
Digital scan-to-print, map (>11"x17")	$35/sheet
Digital file (GIF, TIFF, etc.), book (<11"x17", avg. 300 pg.)	$65/volume
Digital file (GIF, TIFF, etc.), map	$20/sheet
Film-to-print, map (>11"x17")	$100/sheet
Film, photographic slide (<20"x30")	$2/sheet
Film, photographic negative (<20"x30")	$5/sheet
Microfilm, book (avg. 300 pg.)	$109/volume

images used 256 no-color matching and the other employed 24-bit full-color matching. Both were scanned at a 300 dot per inch resolution.)

GEOSCIENCE INFORMATION SOCIETY PRESERVATION COMMITTEE

Information regarding the activities of the Geoscience Information Society (GIS) Preservation Committee was also profiled in the poster session. The Geoscience Information Society Preservation Committee has coordinated several international initiatives to raise awareness of preservation issues related to the literature of the geosciences. These activities of the Committee are described in detail on the Committee's Web site (http://www.libraries.psu.edu/emsl/guides/gis/gispresv.html).

Activities of the Committee include:

1. An Action Plan for preserving the literature of the geosciences
2. Profiles of preservation projects outlining techniques and

results

3. A bibliography of preservation literature related to geoscience material
4. An international survey of geoscience libraries to identify preservation priorities and projects.

The activities of the Committee are also chronicled in a forthcoming article written by Lisa Wishard entitled, "Activities of the Geoscience Information Society Preservation Committee." (Wishard, 1999).

CONCLUSION

This poster session through its samples of preserved and transformed items, outline of average costs and profile of preservation activities taking place in the geosciences sought to raise consciousness about the viability of preservation options for the unique literature of the geosciences. It is the hope of the authors that the poster session demonstrated not only the results of, but also access to preservation treatments for geoscience literature. And thus, that the increased awareness of the accessibility to preservation methods will encourage more preservation activities to take place in geoscience libraries worldwide.

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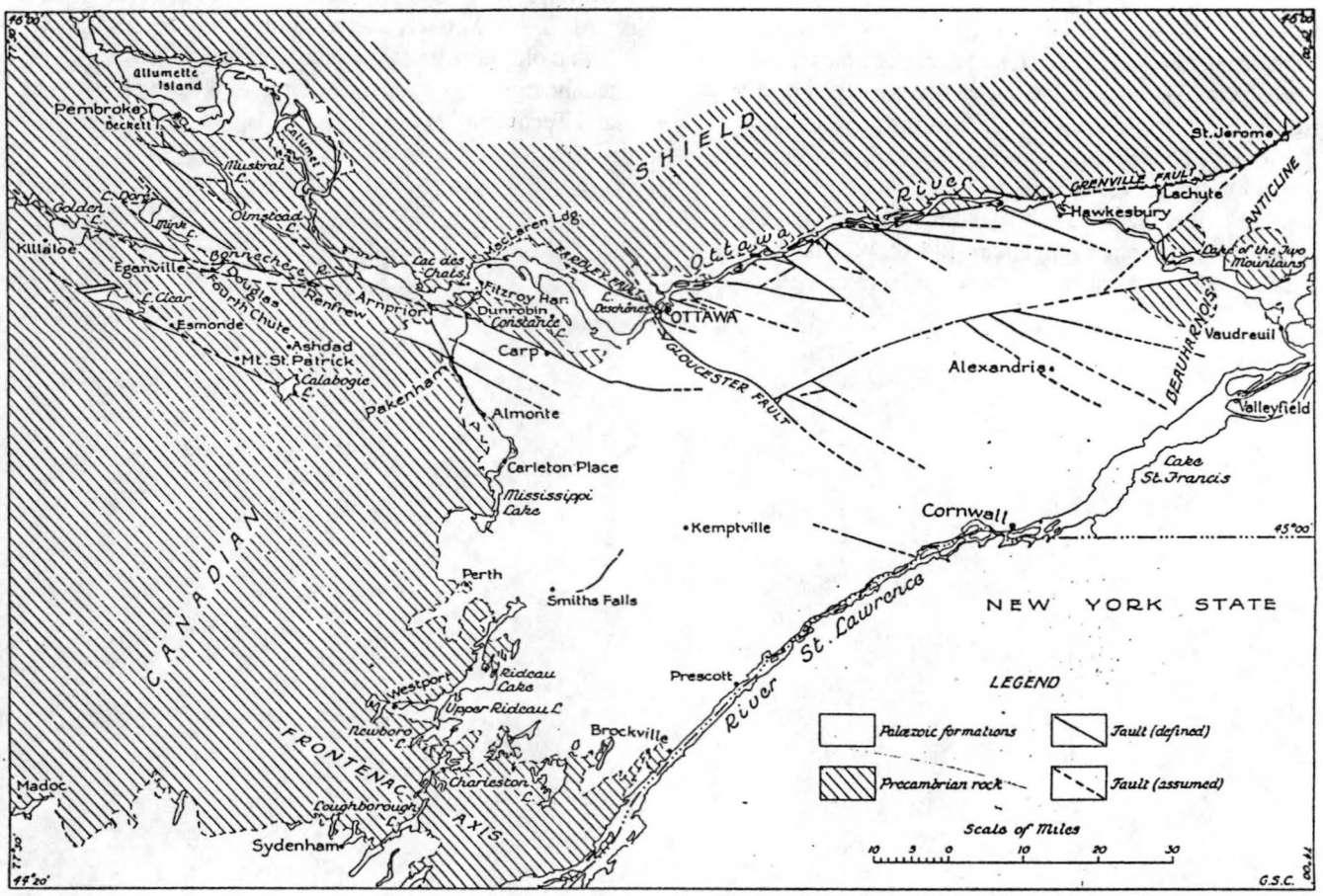
Wishard, L. A.; Musser, L. R., in press, New technologies for an old literature: Application of preservation technologies to geoscience literature: Library Resources and Technical Services.



Map: Structural map of the Ottawa-St. Lawrence Lowland, in Canada, showing faults affecting the Paleozoic formations. *from* Wilson, A. E., 1946, Geology of the Ottawa-Saint Lawrence Lowland, Ontario and Quebec: Geological Survey of Canada Memoir 241, 65 p.

NASA'S GLOBAL CHANGE MASTER DIRECTORY (GCMD): A MULTIDISCIPLINARY APPROACH TO LOCATING EARTH SCIENCE DATA

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Abstract--NASA's Global Change Master Directory (GCMD), is a free, online resource for obtaining information about available data sets in the Earth and environmental sciences. Locating Earth science data sets can be a more time-consuming task than locating journal articles. The GCMD simplifies the task of finding data, by coordinating information about data sets from around the world and providing search and retrieval tools for the user. The GCMD database contains over 5700 descriptions of data sets from meteorology, oceanography, geophysics and geology, hydrology, ecology, paleoclimatology, and human dimensions of global change. The mission of the GCMD is to provide users with the means to rapidly determine what data sets are available and how to obtain the data. The GCMD also provides online tools for data providers to easily register their data sets in the GCMD database.

The GCMD uses a multidisciplinary approach to locating data sets by providing several search and retrieval options including an extensive multidisciplinary hierarchical keyword taxonomy system, a free-text/geospatial search interface, and a Java-based graphical search interface. The GCMD is the central node of the Committee on Earth Observation Satellites (CEOS) International Directory Network (IDN) program and is a part of NASA's contribution to the U.S. Global Change Research Program (USGCRP). The GCMD is available to anyone with a web browser at http://gcmd.nasa.gov.

CAPTURING FEATURES OF TECTONIC SIGNIFICANCE IN THE GENERALIZED GEOLOGY OF THE WORLD GIS FRAMEWORK: A RESOURCE FOR FUTURE GEOLOGICAL RESEARCH

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Abstract--The Generalized Geology of the World subproject of the World Minerals Geoscience Database Project is devoted to prototyping a digital database and GIS model for global geology at the index level. The intent is to build a fully referenced, flexible database that will grow with the acquisition of new data on age, magmatism, major structural events, sedimentary assemblages, depositional environment, and mineralization in space and time. This database can be linked to geospatial features such as faults and bedrock domains, resulting ultimately in a spatial global inventory of 'what-where-and-when'. At present, high spatial accuracy for the global scale is hard to attain because of lack of resources and inconsistent georeferencing quality of spatial data sources. Nevertheless, spatially generalized globally-pertinent information with consistent geological topology is useful for education and research. In fact, the level of generalization for the spatial features must be high for displays to have visual impact as world wall maps, and minimal digital size is also needed so that displays covering substantial areas are manageable with today's desktop software. The generalization simplifies feature geometry, defines uniformly mixed spatial domains in orogenic belts, and allows multiple elements in the attribute database to be attached to each feature. The database and GIS, accommodating more information than would ever be displayed at one time, can be used to produce customized theme products derived by database query and dissolution of unnecessary linework, further accommodating the need for simplicity. The Generalized Geology of the World is currently being used to produce maps of mafic-ultramafic magmatic, felsic-intermediate magmatic, and predominant rock type subdivided by age as backdrops for mineral deposit distribution. Other uses, including geospatial sedimentary package inventories, are being entertained. The GIS must currently be maintained centrally for spatial and indexing integrity. Ways to allow different specialists to populate their own areas of the database and to coordinate changes in linework are under investigation.

DEVELOPING DIGITAL GEOLOGIC MAP DATA FROM ACCRETING OUT-OF-PRINT PUBLICATIONS; RESCUING GEOLOGIC TERRAINS FROM THE EFFECTS OF CARTOGRAPHIC GENERALIZATION AND ANALOG SUBDUCTION ZONES

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Abstract--Driven by the economic value of their natural resources, most countries, states, or provinces have made large investments to develop an understanding of the geologic framework within their domain. Prior to the advent of computer aided mapping and digital geologic map databases, the results of these efforts were commonly preserved through the publication of geologic maps. The analog processes involved in the production and printing of these maps were often of high quality. However, combined with a geologically brief passage of time, they have forced most of the information gained through geologists' field work into the category of out-of-print publications. Archivists and current investigators commonly find a smaller scale published map to be the only extant element of original field mapping efforts. The advent of computer applications in geology has created a demand for digital geologic map databases, driven by the same forces that produced investment in original field mapping. Unfortunately, increased generalization at smaller scales is an inevitable aspect of the cartographic drafting process. Scanning or other means for direct digital capture of geologic features from existing smaller-scale maps will perpetuate the errors introduced by cartographic generalization. These methods will not produce satisfactory digital geologic data for use with other data derived from larger scale base maps, even though scanned images of old maps provide efficient, cost-effective means for preserving past geologic research. This paper reports an alternative, satisfactory technique for development of digital geologic map databases through interpretation of information available in the published geologic maps. Designed and tested within the context of sedimentary stratigraphy typical of Kansas and the mid-continent, the technique is suitable for application in any region lacking digital geologic map databases where high quality, larger scale, topographic maps are available in combination with reputable, smaller scale, geologic maps. Where the required maps are available, this technique can easily be an order of magnitude less expensive than re-investment in the labor intensive production of new field maps, while providing a comparable asset for further geologic inquiry.

Part IV: Geoscience Information Society Forums

GEOSCIENCE INFORMATION SOCIETY'S DIGITAL DATABASE FORUM
CANADIAN INTERNET RESOURCES FOR THE GEOLOGIST

October 25, 1998

Presiding: Digital Database Chairperson Adonna Fleming
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Introduction--For several years, the Geoscience Information Society's Digital Database Forum has been the venue for geologists and information specialists to learn about the latest in electronic resources for the geoscientist. Some years the Forum will have a single theme; such as, electronic journals; other years, there will be a variety of topics. In 1998, the Forum presented demonstrations on a variety of resources available through the World Wide Web. The following is a summary of these sites.

CANADIAN KNOWLEDGE NETWORK

Natural Resources Canada (NRC) (available at http://www.NRCan.gc.ca/) is the gateway to the Canadian Government's information resources for energy, minerals and metals, forests and earth sciences. This site is part of the Canadian Geospatial Data Infrastructure (CGDI), whose charge is to make geo-information accessible on the World Wide Web for commercial purposes, community development and land-use decisions. The NRC web page maps to the following three sites:

- The Geological Survey of Canada (http://www/nrcan.gc.ca/gsc/),
- The Earth Science Sector (http://www.nrcan.gc.ca/ess/),
- The Climate Change (http://climatechange.nrcan.gc.ca/).

The Canadian Knowledge Network web pages were presented by Annette Bourgeois, Senior Advisor to the ADM (ResSources), (613) 995-7602, abourgeo@NRCan.gc.ca

Geological Survey of Canada site

Highlights of the Geological Survey of Canada site include "Educational Resources" which has information and tools for earth science teachers, and an opportunity to email questions through "Ask-a-Geologist". The "Geoscience Connections", is a listing of web addresses for geological resources, including the regional surveys as well as universities and libraries.

Earth Science Sector site

The Earth Science Sector site maps to the Earth Science Information Centre (ESIC) are available at http://www.nrcan.gc.ca/ess/esic/esic_e.html. The Centre has Canada's largest collection of books, serials and maps in the earth sciences with worldwide coverage. The collection emphasizes the following areas: geology including geochemistry, geochronology, geomorphology, geophysics, mineral resources, mineralogy, paleontology, petrology, tectonics, and geomatics including cartography (aeronautical, geological, thematic, topographic), geodetic and legal surveying, GIS, GPS, photogrammetry, and remote sensing. Document delivery and interlibrary loan is available from the Centre. In addition, the Centre has online access to the GEOSCAN database, which contains the publications of the Canadian Geological Survey. The Earth Science Sector site also features "What's New" and "Spotlight On" which link to new and unique information at the site.

Climate Change site

The Climate Change site accesses a variety of resources and information dealing with global warming and Canada's response to the Kyoto Protocol, which legally mandates that industrialized nations reduce their collective emissions of greenhouse gases by 5.2% below 1990 levels by the period 2008 to 2012.

CANADIAN GEOSCIENCE PUBLICATIONS DIRECTORY

This directory (http://ntserv.gis.nrcan.gc.ca/) is a combined online catalog featuring bibliographic information for publications of the Geological Survey of Canada as well as the provincial and territorial geological surveys. Records are in metadata form and include map coordinates, which agency has the resource, and traditional bibliographic information. MapGuide Plugin software is needed to view maps.

The Canadian Geoscience Publications Directory was presented by John Broome, Physical Scientist, Natural Resources Canada, (613) 995-6914, broome@NRCan.gc.ca.

PALAEONTOLOGIA ELECTRONICA

The journal Palaeontologia Electronica (http://www.earthsci.carleton.ca/paleo/index.htm) is an electronic journal available only through the World Wide Web. Published by Coquina Press, it is distributed over the Web with no subscription charges. It includes peer-reviewed articles on paleontology and related fields. The journal is graphical oriented and features high-resolution color images, video animation, and interactive databases.

The format of this journal is meant to be an interactive media resource. Readers can view enlargements of the images and in some cases, rotate and manipulate them, as if they were holding the fossil in their hand. In addition, readers can access biographical information about the authors, participate in an online discussion about the articles, and connect to references for further information on the subject.

Articles are in English with the abstracts also in Spanish, French and German. In addition, a "plain-language" summary of the articles for non-geologists is also available. The journal is published twice a year and readers can access the graphics and full-text of the article through their web browser or in PDF format. Issues will be available on the Web for one year free of charge and past issues can be purchased in CD-ROM format.

Palaeontologia Electronica was presented by Dr. Tim Patterson, Executive Editor of Palaeontologia Electronica, and Associate Professor, Department of Earth Sciences, Carleton University, Canada, (613) 520-2600 ex. 4425, tpatters@ccs.carleton.ca.

CISTI - CANADIAN INSTITUTE FOR SCIENTIFIC AND TECHNICAL INFORMATION

CISTI (http://www.cisti.nrc.ca/cisti/) is Canada's national library for science, technology and medicine. Holdings include: 54,000 different serial titles, 700,000 books, conference proceedings and technical reports, plus 2 million technical reports on microfiche. The library's holdings are searchable through their online catalog.

CISTI's services are fee based and highlights include: online, direct document delivery for journal articles and technical reports, online requests for books, and the SwetScan database which provides keyword searching of the table of contents of over 14,000 journals.

CISTI was presented by Christine Midwinter, Marketing Officer, (800) 668-1222, Christine.midwinter@nrc.ca.

NATURAL RESEARCH COUNCIL RESEARCH PRESS

Natural Research Council (NRC) Research Press (http://www.nrc.ca/cisti/journals/rj.html) publishes books, conference proceedings and 14 international science and engineering journals. The journals are available online, full-text, in PDF format for a subscription fee. Of special interest to geologists is the Canadian Journal of Earth Sciences.

NRC Research Press was presented by Michael L Boroczki, Marketing Officer, (613) 993-9108, Mike.Boroczki@nrc.ca.

Web Page Addresses Presented During Forum

Natural Resources Canada (http://www.NRCan.gc.ca/)
Geological Survey of Canada (http://www.nrcan.gc.ca/gsc/)
Natural Resources Canada's Earth Science Sector (http://www.nrcan.gc.ca/ess/)
Natural Resources Canada's Climate Change site (http://climatechange.nrcan.gc.ca/)
Earth Science Information Centre (ESIC) (http://www.nrcan.gc.ca/ess/esic/esic_e.html)
Canadian Geosciences Publication Directory (http://ntserv.gis.nrcan.gc.ca/)
Palaeontologia Electronica (http://www.earthsci.carleton.ca/paleo/index.htm)
Canadian Institute for Science and Technological Information (CISTI) (http://www.cisti.nrc.ca/cisti/)
Natural Research Council Research Press (http://www.nrc.ca/cisti/journals/rj.html

COLLECTION DEVELOPMENT ISSUES FORUM

October 26, 1998

Presiding: Collection Development Member Michael Mark Noga
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Introduction--The forum followed the usual format: 1) presentation of serial price data for the next year; 2) presentation of monograph price trends; and 3) open discussion on a several collection development issues.

SERIAL PRICE DATA

A handout containing price data for 108 serial titles was presented at the meeting *[Appendix One]*. The list mainly included commercial publications, because their prices are announced faster than those from other sources. Several sources were used (price lists from publishers, publisher and vendor WWW sites, and notices in journals). Some prices include carriage charges and others do not. Some prices were converted from foreign currencies. The sample shows the following price changes:

10.6% for 1996/1997
6.3% for 1997/1998
6.1% for 1998/1999

MONOGRAPH PRICES 1997-1998

Steve Hiller, Collection Development Committee Chairperson, had prepared a handout, which was distributed at the meeting. The following text and table are excerpts.

1997-1998 geoscience book prices increased substantially from the previous year as the average price of a geoscience book rose from $92.88 to $99.86, a change of 7.5% compared to 1996-1997. This represents the largest annual price increase since the 1992-1993 year. The $100 average book price is the highest recorded. The average price of a book published in the U.S. and Canada rose a substantial 10.6%, while U.K.-published items increased a whopping 13.9%.

As always, the mix of publications changes some each year, and this may also contribute to price variation on a year-to-year basis. The value of the U.S. dollar strengthened earlier in the year against continental European currencies and then weakened while the British pound remained strong. Book output, as measured by the BNA fell about 10% from the previous year, making it comparable to publication in the 1995-1997 period. U.K. book production fell 35% from the previous year, offsetting the large increase in average price.

Table 1. 1997-1998 Geoscience Average Book Prices In Dollars

U.S.	U.K.	Europe*	All
$68.80	$100.15	$131.86	$99.86
+10.6%	+13.9%	unchanged	+7.5%

*includes small percentage of material published in Asia

Table 2. Geoscience Book Prices For Selected Fields
(1997-1998 data not yet available)

	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997
Mineralogy*	104.20	113.19	109.89	134.65	198.99
Petrology*	83.16	83.42	82.98	103.94	109.54
Geophysics*	92.28	91.90	69.63	119.61	99.61
Geochemistry*	123.76	104.49	105.06	99.74	123.38
Geomorphology	104.48	89.76	85.84	89.68	94.80
Hydrology	132.36	87.71	116.39	87.06	137.54
Paleontology	68.15	58.65	79.85	68.17	68.89
Stratigraphy	116.58	141.15	148.74	117.30	112.50
Structural*	109.88	151.30	72.69	73.69	131.49

*Number of books published in these fields is relatively small
Data from Blackwell North America Approval Plan Coverage

Table 3. Geoscience Book Prices 1988-89 To 1997-1998
Average Price ($) by Place of Publication

	U.S.	U.K.	EUROPE*	ALL	% U.S. Published
1998-89	43.03	82.71	93.72	68.61	42.8
1989-90	58.04	87.64	98.70	78.97	42.0
1990-91	57.65	87.05	117.46	83.11	41.1
1991-92	53.12	98.11	122.99	83.63	45.7
1992-93	62.04	98.14	139.17	94.35	42.9
1993-94	66.36	90.98	141.04	98.50	40.1
1994-95	58.65	94.37	133.41	90.27	44.2
1995-96	59.84	84.41	137.78	91.75	44.3
1996-97	62.21	87.89	131.98	92.88	38.0
1997-98	68.80	100.15	131.80	99.86	38.9

*includes small percentage of material published in Asia and Australia

DISCUSSION TOPICS

Keeping in Touch with Users

Three questions were presented as discussion topics; additionally, state survey publications provided a lively debate. The first was: How do you keep in touch with your users and find out their interests as they access more of the literature from outside the library? Three-year surveys of users, focus groups, annual faculty meeting attendance, interviews, and studies of faculty publications and theses were mentioned as techniques.

Use of Reviews

The second question was: Does anyone use book reviews? Just for reference books? A few libraries use book reviews from a handful of geoscience journals. Publisher blurbs, announcements, and large publication catalogs are searched at another institution. In one area, librarians from three small colleges meet once a month to review reference works and try to balance their choices.

Acquisition of State Survey Publications

The discussion moved on to the acquisition of publications from state surveys. One state survey librarian said that only ten copies may be produced of some publications. Another survey librarian commented that her agency produces print runs that should last 20-30 years, and their open-files do not go out of print. State surveys now use open-file reports to save printing costs, not as a medium for pre-publication. In fact, one survey is putting its guidebooks into the open-file series. The move to electronic publication of open-files will help distribute this valuable material.

Status of Electronic Journals

The last question was: What is the status of electronic journals at your institution? Have you subscribed to large packages, from single societies or publishers, or from aggregators? Have you been able to tailor your licenses to the needs of your institution?

Some libraries have taken advantage of the electronic

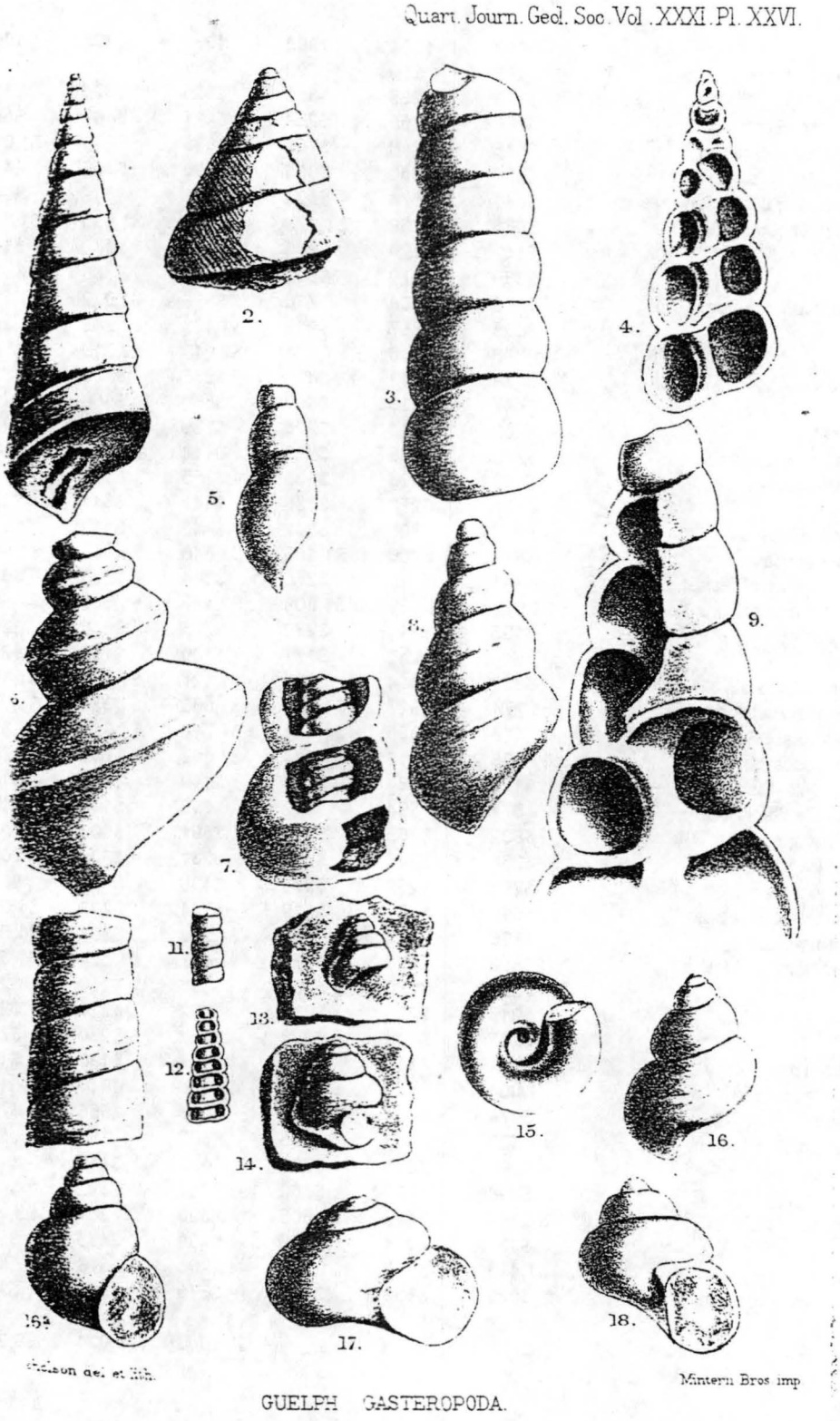
journal packages offered by societies in related fields, as long as there was no extra charge. Inexpensive packages have also been pursued. However, journal packages with a lot of restrictions have been a problem. Librarian involvement in licensing issues varies among the institutions.

The two main issues discussed about e-journals were the desirability of an electronic version of the GSA Bulletin and the initiatives of the Scholarly Publishing and Academic Resources Coalition (SPARC) (www.arl.org/sparc/index.html). After some description of the SPARC publishing program, there was a spirited discussion of its value in competition with high-priced journals from commercial publishers.

Appendix 1. Geoscience serial prices

Title	1993	1994	1995	1996	1997	1998	1999
AAPG Bulletin	$135	$135	$135	$140	$140	$140	$280
American Journal of Science	$90	$115	$125	$135	$148	$150	$152
American Mineralogist	$225	$250	$270	$295	$320	$320	$430
Annales Geophysicae	$721	$597	$675	$943	$1,124	$1,124	$1,320
Antarctic Science	$151	$156	$164	$178	$236	$322	$330
Applied Gechemistry	$300	$300	$329	$385	$430	$499	$584
Atlantic Geology	$38	$38	$43	$43	$48	$48	$60
Australian Journal of Earth Sci	$290	$325	$349	$385	$513	$560	$590
Basin Research	$209	$190	$208	$269	$340	$540	$592
Biogeochemistry	$598	$542	$628	$830	$874	$874	$1,078
Bulletin of Volcanology	$470	$477	$508	$558	$596	$596	$643
Canadian Journal of Earth Sci	$335	$365	$398	$455	$510	$556	$612
Carbonates and Evaporites	$50	$50	$52	$54	$57	$57	$64
Catena	$332	$363	$551	$704	$787	$810	$784
Chemical Geology	$1,447	$1,626	$1,814	$2,261	$2,444	$2,457	$2,379
Computers & Geosciences	$938	$930	$1,006	$1,177	$1,355	$1,443	$1,454
Continental Shelf Research	$713	$760	$842	$1,010	$1,162	$1,312	$1,370
Contrib to Mineral & Petrology	$2,043	$2,174	$2,236	$2,796	$2,707	$2,707	$2,698
Deep Sea Research I & II	$1,644	$1,565	$1,759	$2,099	$2,431	$2,775	$2,796
Earth & Planetary Sci Letters	$1,352	$1,456	$1,743	$2,168	$2,333	$2,471	$2,490
Earth Moon and Planets	$925	$880	$984	$1,166	$1,228	$1,170	$1,362
Earth Science Reviews	$430	$439	$454	$579	$648	$819	$825
Engineering Geology	$608	$650	$696	$592	$704	$1,000	$1,063
Environmental & Eng Science	$90	$90	$135	$125	$125	$125	$125
Environmental Geology	$337	$344	$359	$404	$597	$615	$771
Eos	$205	$225	$230	$295	$315	$340	$357
Evolution	$160	$160	$160	$160	$160	$170	$170
First Break	$410	$399	$442	$505	$505	$526	$584
Geochim et Cosmochim Acta	$775	$895	$1,000	$1,150	$1,295	$1,410	$1,530
Geoderma	$783	$1,003	$1,172	$1,482	$1,667	$1,707	$1,654
Geoforum	$398	$410	$440	$519	$575	$630	$668
Geological Magazine	$249	$263	$282	$298	$312	$324	$338
Geologie en Mijnbouw	$168	$153	$187	$247	$250	$252	$305
Geologische Rundschau	$337	$317	$331	$398	$441	$460	$552
Geology	$150	$150	$170	$170	$350	$350	$360
Geology Today	$195	$172	$190	$217	$234	$271	$296
Geo-Marine Letters	$202	$202	$235	$318	$350	$368	$447
Geomorphology	$423	$594	$639	$814	$1,185	$1,195	$1,264
Geophysical Journal Internat	$970	$872	$972	$1,037	$1,043	$1,229	$1,355
Geophysical Prospecting	$362	$369	$406	$464	$501	$501	$563
Geophysical Research Letters	$498	$590	$590	$780	$826	$879	$985
Global Biogeochemical Cycles	$148	$185	$185	$270	$275	$295	$318
Grana	$217	$220	$242	$277	$285	$295	$305
GSA Abstracts with Programs	$73	$80	$73	$89	$113	$129	$129
GSA Bulletin	$185	$185	$205	$205	$350	$350	$350
Intl Jour of Rock Mech Min Sci	$1,197	$845	$976	$1,249	$1,419	$1,616	$1,767
International Geology Review	$789	$849	$889	$949	$985	$985	$985
International J of Coal Geol	$617	$466	$521	$696	$802	$1,138	$1,348
Journal of African Earth Sci	$595	$676	$723	$875	$984	$1,172	$1,576
Journal of Applied Geophysics	$212	$417	$447	$585	$704	$690	$668
Journal of Asian Earth Sci	$513	$490	$485	$859	$663	$721	$783
Journal of Atmos Sol-Terr Phy	$1,279	$1,245	$1,319	$1,654	$2,014	$2,190	$2,270
Journal of Atmos Chemistry	$408	$369	$498	$589	$632	$647	$646
Journal of Geochem Explorat	$701	$633	$742	$988	$1,139	$968	$896
Journal of Geodesy	$332	$357	$409	$456	$540	$571	$675
Journal of Geodynamics	$447	$455	n/a	$629	$741	$914	$1,086
Journal of Geophysical Res	$2,800	$3,065	$3,510	$3,970	$4,310	$4,598	$4,965
Journal of Hydrology	$2,349	$2,383	$2,495	$3,147	$3,475	$3,621	$3,508
Journal of Marine Research	$80	$90	$90	$100	$110	$110	$110
Journal of Micropaleontology	$100	$100	$100	$108	$117	$123	$129

Title	1993	1994	1995	1996	1997	1998	1999
Journal of Paleontology	$99	$99	$99	$99	$99	$99	$110
Journal of Petrology	$273	$295	$350	$380	$525	$595	$700
Journal of S Amer Earth Sci	$266	$255	$254	$414	$467	$508	$597
Journal of Structural Geology	$618	$640	$708	$835	$936	$1,018	$1,036
Journal of the Atmos Sci	$350	$350	$355	$390	$455	$475	$495
Journal of Geol Soc of London	$441	$524	$524	$571	$617	$641	$673
Journal of Volc Geotherm Res	$965	$1,139	$1,178	$1,500	$1,635	$1,638	$1,698
Lethaia	$142	$129	$143	$171	$179	$180	$189
Lithos	$339	$529	$551	$723	$796	$802	$828
Marine & Petroleum Geology	$535	$604	$716	$899	$1,032	$1,123	$1,260
Marine Chemistry	$855	$867	$919	$1,183	$1,348	$1,368	$1,456
Marine Geology	$1,352	$1,385	$1,481	$2,049	$2,316	$2,345	$2,412
Marine Micropaleontology	$434	$444	$473	$585	$889	$879	$851
Marine Pollution Bulletin	$447	$430	$462	$589	$656	$783	$821
Mineralogical Magazine	$202	$215	$225	$225	$250	$270	$295
Natural Hazards	$282	$288	$329	$413	$428	$431	$512
Norwegian Jounal of Geology	$133	$125	$135	$155	$160	$170	$180
Oceanologica Acta	$294	$279	$338	$341	$344	$370	$363
Ore Geology Reviews	$310	$306	$342	$445	$519	$529	$628
Organic Geochemistry	$618	$700	$1,185	$1,646	$1,807	$1,965	$2,056
Origins of Life & Evol of Biosph	$251	$228	$276	$344	$350	$354	$414
Palaeo Palaeo Palaeo	$1,587	$1,539	$1,809	$2,477	$2,528	$2,586	$2,553
Paleoceanography	$195	$215	$270	$275	$280	$299	$319
Petroleum Geoscience	n/a	n/a	$171	$180	$195	$217	$229
Phys & Chem of Minerals	$832	$814	$883	$1,127	$1,173	$1,173	$1,320
Phys Earth Planetary Interiors	$1,274	$1,317	$1,370	$1,683	$1,826	$1,845	$1,785
Planetary and Space Science	$1,416	$1,355	$1,431	$1,718	$1,926	$2,096	$2,173
Precambrian Research	$1,038	$1,219	$1,244	$1,592	$1,741	$1,759	$1,703
Proc of Geologists Assoc	$129	$134	$140	$149	$161	$169	$184
Proc of Yorkshire Geol Soc	$77	$94	$92	$96	$109	$114	$122
Progress in Oceanography	$632	$705	$753	$891	$900	$1,094	$1,286
Quarterly J of Engineer Geol	$234	$245	$245	$281	$304	$307	$322
Quaternary International	$262	$250	$373	$438	$563	$614	$691
Quaternary Science Reviews	$599	$575	$619	$724	$798	$1,014	$1,151
Remote Sensing of Envt	$796	$908	$1,159	$1,236	$1,398	$1,564	$1,660
Rev of Paleobotany and Palyn	$898	$908	$973	$1,457	$1,574	$1,552	$1,503
Reviews of Geophysics	$220	$220	$250	$250	$250	$265	$280
Rock Mech and Rock Eng	$215	$225	$237	$222	$228	$228	$259
Science	$205	$215	$228	$250	$260	$295	$325
Scottish Journal of Geology	$102	$114	$119	$126	$136	$142	$150
Sedimentary Geology	$1,004	$1,187	$1,348	$1,686	$1,944	$2,115	$2,046
Sedimentology	$474	$434	$479	$546	$588	$729	$802
Sedimentological Res Letters	$20	$20	$85	$85	$85	$85	$90
Surveys in Geophysics	$296	$296	$352	$433	$447	$426	$498
Tectonics	$308	$330	$380	$385	$392	$409	$429
Tectonophysics	$2,444	$2,429	$2,505	$3,090	$3,267	$3,362	$3,349
Terra Nova	$338	$314	$358	$409	$433	$502	$537
Water Research	$1,493	$1,615	$1,841	$2,268	$2,516	$2,516	$3,243
Water Resources Research	$530	$660	$675	$675	$680	$720	$720
				$85,006	$94,034	$99,975	$106,097



Drawings: Guelph Gasterpoda, Plate XXVI. *from* Nicholson, H. A., 1875, Notes on the Gastropoda of the Guelph Formation of Canada: Quarterly Journal of the Geological Society of London, v. 31, p. 543-551

GIS PRESERVATION FORUM
GIS PRESERVATION COMMITTEE DEMONSTRATION PROJECTS

October 27, 1998

Presiding: Committee Co-Chairs: Linda R. Musser and Lisa A. Wishard*
Earth & Mineral Sciences Library
The Pennsylvania State University
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Summary: This forum consisted of a series of short papers, describing preservation projects, presented by members of the committee, who had overseen and/or carried out the projects. The presentations were followed by a question and discussion session led by the committee chairs.

The preservation forum section of this proceedings volume includes an additional paper written by committee member, Pauline Kamel, for inclusion in this proceedings volume.

* * * *

PRESERVATION OF A UNIQUE GUIDE TO LOCAL GEOLOGY:

GEOLOGY OF THE HANOVER DISTRICT
James W. Goldthwait

Elaine Clement and Barbara Sagraves
Dartmouth College
Hanover, New Hampshire

Abstract--As an outgrowth of preservation initiatives of the Geoscience Information Society, the authors collaborated in identifying and preserving a unique work in the collections of the Dartmouth College Library. The work the authors chose is a local geology primer, illustrated with drawings, photographic plates and a unique map of the bedrock geology within five miles of Dartmouth College. It has many of the features of a field trip guidebook, as it is intended to be used by students to interpret local geologic features which they find in the field. Treatment efforts were intended to preserve the work for active use and a copy for long-term preservation. The authors compared the time and monetary investment needed for each process and the work was conserved and reformatted.

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INTRODUCTION

Based on dates appearing on the map inserted into the work, the Geology of the Hanover District was written by James W. Goldthwait circa 1916. There is no other infor-mation on the work which would identify the publisher or the year of publication. The work is a twenty page pamphlet, which contains five figures and three pages of photographic plates. A folded, colored map is stapled into the center of the work.

The author of the work, Professor James Walter Goldthwait was a glacial geologist who first became widely known due to his discovery of the tilted shorelines of ice-age lakes in the Great Lakes region. He was the first to prove how much the land had been depressed by glacial ice and how much it had risen when the glacial ice receded. A professor of geology at Dartmouth College in Hanover, New Hampshire from 1908 until his death in 1947, he wrote extensively on extinct shorelines, earth movements, river floods, and studied glacial and physiographic phenomena in New England and Canada.

Goldthwait intended this unique work to be an introduction and guide to the geology of the area within five miles of Dartmouth College, and to be used in the field. The students of the College are still actively using this work, 82 years after its' publication. There are few copies left in the Library's circulating collection and these are in poor condition.

As a part of the preservation initiatives of the Geoscience Information Society's Preservation Committee, this work was chosen to be used in a pilot project to preserve guidebooks or other unique local geological information that was in danger of being lost due to the physical deterioration of the work. The

Preservation Services department at the Dartmouth College Library was established in 1995. This project gave the staff an opportunity to train and work with a variety of different preservation methods, and gave the librarians an opportunity to track the time, training and cost of in-house preservation projects.

METHODOLOGY

The Preservation Services staff closely examined the condition of the material. Based on their findings, the staff proceeded with the initial plans to conserve and reformat the material. The following section describes the steps taken by Preservation Services staff.

I. Physical Condition

The original twenty page pamphlet (8 3/4" x 6") had been glued to a cloth strip which had been stitched into a pre-made pamphlet binder. The accompanying color map (10 3/4" x 10 3/4") was folded and placed in a pocket in the back of the binder. The first and last pages of the pamphlet were showing signs of stress along the line where the cloth strip ended and the paper folded against it. The tattle tape was also a source of distress because its location caused the paper to flex unnaturally. In time the pages would most likely break off. The map was breaking along the fold lines.

The treatment decision was to remove the pamphlet from the binder, and remove the rusting staples and tattle tape. The pages were reinforced with Japanese Tissue and wheat starch paste and resewn (after reformatting) into an acid free pamphlet binder. The map was deacidified, repaired with japanese tissue, and placed unfolded in a Mylar envelope custom designed for the map. The text and map was stored together in a custom fit portfolio. A new tattle tape was attached to the pamphlet in a location that would not cause physical damage when the text was opened flat or the pages flexed.

II. Conservation

Time: 4 .25 hours
Staff: Conservation Specialist (technician)
Cost: $60.82
Materials: $6.63
Labor: $54.19

Comments: The treatment time was longer than expected. Wheat starch paste was used to glue the tissue and a batch had to be cooked for the treatment (30 minutes). Testing the color fastness of the map and deacidifying it took 30 minutes. Removing the pamphlet and repairing the folds and repairing the map took 2.5 hours. Labor cost, if outsourced, was estimated to be between $112 and $188.

III. Reformatting

This title has been continuously used since its publication so a preservation photocopy was made of the text and map. The title was also microfilmed. (See below.)

A. *Preservation Photocopying:*

Time: 15 minutes
Staff: Preservation Services Assistant and Brittle Books Supervisor
Cost: $19.21
Cost:$19.21Materials:$14.36
Labor: $4.85

The preservation photocopy was produced by a local vendor. The copy was made on acid free paper that met the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper). In anticipation that the work would be frequently photocopied by patrons, the gutter margins were made larger than the original so it could be photocopied without forcing and stressing the spine. The leaf attachment was a notched double fan adhesive with buckram covers. A Tyvek pocket was placed in the back to hold a color photocopy of the map. The volume was checked for collation prior to sending it to the vendor and checked for completion and clarity when it returned.

Comments: Given the frequent use of the title and the high value to the region, it was decided that two treatments (conservation and photocopying) were appropriate. In most situations a selector would designate one treatment, weighing the decision against the artifactual value of the original, anticipated use, intellectual value and other factors.

B. *Microfilming:*

Time: 1.5 hours
Staff: Preservation Librarian and Brittle Books Supervisor
Cost: $109.50
Materials: $74.50
Labor: $35.00

For the purposes of this exercise the pamphlet and map were sent to a vendor for preservation microfilming. A master negative, print master, and service copy were made following the Research Libraries Group guidelines for microfilming.

This was the first title the Preservation Services department sent to be microfilmed so preparation took longer than expected. A department with an established reformatting program would take considerably less time. The text and map were repaired prior to photocopying and microfilming.

Comments: In ordinary circumstances it would not be advisable to reformat the pamphlet by both photocopy and microfilm. The duplication of effort uses too many resources and should only be given to items that are rare but are heavily used. The microfilm format provides security and the photocopy format provides ease of access.

From a longevity/security point of view microfilming is generally the best treatment. This item is the exception. The map colors (dark blue, red and black) appear as black and white tones in the microfilm and are of little value to anyone using it. Also the map is intended to be used in conjunction with the text and the microfilm format is cumbersome in this case.

C. *Digitization*

Digitization of the work was discussed but not pursued. The process has its own preservation problems but digitization could make studying the map and text in the classroom easier.

CONCLUSION

This project proved to be a valuable test of the ability of the Preservation Services department to successfully accomplish treatments and reformatting methods which had not previously been completed in-house. It is difficult to make generalizations about costs based on this exercise because there were so many variables: the nature of the repairs, the start up time needed for reformatting, the size of the pamphlet, etc. This summary includes only the cost to conserve and reformat; the cost of cataloging the reformat-ted material was not included in the study.

The preservation photocopy is in the circulating collec-tion of Kresge Physical Sciences Library. The conserved original copy is in the reference collection As a result of this pilot project, patrons are assured of being able to use a unique local geological resource in the field, as it was designed to be used. The contributions of Prof. Goldthwait to the education of the students of Dartmouth College continue.

Acknowledgements: The authors gratefully acknowledge the assistance of Patti Houghton, Rare Books Specialist, Dartmouth College, for her assistance in providing the biographical information for Prof. J. W. Goldthwait.

* * * *

GUIDEBOOKS PREPARED FOR THE 12TH INTERNATIONAL GEOLOGICAL CONGRESS, HELD IN TORONTO, 1913.

Pauline Kamel
Earth Sciences Information CentrePauline Kamel
Natural Resources Canada
601 Booth Street, Room 350
Ottawa, Ontario
Canada K1A OE8

This set of 10 volumes was issued by the Geological Survey of Canada after the close of the meetings. Guide-books number 6 and 7 were issued by the Ontario Bureau of Mines.

No. 1. Excursion in Eastern Québec and the Maritime Provinces. Parts 1-2.
No. 2. Excursions in the Eastern Townships of Québec and the Eastern Part of Ontario.
No. 3. Excursions in the Neighbourhood of Montreal and Ottawa.
No. 4. Excursions in Southwestern Ontario.
No. 5. Excursions in the Western Peninsula of Ontario and Manitoulin Island.
No. 6. Excursions in the Vicinity of Toronto and to Muskoka and Madoc.
No. 7. Excursions to Sudbury, Cobalt and Porcupine.
No. 8. Transcontinental Excursion Toronto to Victoria and Return via Canadian Pacific and Canadian Northern Railways. Parts 1-3.
No. 9. Transcontinental Excursion Toronto to Victoria and Return via Canadian Pacific, Grand Trunk Pacific and National Transcontinental Railways.
No. 10. Excursions in Northern British Columbia and Yukon Territory, and Along the North Pacific Coast.

The set of guidebooks each measure 8" x 13". Illustrations are mostly black and white, but there are some color maps. Many of the illustrations are folded and interleaved. Some guidebooks have additional folded maps in the rear pocket. Several volumes have damaged spines. Those with multiple maps in the pocket show evidence of cracking along the spine and warping of the covers.

Treatment: The guidebook set was microfilmed according to Association for Information and Image Management (AIIM) MS23 standards. The camera master is 16mm silver gelatin microfilm with 105mm diazo duplicates. Service copies are positive and stored in acid-free envelopes.

***Evaluation*:** The microfiche are satisfactory. However, further damage to bindings was incurred as a result of manipulation during filming.

* * * *

FIRST GUIDEBOOK FOR THE ANNUAL FIELD CONFERENCE OF PENNSYLVANIA GEOLOGISTS.

Harrisburg, Pa., Field Conference of Pennsylvania Geologists, 1931.

Lisa A. Wishard*
Penn State University

Treatment: Digital scan to print. Volume required less than 1 hour of scanning, printed on laser printer, then was bound.

* * * *

SKETCHES OF CREATIONSKETCHES OF CREATION
Winchell
NY, Harper & Bros., 1870

Louise Zipp
Preservation Department
Parks Library 204
Iowa State University
Aimes, IA 50010-5537
Lzipp@iastate.edu

Treatment: Xerographic reproduction. The work was done at BookLab, and the cost was $141.62. Instead of a color copy of the cover, this volume features a local modification, where a portion of the cover was removed from the original and glued onto the cover of the reformatted book. The reformatted book contains examples of digital black & white reproduction of lithographs.

COAL; ITS PROPERTIES, ANALYSIS, CLASSIFICATION, GEOLOGY, EXTRACTION, USES AND DISTRIBUTION
Elwood S. Moore
1922

Treatment: Xerographic reproduction. This work was done at ACME Bookbinding, for an estimated cost of $97. It features a digital color foldout of a simple geologic map and digital greyscale reproduction of halftones. The reformatted book also shows the effect of pencil underlining that was not completely erased before copying.

* * * *

SOME GEOLOGICAL ASPECTS OF THE CARBONIFEROUS OF SOUTHERN INDIANA
Edited by T. H. Hexdrix.
NAGT. Eastern Section, Apr., 1966

Lois Heiser
Geology LibraryLois Heiser
Indiana University
Bloomington, IN 47405
Heiser@indiana.edu

Treatment: Digitized text; 8 JPG images. Available at: (http://www.indiana.edu/~libgeol/reprints/hendrix/hendrix.html).

* * * *

**THE GEOLOGY OF A PART OF ST. LOUIS COUNTY,
MISSOURI. ST. LOUIS, MISSOURI, WASHINGTON UNIVERSITY**
John Peters Thompson
1928

Clara McLeod
Earth & Planetary Sciences Librarian
Washington University
Campus Box 1169, One Brookings Drive
St. Louis, MO 63130
cpmcleod@library.wustl.edu

Treatment: Text re-keyed and photographs scanned. This project began with the scanning of the thesis text, but the scanned text contained so many errors that the text was simply re-keyed with the black and white photographs scanned. Available at (http: //library.wustl.edu/~eps/Thompson628new.html).

* * * *

REPORT ON THE GEOLOGY, MINERALOGY, BOTANY, AND ZOOLOGY OF MASSACHUSETTS.

Edward Hitchcock
2nd edition, 1835

Michael Mark Noga
Science Library
Massachusetts Institute of Technology
77 Mass. Ave, 14-134
Cambridge, MA 02139
mnoga@mit.edu

Treatment: Bindery/repair treatment. The cover was removed from the block and replaced, complete with a new spine label. The gift label was moved, and new endpapers were sewn. The paper is in good condition, so the block was not disturbed.

* * * *

TURN OF CENTURY FIELD TRIP GUIDEBOOKS

Lois Pausch
Geology Library
223 Natural History Building, 1301 W. Green
University of Illinois
Urbana, IL 61801
l-pausch@uiuc.edu

Treatment: Binding.

* * * *

LOGAN LEGACY FUND

Pauline Kamel
Earth Sciences Information Centre
Natural Resources Canada
601 Booth Street, Room 350
Ottawa, Ontario
Canada K1A 0E8

Abstract--The Logan Legacy Fund was established in 1992 to raise money to preserve some of the rare material housed in the Book & Map Archives of the Geological Survey of Canada. This special fund is administered by the Canadian Geological Foundation. After five years of fund-raising, close to $60,000 has been donated. Conservation work has focused on the Logan Collection, which contains more than eighty books, maps and manuscripts which belonged to Sir William E. Logan (1798-1875), the founding director of the Geological Survey of Canada. Since this work is nearing completion, new projects are being planned, and strategies for maintaining the momentum of the Fund are being developed.

INTRODUCTION

The Logan Legacy Fund is an initiative to preserve Canada's historical geoscience books, maps and photographs by raising money from the private sector. The fund was established in 1992, the year of the 150th anniversary of the founding of the Geological Survey of Canada (GSC). Such an important anniversary inevitably included reminiscences and an increased focus on the corporate memory. It seemed appropriate at this time, to take special measures to preserve some of the early works of the Survey, many of which were housed in the Book and Map Archives (BMA) of the Earth Sciences Information Centre (ESIC), (formerly the Geological Survey of Canada Library).

A survey of the holdings of the BMA had been completed earlier in the year. It revealed a collection of books of considerable interest and value for geological research, many of which are uniquely held in Canada. The Logan Collection itself consists of more than eighty, pamphlets, manuscripts and bound maps, which, along with Logan's collection of professional journals, became the initial library collection of the GSC. Also of special note are the more than six hundred journals and accounts of the early exploration of North America, which provide some of the first observations of the geology of the continent. As well, there are more than two hundred monographs relating to the early development of the science of geology, through which the development of geological thought and theories can be traced. It was estimated that the cost to preserve these three collections would be in excess of $900,000, a figure well beyond the normal budgetary allocations for the library.

ESTABLISHING THE FUND

Initial discussions took place between Dr. Charles Smith, the coordinator of the 150th anniversary celebrations and Dr. Hugh Morris, the treasurer of the Canadian Geological Foundation (CGF). The Foundation is a non-profit charitable organization, dedicated to the development of the geosciences in Canada. A proposal was developed which included the background information relating to the collections. It outlined the purpose of the Fund as well as a proposed time frame. It was decided to focus initially on the Logan Collection and it was estimated that conservation of these works could be accomplished over a period of five years at an estimated cost of $70,000. The proposal was accepted in May 1992. During this period, discussions were also taking place between Dr. Smith and the American Association of Petroleum Geologists (AAPG), which had indicated an interest in supporting the Fund. During the opening ceremony of the AAPG convention, held in Calgary on June 21, 1992, the Association announced that it would donate $5,000 in seed money to the Fund. The Fund being established, promotion efforts began and the 1992/1993 fund-raising campaign was launched.

PROMOTION

From the outset, the ESIC worked closely with the Communications Section of the GSC to develop a strategy for promoting the Fund. This consisted of several approaches. First, a mail-out campaign was undertaken. A short letter was prepared, describing the importance of the Fund, its aims and objectives and the recognition which

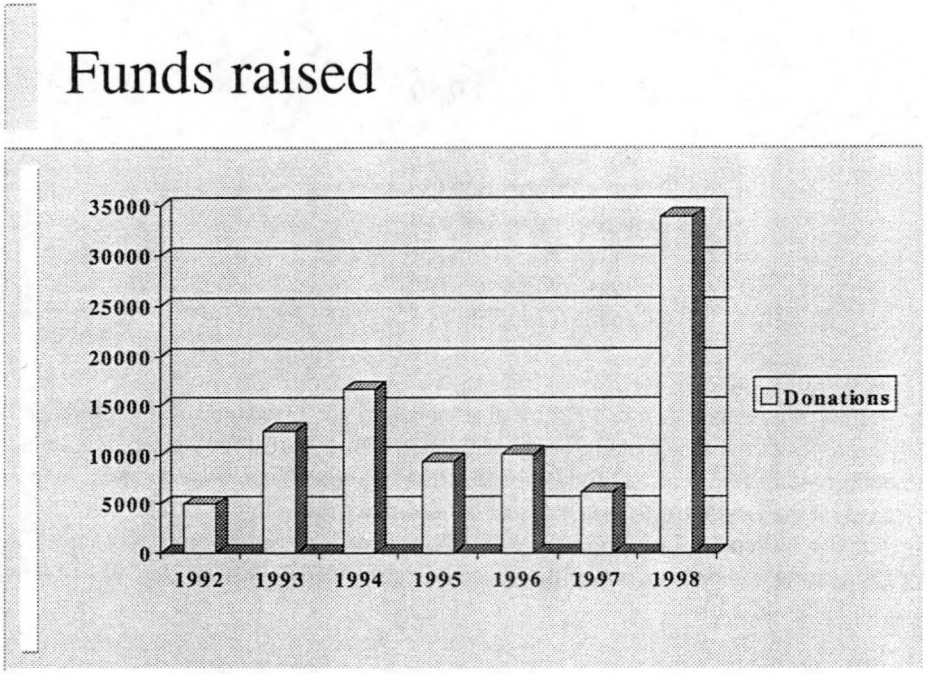

Figure 1. Funds raised June 1992 - October, 1998

would be given to donors. This was signed by the Assistant Deputy Minister for the GSC and mailed out to some six hundred senior colleagues and industry partners in Canada.

Next, a brochure was developed which briefly summarized the Fund and its purpose, solicited donations and included a donor form. This was included as part of the initial mail-out and also made available to GSC offices across Canada. Information about the Fund was also sent out to the science media outlets in Canada in the form of a brief article which subsequently appeared in the *Canadian Mining Journal*, the *Northern Miner* and the *Mineralogical Association of Canada Newsletter*. As well, the brochure was distributed along with of the GSC *Information Circular* in January 1993, thus reaching more than three thousand members of the geoscience community. Each year, at the end of the campaign in March, a newsletter is sent out to all contributors of the Fund. This provides an excellent opportunity to describe the projects undertaken throughout the past year and to outline the projects planned for the year ahead.

In cooperation with the renowned Canadian conservator, Hubert Leurs, a pictorial display was prepared which would be exhibited at conventions where the GSC has a presence. The exhibit consists of photographs of some of the material which had sustained damage over the years, and an explanation of the conservation techniques used in the restoration process. Over the past five years, the display has been exhibited at fora across Canada, and traveled as far as Prague for the GeoInfo V convention. A web site was developed in 1998 which includes a scanned image of the display, all previous newsletters, a description of the items in the Logan Collection, as well as the brochure and key contacts for the Fund (available at http://www.nrcan.gc. ca/ess/esic/logan_legacy/loganhp_e.html).

FUND-RAISING ACHIEVEMENTS

Initial interest in the Fund was strong and the fund-raising met with success during the early years. However in 1995 the momentum began to wane and donations leveled to around $10,000 in this and the following year. A further drop to $7,200 in 1997 was cause for concern. Fortunately, a generous donation of $27,600 by the organizing committee of the Ottawa '97 Geological Association of Canada/Mineralogical Association of Canada Conference, in March 1998 provided a significant boost to the Fund.

Donor profile

An analysis of the donors revealed that individuals are the chief supporters of the fund. During 1994, a successful fund-raising year, there were eighty eight donors, seven of whom donated $1,000 or more. Each year, there are five or six corporate donations which represent a small percentage

of the total funds raised. A strong core of support exists in the Ottawa region, although donations do come from across Canada, with one or two arriving each year from the United States.

The ESIC makes every effort to maintain a strong relationship with the donors to the Fund. This is achieved in several ways. Every donor receives an income tax creditable receipt which is mailed out promptly, along with a letter of thanks, as soon as it is received from the CGF. The annual newsletter lists all donors for the current year and a special plaque has been created on which is engraved the name of each donor who has given $1000 or more. The plaque, which is on permanent display in the ESIC, is unveiled each year at an annual ceremony and reception. Everyone who has ever donated to the Fund is invited to this reception, which takes place in April and coincides with the anniversary of the founding of the GSC. This reception is a wonderful opportunity to meet with donors and offer personal thanks. It also provides us an occasion to display the conserved items, to answer questions and together to celebrate our achievements.

CONSERVATION ACTIVITIES

The conservation activities to date have focused largely on the Logan Collection. Over the years, considerable damage has been sustained to this collection, owing to improper storage conditions as well as general wear and tear. For years, the collection has been subject to fluctuations in temperature and humidity as well as to the negative effects of atmospheric pollution. Many of these books were leather bound, and gradually the leather has dried out, causing it to flake. A large part of the conservation of this collection was carried out by Hubert Leurs who painstakingly dismantled, cleaned, re-stitched and rebound many of the books. In 1996, the services of the company, Preservation Services, were secured to participate in the book conservation and a paper conservator carefully cleaned and restored manuscript material. Deacidification of the Logan Collection was carried out by the National Library of Canada in its mass deacidification facilities using magnesium methyl carbonate in a non-aqueous process.

Work has begun on the restoration of the early paleontology journal *Palaeontographica*. Scattered issues and supplements had been left unbound and others had fallen into disrepair. Before treatment began, the complete holdings were microfilmed and a copy of the microfiche was sent out to GSC researchers in Vancouver, thus increasing access to this valuable resource. It is expected that the rebinding will be completed in 1999.

Conservation treatment is time consuming and expensive. In 1997 it was decided that, as well as sending out works from the Logan Collection for complex treatment, measures should be taken to improve the general condition of a greater part of the archival collection. To this end, a conservator was engaged to systematically assess items and to perform basic cleaning and repair work. Enclosures are being created for fragile material and oversize maps are being encapsulated as required. At the same time, treatment proposals are prepared for those books needing extensive repair. In order to assist the ESIC in setting priorities, monetary appraisals as well as assessments of the scientific merit of the collections are ongoing.

Costs

In the beginning years a single conservator was working on the collection, and between 1993 and 1995, approximately $10,000 was spent. From 1996 onwards, steady progress was made, as additional conservators were engaged and the reconditioning program begun. To date, approximately $47,000 has been spent on conservation activities.

CHALLENGES

There are several difficulties which we have experienced since the inception of the project. An obstacle to progress has been the lack of available qualified conservators in the Ottawa vicinity. Work between 1993 and 1995 was carried out by a single conservator in the area, and it was not until 1996 that we were able to find additional conservators who were able to accept commissions, although on a part-time basis. Owing to these circumstances, progress in conserving the collection is happening less rapidly than initially anticipated.

Shortly after the Fund was established, it became evident that many of the administrative duties could not be efficiently handled by members of the Canadian Geological Foundation, which is a voluntary organization. By necessity, these duties were transferred to staff at the ESIC, who prepare receipts and correspondence and maintain the databases related to the Fund. Additionally, staff manage the conservation projects, including the necessary contracts. In an era of downsizing and reduced resources it becomes increasingly difficult to manage workload. Priorities must be developed as we work to preserve our heritage of scientific knowledge while at the same time move ahead to deliver a comprehensive range of information services in the rapidly changing technological world.

By 1997 it became evident that the Fund was losing momentum. Excluding the generous donation in 1998, there has been a significant drop in both the number and amount of gifts. In 1994 there were eighty eight donors; by 1997 this number had fallen to sixty seven. Such an occurrence may be seen as part of the normal fund-raising cycle, nevertheless it presents a challenge as we work to maintain interest and enthusiasm among the donor community. In particular, outreach to the corporate

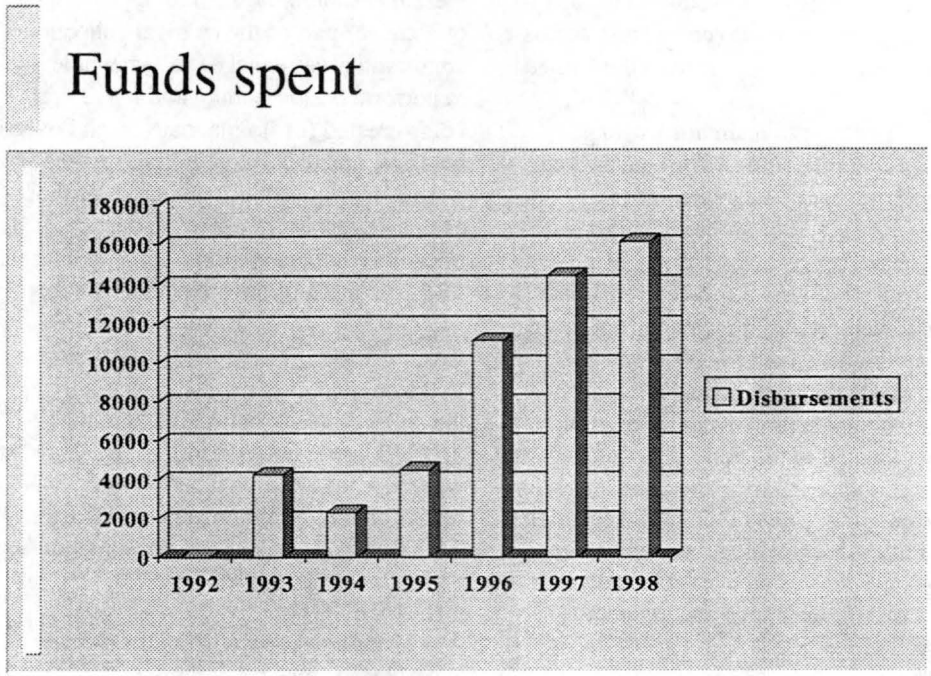

Figure 2. Disbursements January 1993 - October 1998

community has met with limited success and new fund-raising techniques must be investigated.

Future directions

The Logan Legacy Fund is approaching the end of its fifth full year of fund-raising. It is appropriate at this time, to assess the Fund and its achievements and to develop a strategy for the coming years. To this end, consultations are being held with the donor community and new plans for promoting the Fund are being developed. Since the restoration of the Logan Collection is close to completion, the terms of reference for the Fund must also be revisited. It is possible that fund-raising will continue for another finite period, and proposals are now being prepared for specific projects.

Conclusion

The generosity of our donors and the fine conservation work undertaken have been gratifying. This unique initiative has been strongly supported by the local geoscience community as well as by individuals from across Canada. The initial goal of preserving the Logan Collection has been achieved. There are still many more early books, journals, photographs and maps in need of treatment. Much remains to be done, but we are confident that with careful planning and the ongoing support of our donors, the Logan Legacy will continue.

GEOREF USERS GROUP
October 28, 1998

Presiding: GeoRef Users' Group Chair, Nancy Blair
U.S. Geological Survey Library
345 Middlefield Road, M.S. 955
Menlo Park, CA 94061
nblair@usgs.gov

Introduction--The forum opened with a short presentation: "Review of Some of the Characteristics of Georef for Users" by Nancy Blair. This was followed by: 1) a presentation of a report on the state of GeoRef by Sharon Tahirkheli, the Director of Information Systems for the American Geological Institute; 2) questions, comments, and suggestions from those in attendance, on all aspects of GeoRef access, usage, etc., fielded by Nancy Blair and Sharon Tahirkheli.

REVIEW OF SOME OF THE CHARACTERISTICS OF GEOREF FOR USERS

Nancy Blair
United States Geological Survey

How does GeoRef compare as a source of citations for earth science subjects to other scientific bibliographical databases? Pretending to be a user interested in information on California mercury deposits, a searcher used the terms *"mercury and California"* in searches of GeoRef, as supplied by two vendors: SilverPlatter and Community of Science. Mercury can be a metal, but also a god, a car, a toxic pollutant, a component in measuring instruments, and a planet, but our searcher does not qualify either *mercury* or *California* as a sophisticated searcher might choose to do. GeoRef (Silverplatter) yielded 387 citations and GeoRef (Community of Science) yielded 339 citations. A high percentage of the citations found were specifically related to the patron's request. Other bibliographical databases yielded citations of varying quality for use by the patron, but none retrieved as many references as GeoRef. Since GeoRef covers many years, the second column in the table shows the numbers of citations in GeoRef limited to the years covered by the comparison database, i.e. 1974 to June, 1998 for Geoarchive. Even when limited in time to the same numbers of years, only SciSearch and Water Resources Abstracts retrieved over 50% of the numbers of citations located by GeoRef.

Table 1. Comparative Search Totals For *Mercury And California*

	Total in each database	**Total GeoRef when limited by same date**
GEOREF (SilverPlatter) 1785-	387	387
GEOREF (COS)	339	339
GEOARCHIVE 1974-	38	207
GEOBASE 1980-	55	160
EI COMPENDEX 1967-	48	225
INSPEC 1969-	14	232
CA ABSTRACTS 1967-	76	238
SCISEARCH 1974-	180	207
WATER RES.ABS. 1967-	162	238

When GeoRef is searched with different search engines, the resulting searches are not the same. Despite considerable overlap, some citations were picked with each

search engine that were not found among the citations of the other. Investigating these records showed that GeoRef on Silver Platter picked up more citations of no use to our unsophisticated searcher. For instance, the search with GeoRef on Community of Science did not pick up part of a descriptor and therefore excluded unneeded citations related to the planet Mercury when the compound descriptor "Mercury Planet" was given. The COS search engine also did not pick up "California" in the compound descriptor "Gulf of California" or hyphenated title words which included one of the search terms such as "mercury-tubes". GeoRef on Community of Science did not search some fields that the SilverPlatter version did, such as DI for Degree Granting Institution. These differences resulted in a cleaner search for our user, but could exclude some important citations in a different search.

Table 2. Sample Citations Picked Up By Georef (Silverplatter) But Not By GeoRef (Community of Science)

COMPOUND DESCRIPTOR (MERCURY PLANET)

Radar imaging of the ice deposits on Mercury's poles
Radar investigation of Mars, Mercury, and Titan
New 3,5-cm wavelength radar images of the equatorial regions of Mercury
New radar topography of Mercury and the need for a Mercury DTM.
Characterizing the core of Mercury
Scarps, ridges, troughs, and other lineaments on Mercury
Impact phenomena on the terrestrial planets
Impact craters from centimeters to megameters
Earthlike planets; surfaces of Mercury, Venus, Earth, Moon, Mars
Large impact craters and basins; mechanics of syngenetic and postgenetic modication
Mercury radar imaging; evidence for polar ice

COMPOUND DESCRIPTOR (GULF OF CALIFORNIA)COMPOUND DESCRIPTOR (GULF OF CALIFORNIA)

Antimony deposits of the Tejocotes region, State of Oaxaca, Mexico
Los yacimientos de antimonio de Saj Jose, Sierra de Catorce, Estado de San Luis Potosi
San Jose antimony mines near Wadley, State of San Luis Potosi, Mexico
Geology and paleonology of the Permian area northwest of Las Delicias, southwestern Coahuila,

HYPHENATED KEYWORDS (MERCURY-TUBE, GOLD-MERCURY)

Description and history of mercury-tube tiltmeters used in the San Francisco Bay Area.
Geothermal setting of the Geysers steam field, Northern California IN: Active geothermal systems and gold-mercury deposits in the Sonoma-Clear Lake volcanic fields.(Notice article does not fit subject, although general volume does)

CALIFORNIA IN DI (Degree granting institutions)

Using molecular techniques to increase mercury removal from soil and water sediment systems. (DI=University of California at Irvine
Gold mineralization related to Cretaceous-Tertiary magmatism in the Kuskokum Mountains of west-central and southwestern Alaska (DI = University of California, Los Angeles)

Analyzing the few citations selected by GeoRef on Community of Science and not by GeoRef (Silver-Platter) showed these citations were either very recent and had not yet been updated by SilverPlatter or the information was picked up in abstracts included in the Community of Science version.

Table 3. Citations Selected by GeoRef (Community of Science) and not by GeoRef (SilverPlatter) for Mercury and California

Mines and mineral resources of Contra Costa County: California mines and geology
Origin of planetary wrinkle ridges based on the study of terrestrial analogs

Hydrothermal eruptions of Waiotapa geothermal system, New Zealand: their origin, associated breccias, and relation to precious metal mineralization.

1992 to 1995 environmental surveillance data collected at or near Area G

Suspended load transport of mercury minerals during the January, 1997, floods in Los Tablas Creek, San Luis Obispo County, California

Intergrated techniques for quantifying fractures, Monterey Formation, offshore California, U.S.A.

Another comparison of the coverage of GeoRef for earth science literature was to do a comparison search for two U. S. Geological Survey authors who primarily publish in outside journals. GeoRef located the highest number of citations for each author. The differences in years covered was not important in this search as each author had done most of his work in the past few years. GeoRef searches yielded the most citations for these authors. The closest database search in numbers yielded only 36% of the citations found by GeoRef. The respective fields of these authors are in geophysics and geochemistry and could be expected to be well represented in physics and chemistry databases.

Table 4. Searches Done For Two Authors On Different Bibliographical Database

	BOHLEN, S.R.	*NORDSTROM, D.K.*
GEOREF, 1785-	132	97
GEOARCHIVE 1974-	48	24
GEOBASE 1980-	44	22
EI COMPENDEX 1967-	2	7
INSPEC 1969-	11	4
CA ABSTRACTS 1967-	35	53
SCISEARCH 1974-	21	12
WATER RES. ABSTR. 1967-	0	19

The searches done in Table 4 were similar to comparison searches for GeoRef using different search engines in that there were unique citations located only in one or more of the comparison databases despite considerable overlap with GeoRef references. This also occurred in searches using *mercury and California* indicating that GeoRef indexing was not comprehensive. Some of the citations missing in GeoRef had a strong biological component and could have been deliberately omitted. Some were from sources perhaps not readily available to GeoRef indexers, but some shown in the following table were surprising, including an article in *Canadian Mineralogist.*

Table 5. Selected Citations From Ca Search And Ei Compendex Not In Georef

Searching for D.K. Nordstrom as Author

Nordstrom, D.K., 1996, The geochemistry of acid mine waters : from research to remediation, *Proc. Int. Symp. Geochem. Earth's Surf., 4th*, p.354-360.

Robbins, E.I. [and others], 1996, Microbial and mineralogical analysis of aluminum-rich precipitates that occlude porosity in a failed anoxic limestone drain, Monongali County, West Virginia: *Proc. Annu. Int. Pittsburgh Coal Conf.*

Davis, S.N., and Nordstrom, D.K., 1992, Hydrogeochemical investigations in boreholes at the Stripa mine. The hydrochemical advisory group and their associates: *Report STRIPA-TR-91-19.*

Webster, Jenny G.; Nordstrom, D.K.; and Smith, Kathleen S., 1994, Transport and natural attenuation of Cu, Zn, As, and Fe in the acid mine drainage of Leviathan and Bryant Creeks: *Environmental geochemistry of sulfide oxidation, ACS Symp. Ser.*

Alpers, C.N.; Nordstrom, D.K.; and Thompson, J.M., 1994, Transport and natural attenuation of Cu, Zn, As, and Fe in the acid mine drainage of Leviathan and Bryant Creeks: *Environmental geochemistry of sulfide oxidation, ACS Symp. Ser.*

Davis, A. O; Galloway, J.N.; and Nordstrom, D.K., 1983, Lake acidification : its effect on lead mobility in the sediments of two Adirondack Lakes: Integrated lake-watershed acidification study :proceedings of the ILWAS annual review conference: *Electric Power Research Institute (Report) EPRI -EA 2827.*

Searching for Mercury and California

Cahill, T.M. [et al] 1998, Elemental profiles in feather samples from a mercury-contaminated lake in central California ; *Arch. Environ. Contam. Toxicol.*

Wolfe, Marti; and Norman, Donald, 1998, Effects of waterborne mercury on terrestrial wildlife at Clear Lake: evaluation and testing of a predictive model: *Environ. Toxicol. Chem.*

Szymanski, J.T; and Groat, L.A., 1997, The crystal structure of deanesmithite, Hg1+2Hg2+3Cr6+O5S2: *Canadian Mineralogist.*

Harnly, Martha [et al], 1997, Biological monitoring for mercury within a community with soil and fish contamination: *Environ. Health Perspect.*

Premuzic, E.T.; Lin, M.S.; Jin, Jing-Zhen; and Hamilton, Karlene, 1997, Geothermal waste treatment biotechnology: *Energy sources.*

Maurer, D.; Robertson, G.: Gerlinger, T., 1994, Trace metals in the Newport Submarine Canyon, California and the adjacent shelf: *Water environment research.*

* * * *

SUMMARY OF REPORT PRESENTED TO GEOREF USERS' GROUP MEETING

Sharon Tahirkheli
Director, Information Systems
American Geological Institute
Alexandria, VA 22302
snt@agiweb.org

GEOREF GROWTH

- 75,000+ references will have been added to GeoRef in 1998.
- 21% of current references being added contain abstracts.

GEOREF ACCESS

GeoRef is currently available on the Web through three different providers, Community of Science (COS), OCLC, and SilverPlatter. COS and SilverPlatter reloaded GeoRef during the year using the most current version of the file. This version contains all corrections made during the past year and changes prompted by the publication of the Eighth edition of the GeoRef Thesaurus. The SilverPlatter reload resulted in 5 CD-ROMs.

GEOREF SOURCES

Sources for GeoRef references have expanded greatly in past years and now number nineteen separate sources. Each source is identified in the reference and each reference is edited and reviewed by GeoRef staff for consistency. A list follows this report (See Appendix 1).

NEW PRODUCTS FROM GEOREF

1. Groundwater and Soil Contamination database: This database is now produced by AGI directly. The material contained in the database overlaps with GeoRef with the notable exception of NTIS references. These appear first in the Groundwater and Soil Contamination database and, after a twelve-month holding period, appear in GeoRef.
2. GeoRef Previews database: This free database is available on the Web at AGI's homepage www.agiweb. org. It contains references to current materials that have not been completely edited and indexed.
3. Union List of Geologic Field Trip Guidebooks database: This database, produced in cooperation with the Geoscience Information Society, will be available on the AGI web site in early 1999. The website will allow interactive editing by the GIS Guidebook Committee.

THE ARCTIC BIBLIOGRAPHY

GeoRef obtained a grant from NSF for the digitization of the *Arctic Bibliography.* This publication consists of 16 printed volumes (108,000) references on the Arctic region and a seventeenth volume done on index cards. Publication dates for the references range from the 1800's to around 1975. The Arctic Bibliography will be produced as a separate database and, in addition, about 40,000 relevant items will be added to GeoRef.

Appendix 1. GEOREF INTERNATIONAL DATA EXCHANGE PARTNERS

CANADA:	GEOSCAN/Earth Sciences Information Centre, Ottawa
CHINA:	Chinese National Geological Library, Beijing
	Academia Sinica, Guiyang City, SW China
CZECH REPUBLIC:	GEOFOND, Kostelni
FINLAND:	Geological Survey of Finland, Information Bureau, Espoo
FRANCE:	Institut de L'Information Scientifique et Technique (INIST)
GERMANY:	Bundesanstalt fur Geowissenschaften und Rohstoffe, Hanover
HUNGARY:	Hungarian National Geological Library, Budapest
ITALY:	Istituto di Ricerca, CNR, Napoli
NETHERLANDS:	Elsevier Science, B.V., Amsterdam
NEW ZEALAND:	Institute of Geological and Nuclear Sciences, Lower Hutt
POLAND:	Panstwowy Instytut Geologiczny, Warsaw
RUSSIA:	International Centre for Scientific and Technical Information (ICSTI), Moscow
SPAIN:	Instituto Tecnologico GeoMinero de Espana (ITGE), Madrid

PROFESSIONAL ISSUES FORUM

October 29, 1998

Presiding: Geoscience Information Society Member, Claren Kidd
Geology Library
University of Oklahoma
100 E. Boyd R220
Norman, OK 73019-0628

Introduction—The Professional Issues Forum is the arena in which society members can gather to discuss issues of common concern. Discussions are generally free and wide-ranging; topics considered might include staff training, coping with branch mergers, space concerns, etc. The discussion is facilitated by a member of the society. In Toronto, in 1998, Claren Kidd, chair of the International Initiatives Committee, mediated our discussion.

In this session, before the broad discussion topics were broached, Claren introduced the GIS Fellow, Ma. Arlene A. Marzo, who gave a report of her Fellowship activities. This presentation was followed by a specific question and answer period with Arlene. A paper detailing Arlene's GIS Fellowship activities, follows this brief summary.

(Written by Charlotte R. M. Derksen)

* * * *

MY EXPERIENCES IN NORTH AMERICA AS THE FIRST GIS FELLOW

Ma. Arlene A. Marzo
National Institute of Geological Sciences (NIGS)
College of Science
UP Diliman
Quezon City, Philippines

Introduction--This final report contains my impressions of having just spent two full and very exciting months visiting geoscience libraries and information centers in North America. I had a very pleasant and positive exchange of ideas with every person I met, right from the beginning to the end of my trip. I enjoyed the entire experience and I hope that I have given as much as I have gained. The hospitality of the people I contacted exceeded my expectations and I am forever grateful to GIS for giving me this rare experience. I certainly hope that my observations will have a positive impact on the fellowship program. The visits to each site varied tremendously due to the amount of time that was allocated. Each place I went to and every person I met contributed so much to my learning experience. I planned to take them all with me when I went home to try, to test, and if feasible adapt to our working environment.

My first impression was that this country (America) is so vast and so multinational. Its citizens easily represent every country of the world. I found it very worthwhile to see and hear about library automation specially with the advent of electronic technology and the different concerns this new format has created.

THE INITIATION

The seventeen hour trip of the connecting flight from Taiwan had been filled with excitement coupled with apprehension of meeting the GIS organizers and the president and the chair of the International Initiatives Committee. I had been communicating with these people for the past couple of months. This uncertainty slowly went away, as I grew to be more independent and certain in my journey to different places.

Visit to Rutgers

From the newsletter I received before I left the Philippines I noticed that the library address of one of the GIS officers, Ms. Susan Goodman, was located quite near

the place where I would be staying in New Jersey. Immediately I contacted her and made an agreement to meet. It was school term break, so I had the chance to see the library and its collection with less interference. What was more important, Susan gave me a tour around. I was impressed that one only had to go to any of the computer terminals accessible on every floor, then in just a few keystrokes all the information about the library is available not just on the screen, but also on the Web. The user need not go from one service station to another or to consult the card catalogue. They also had electronic journals for the students and faculty. Having read much about it, mostly from promotional brochures, I had always wanted to see what one looked like. Although I already had some idea on how it would appear in this format, I was looking for some extra points; some plus factors which could convince me that having them in the library would be cost effective. Connectivity could be a problem, which if not be addressed, would mean that such subscriptions would go to waste. The Library of Science and Medicine at Rutgers University is also a member of a group of science libraries where they share and link with each other. The library is fully automated and is equipped with an alarm at the exit door to discourage users from taking out library materials without proper approval.

After the exploratory tour, I joined Susan and some of her colleagues for lunch at the university cafeteria. It was a hearty meal with a pleasant conversation. This was my first meal in a university canteen in America. It looked just like the university canteen in the Philippines, only the food had more colors and many crispy leaves (salads that come with so many kinds of dressings). Susan took me for a short drive along the Piscataway River in New Jersey before driving me home. It was a very fine way to end a truly notable day.

In Washington DC

It was Labor Day when I arrived in Washington, D.C. I had no schedule for that day and my landlady encouraged me to try the subway. Earlier, I had asked her some questions about it. I have never been into an underground railroad, so I was scared to venture on my own. I had a subway ticket pass good for two weeks, thoughtfully made available by Mr. Shaun Hardy. My landlady supplied me with a metro guide and gave instructions on which direction to go. I was hesitant at first; at the back of my mind, I was thinking that maybe I had to wait for Claren or Shaun to take me. Instinct told me otherwise, as it was too nice a day to stay indoors. Giving allowances for time in case I got lost, I'd rather be lost with the sun still up and not down. So out I went, with my maps, an extra sweater, and some food.

For the locals, directions like street posts and signs do not matter. For a foreigner like me, I was literally gawking for a sign that I might miss. Last year, when I was in Denmark I had a fellow Filipino with me. Looking back, it was not easy then because Danish names are so different in spelling and appearance (the vowels have upper signs totally unclear to us). This time in America it will just be a piece of cake, or so I thought, for I could read the street names and signs easily. But where were the signs? Being a holiday, the streets were deserted. There was no one in sight to ask where the subway was. Nearby, I saw a small Chinese restaurant that was open. I went inside and, with my halting Chinese, I asked directions of the cashier, who answered me in perfect American English, with instructions on how to reach the nearest subway station. That reminded me that this is not China, this is America. Back at home jeepney and bus stops are everywhere; one must be totally blind to miss the speeding vehicles on your side. There is a continuous noise of the horns. Here there were no honking horns and no speeding drivers. Everything was in order. The vehicles were on one side and the pedestrians on the other. Finally, I spotted the electronic staircase going below stepped onboard. It was a relief that an elderly couple went ahead of me; thus, I could observe how to put in the ticket (which side is up) and how to choose the train to get in. Now the colors on the metro guide, which were unclear before, made sense. It was on my transfer trip that things became more complicated. Which direction now? Left, right, east, north? Do I go down to one level or not? I felt like I was learning to walk for the first time; I had to look for a guide or sign, any indication on the walls or stairs that I was on the right track. Everybody on the subway seemed to be preoccupied; an attitude that discouraged one from inquiring. Indeed, people were not cold, but seemed so preoccupied, I thought that they might not look kindly on me, if I were to disturb them.

I noticed from the Metro card that it expired on a specific date and not on the number of trips you make in a day. Well, I had fun in trying it out by myself. It was a discovery to find out that it was so simple, once you had mastered it. I started to write down notes on places to get off. With the tourist map of the city I then started to make my plan for the day and decide which places to see. I did not mind [at all] that I was alone in this foreign city. I learned which exit door to face before the train stopped. I could walk steadily on the train even while it was still running. I enjoyed looking at the faces and expressions of the people I saw in America. Getting off of the subway is like getting out from a cold, dark hole; it certainly is refreshing to breathe the air once up again on the streets with the sunlight.

The next day, I tried the metro bus; it would be slower, but there would be more to see on the way. On my second trip into the city, I had hoped to have the time to visit the Library of Congress; I could not do it on my first day

because I didn't want to miss the guided tour at the Capitol. When the chance came, I excitedly applied for an identification card so that I could go inside the reading rooms. I always have my passport with me, so it was a very easy procedure. The application process is automated. A staff member gave me a form and asked for some identification with an address. Then I was asked to fill in some more data on a worksheet at a PC terminal. Helpful instructions on the screen guide you on what to do. The last step is to wait for your number to get your digital photograph taken. I liked that part: to see what you look like before you print it. The gracious camera boy showed me the screen, and inquired if the picture was fine with me or was another shot necessary? This was a totally impressive and neat way of having your picture taken. That afternoon, I boarded the metro with my newly acquired American Library of Congress Card. My librarian friends back home will be thrilled to have an LC library card.

Carnegie Institute of Washington-Department of Terrestrial Magnetism

The next day, I met Mr. Shaun Hardy and got to tour his library at the Carnegie Institute of Washington, Department of Terrestrial Magnetism (CIW-DTM). It is on the same road, the Broadbranch Road, where I was staying. The building is up a hill nestled among the trees occupied by playful tiny, brown squirrels. I would have liked to stay longer with the little ones but my landlady was with me. I would renew our acquaintance on my way back later.

Shaun's library collections include holdings in the history of geomagnetism, volcanology, petrology, physical chemistry and early 20th century exploration and travel. Scientific reports as well as international dissertations ranged as far back as 1880-1935. The institute's conference room on the lower floor contained a display of the journal articles/covers that the Carnegie researchers had contributed. This is a good way of encouraging the other researchers to do better, and to publish their most recent findings in the international periodicals. The library occupies three floors. Besides the full time librarian, an assistant helps with the day to day functions of the library. Searching for an article or a book is quite easy, because the catalogue is available on-line. They use Inmagic; cataloguing is done through Dialog/OCLC searching. Going home after the tete-a-tete with Shaun and Merry concluded another productive day.

I would return the next week to study on-line searching in the First Search Family, plus other on-line capabilities which support the technical duties of the librarian. Then, I did on-line cataloguing via OCLC at the Carnegie Institute, learning the mechanics of on-line cataloguing. I also had the opportunity to try searching on-line databases using DIALOG. I was able to browse through the different searching engines and reference databases like GeoRef, Current Contents, SPIN, Uncover, and FirstSearch. This was my first attempt to try on-line information resources; those I had tried back home are watered down from promotional or trial versions; we have not ventured beyond the databases provided free on the Internet. These above mentioned resources were what I would be observing and experimenting with in the different libraries and information centers called upon for the duration of my internship. I was very impressed by the technology CIW is using and the support that they extend to scholars and technical writers/researchers in advanced research areas of physical and earth sciences. Light moments were also very memorable as I joined the rest of the staff for luncheon: American pizza and ice cream, with very delicious apple crisp for dessert. All these goodies merited an encore.

As you can see, my first days in America were fully packed with action and excitement. It would take perhaps a couple of days, if I were to give you in detail my adventures for the remainder of the seven weeks. Suffice it to say that not a day was the same, and each one was as truly fulfilling and delightful as the others. I noted how technology is now being applied to make thousands of documents and reports more accessible with the Internet. I observed that libraries in North America were given state support to meet the needs of its clients.

Reflections and Possible Applications

The economic situation has impinged upon the development of Philippine libraries. Library development is not regarded as priority in national development; this is evidenced by the dwindling budgets allocated to libraries, compared to food and health. Most of the funds allocated for library development have benefited the urban areas more than the rural areas. We also need to improve the education and training of librarians in order to make it relevant to the our local conditions. Library and information science curricula should include teaching oral tradition and audio-visual materials and technology. The library training that is offered is sometimes irrelevant, because students are compelled to take courses which were designed for a totally different information environment. The Geoscience Information Society's role as an advocate of this worthy cause should grow and expand, with more programs aimed at librarians in the Third World. *There is now an even greater demand giving interest in the libraries built on the expertise of librarians providing access efficiently and accurately in any medium.* Any librarian should realize that his or her library is more than the sum of the books, buildings, computers and the special collection holdings.

THE GEOSCIENCE INTERNATIONAL CONFERENCE

My first exposure to international geoscience started at the conference on Science Editing and Information Management held in Washington, D.C. Before this trip, I had very little background in the Geosciences, most of which was based on what I had heard and read. In reflection, that may be very beneficial because I was open to whatever issues there were and could be very flexible.

At the conference one interesting discussion addressed the expanding role of librarians in the area of increasing access to electronic information. The electronic environment should not make it more difficult for the librarian to access information. Librarians need to expand our roles in order to have an impact on how these new systems and products will be packaged and delivered to our users. Both training and instruction are needed to use electronic products effectively. Presently there are three types of electronic formats to deal with:

* full-text documents available in both traditional print and electronic format;

* full-text documents available in electronic format only (Several commercial services, e.g. Ovid, offer full-text electronic versions of print journals.);

* information available over the Internet.

The electronic environment has put librarians in a position of needing to explain to users that we are going to" rent" electronic materials or purchase it on a temporary basis when we already own the exact item in a print format. Issues of ownership of material and information versus only use of that material for a given period of time are important. When a library owns a print copy of an item, library staff can copy it or loan it, according to standard practices and guidelines governing copyright. The purchase of electronic information does not have this same assurance. Contracts may limit those who can access the material libraries have purchased. Electronic access to information raises a number of important issues like ownership agreements, who will use the information, the price, design, and quality of the software systems.

All these changes will lead to a significant role changes for a librarian who has had traditional expertise with print material. It is true that we now have the opportunity of expanding our services but at the same time we are presented with a host of new issues such as information resources in multiple formats, new approaches to user services, as well as the combination of public and technical services. Consequently, we must become managers of these electronic resources and the information contained in them. Technically and economically we are not yet ready. What we can do now is to observe how the First World countries handle these issues. Perhaps in the near future they can be dealt with by proper management and direction.

At the conference I had the chance to engage in several conversations with the resource speakers and to consult with them on their ongoing projects. Most of those who attended suggested that I contact their sites to coordinate with their respective gifts and exchange divisions for possible arrangements that could be beneficial to both sides in the future.

PENN STATE, UT-AUSTIN, TORONTO AND BEYOND

After the Sixth International Conference on Geoscience Information in Washington, D.C. I went to Pennsylvania State University for a week, next flying to the University of Texas at Austin. Then I proceeded to the Natural Resources Canada's Earth Science Information Centre in Ontario, Ottawa, Canada. Finally, I traveled by train to Toronto to attend the GSA Annual Conference. All of the libraries and information centers visited had information and publications staff that were very helpful. They accommodated all my questions which conceivably sound so simple to them. I found all this talk truly enlightening and informative. Sometimes we had formal sessions, other times were less formal, sometimes the computer center personnel or faculty joined us and other times it was the full library staff or selected staff.

While the librarians in my country have a good knowledge foundation and know what they have to do, they do not have sufficient resources to be successful in meeting their goals. Long-term vision is somewhat impaired, because of restrictions in access to information technology. Ownership of information prevails, rather than the practice of creating mechanisms to ensure a more comprehensive system of access to information. In contrast, the North American libraries I saw have a state of technology that allowed for more dependable reliance on electronic access. An insufficient number of computers in libraries and campuses need not hamper one's ability to feel a commitment to these resources. In the Philippines, in order to take advantage of electronic resources so that our users can be weaned from print, suitable computing resources and widespread connectivity need to be available. Efforts of varying degree are now underway to expand networks but progress is not fast enough, thus the current generation of students are being trained on limited sources. Most of the time, they have to cite abstracts rather than full text. We need some more reliable back-up generators; now we have frequent interruptions due to blackouts or brownouts that make the workday shorter and less productive. Increasingly our library work is dependent upon computing. Recognizing our current technological limitations, we need to assess our library network and make up a needs program

for the continuing development of our present information infrastructure. Many of you are aware of the volatile economic conditions in my country. Among other things, we have a devalued currency coupled with inflated production costs. These realities should be a driving force to make us even more creative, making us strive to learn and explore new ideas never considered in the past. Our basic need right now is for more computing power and for that we need more state of the art computers and increased, reliable connectivity.

NETWORKING AND A GIS PHILIPPINE CHAPTER

For our geoscience discipline to flourish we should endeavor to establish an earth science library network. With the guidance of GIS members, we could start this not only among the academic institutions, but also the public ministries and agencies. Our main purpose should be to promote a common point of access to all the networked libraries' holdings. All its member libraries should have opportunities to search for requested materials from all sites through an integrated on-line public access catalog. This could extend to remote areas and offer exchange of materials for geoscience researchers, by practicing cooperative interlibrary lending and borrowing.

We could also initiate a "Books across the seas" program. While I was in DC, I contacted some who would be willing to send some duplicates to my library, but we would have to shoulder the cost of shipment. At the Walter Geology Library of the University of Texas at Austin, I was able to obtain some books and scientific documents. They shipped the boxes to us and our institute will reimburse the cost. If this test works well, then we can continue and expand the arrangement to other libraries. On GeoNet-L, many documents are made available by geoscience libraries, but this is usually only within US and Canada. Our greatest concerns right now are where to get the reimbursement monies and if the sending institution would be willing to shoulder the cost initially, pending reimbursement. The process will be slow, taking a couple of months on both sides, plus the shipment time via surface mail. The NIGS library can act as the distribution center to other Philippine libraries. Besides the shipment cost there will also be some added responsibilities, like record keeping, packaging, matching of donors, storage, and correspondence. The network members will need to consider all of these pieces to the proposed program.

Another project of the network could be to develop a jointly produced Philippine Earth Science Resources Index. Its lack diminishes the amount of staff resources currently employed. We could produce a superior product that would generate revenue to maintain this important service to library users. Should the network expand, we could enhance the service with document delivery using courier/fax and ultimately a technology such as ARIEL. Again this need not only be service oriented. This service could also generate some income to sustain the network. Data exchange is necessary for geoscience development. *By consolidating our resources the buying power for information reduces the unit costs and current trends in distributing via consortia structure can spread our resources*. Some years ago, the College of Science Library in the University of the Philippines became the central node of a library network with seven academic libraries. The World Bank supporting the Department of Science and Technology - Engineering and Science Education (DOST-ESEP) Project funded the network (Lourdes, 1995). The libraries that have more would share their resources by interlibrary lending and borrowing. This should work well in a geographically concise region where courier services can get materials from one site to another easily and speedily or when postal services function efficiently, dependably and cheaply. Newer technologies, such as fax, can help alleviate some of the problems as copies could be made of specific pages or references before transmission. A more advanced technology, ARIEL scanning allows for the elimination of copying. The scanned images can be sent electronically. I saw ARIEL stations in use at the University of Texas at Austin, at the Natural Resources of Canada's Earth Sciences Information Centre and at CISTI (Canadian Institute for Scientific and Technical Information). This should also address the problem for resource sharing some articles that are in demand.

Document Delivery Services

For a library network in the Philippines to evolve electronically we need to contract for on-line document delivery services. We could consider OCLC as possible provider for document delivery and a wide range of other services. We could investigate the possibility of joining the OCLC Asia Pacific Services program and convert our cataloging via these worldwide databases, with 63 member countries and territories. The OCLC database contains 600 million records, of which 37 million are unique, representing 370 languages. More than 9,000 libraries contribute to and use information in the OCLC on-line Union Catalog. Besides adding bibliographic control, OCLC offers database access to more than 65 bibliographic databases through the FirstSearch family, use of which would increase the need for efficient document delivery sources. Networked pentium computers can handle this processing; if that is not suitable, a CD-ROM copy of the entire database is also available. All library members would benefit. I believe that the other OCLC libraries would also benefit from the original cataloging of our Filipino literature and special collections. CISTI in Ottawa, Canada is a good example of a high-end information center with good

bibliographic control and an OPAC system that encourages self-sufficiency, with many potential options for electronic products. It is currently having discussions to foster the exchange of Science and Technology Information among the 18 member economies of Asia Pacific Cooperation (APEC) via universities, information brokers and the National Councils in Singapore and Taipei to develop document delivery services.

Conservation and Preservation

The libraries that I visited each had a very high level of computing environment. First of all, e-mail is widespread on every campus. Faculty, students and staff are very e-mail proficient. The library and the academic computing services share the responsibility of encouraging e-mail/Internet usage. Penn State and the UT at Austin are land grant universities. As such they are state funded which is why they can offer library service twenty-four hours per day with successive shifts of library employees. Both of their library systems are homegrown, existing before commercial library systems were introduced. I noted that priority was given to digital resources, because they can offer significant added value over print equivalents in such ways as more timely availability. Electronic resources have more extensive content and offer greater functionality, like the ability to invoke linkages to local or related sources. They also provide greater access, because they can be delivered rapidly and remotely at any time.

More than 80% of our collections are now endangered, because they are printed on acidic paper. Preservation and conservation are vital to our day to day operations and it is crucial to preserve a record of our country's culture and technology. In addition, the new media of film, tape and compact disc are highly perishable, especially so in tropical countries, with far less permanence than was once imagined. New technologies are creating new problems in conservation and preservation, requiring technical expertise and new kinds of cooperative and experimental efforts. GIS interests in these issues have been advanced, thanks to the work of the preservation committee. I had always been very interested in the conservation and preservation of our collections, especially our cartographic holdings, which need immediate attention. If given permission by the committee, we would like to employ the same methodology and instrumentation in an effort to find out the status of the preservation and conservation program in our local libraries. From this study we could establish the extent of the preservation and conservation programs needed not only in the Philippines, but also in Asia. We should target not only the earth science libraries in the Philippines, but also the other school, public or private libraries that hold a substantial amount of earth sciences materials in their collection. Results then should be summarized and analyzed with consultation from the committee.

RECOMMENDATIONS

Upon my return to the Philippines, I consulted our academic director regarding ways to make our local programs more attractive to students, not only within the country but also outside. We should maximize the fact that language is not barrier as most students and scientists have a strong command of English. Our local libraries are organized in an Americanized model utilizing the Library of Congress Subject Headings. We need to provide more ports immediately so that the library can function both during the usual working day and once the libraries close, by remote access. More open ports would allow faculty and students to dial in for information. Moreover, faculty members frequently go abroad and need to be able to get back in to local systems to read e-mail or verify information. Our university provider should have sufficient bandwidth to be accessible not only within the campus but also remotely at anytime.

Future GIS Fellows

For the next GIS fellow from a developing country, I would like to impart the following:

1. Try to foster an increased participation in international programs because of the global nature of the information world. Be on the lookout for travel grants, fellowships and aids similar in nature that could be beneficial not only for your own professional growth but also for your library and your country. Take advantage of the educational programs both in the local and external campus.
2. Learn: new software applications; bibliographic instruction for users; effective Internet searching; evaluate resources accessed and various search engines. I acquired familiarity with the latest technology and gained some awareness if not expertise in accessing numerous bibliographic, full text and numerous abstract and index databases. I had been using GEOREF; in addition to providing bibliographic information, it is also very useful in verifying reports from the early years.
3. As much as possible try to attend lectures, dissertation presentations and discussions by local and visiting faculty. This is an excellent means of keeping abreast and gaining additional exposure. The Pennsylvania State University and the University of Texas at Austin have numerous events all year which encourage continuing education for the university librarians.
4.

When you come back, work to strengthen the staff's commitment to resource sharing and cooperation between and among libraries in earth sciences to achieve the goal of providing the right information at the right time.

5. Always keep an open mind on everything and do not be afraid to venture on the unexpected. Do some homework; find out information on the places that you are going to see. Bring your passport with you each time you go out and have a list of emergency numbers to contact. Coins, local maps and compass are very handy to carry always.
6. Remember that the financial picture of librarianship is fair, but the library is not the place for individuals interested in making a fortune. You should feel your profession is dignified and on the same level as other professionals, who do something useful, tangible, concrete, and of lasting value. You are somebody that should assist all types of people from the simple many to the clever few. The challenges that a librarian faces today and will face tomorrow are much more complex and greater in magnitude than those his or her predecessors encountered decades ago. One cannot afford to stand still but must move ahead; be positive in outlook, flexible in many ways of doing things and always ready to adapt and shape one's services to the needs of one's users.
7. The most perplexing of all challenges is the challenge of modernization. The changes being caused by fluid technologies are taking place more rapidly than ever before and their total impact is greatly permeating all aspects of a developing country. Modernization is imposing heavy demands on us, one has to resolve to do more or we will be more left behind than we already are. Try to acquire new perspectives and respond to the pressures of the New World situation to help discard all outmoded behavioral patterns and attitudes and assist in the constant search for knowledge with unflagging assiduity. In doing so you can immeasurably help narrow down the vast gap between culture and science.

The GIS International Initiatives Committee:

For the International Initiatives committee members, Iwould like to note the following:

1. Choose young, aspiring information professionals, full of dreams and visions on what his or her library should be. She/he should be inspired enough to understand that the rewards of librarianship do not come from the financial side of the profession but are derived from the inner satisfaction of those who are a part of it.
2. It would be more prudent to choose a single, unattached applicant, who need not worry so much about his or her family left behind at home for quite some time. From my personal experience, homesickness is the hardest to overcome. Four to five weeks would be ideal.
3. Please be more explicit and more meticulous in giving information regarding travel directions and the like. Small details could be very useful in case of sudden change in schedule/s. Supply contact addresses and phone numbers preferably both at home and office.
4. Give at least three months or more for lead-time in the processing of the travel papers, approval of permits and for the fellow to prepare himself and to delegate some of the duties he will have to temporarily leave for a while.

CONCLUSION

In closing, allow me to thank all of you for giving me this opportunity. I had always wanted to see the different parts of America and Canada. I take great pleasure in having been selected as one of the first two GIS fellows. The experience of traveling to North America to see and meet new friends and fellow librarians meant that I have been more than richly compensated. Not only is the quality of library service at the totally different level, but the exposure to different culture and ideas is something you cannot put a price tag on.

FINAL THOUGHTS

Perhaps someday I will meet some of you again in another place, but I would like all of you to know that you have given me inspiration to improve myself and in my profession to have the strength to move ahead with a more positive outlook and confidence. It is essential for us to have direct involvement and start more active participation in the arduous tasks of nation building. I believe wholeheartedly that networked information in the area of science and technology disseminated by libraries will be one of the wisest investments a developing nation can make on behalf of its people. As librarians in a developing nations, we should try to focus on building the computing and telecommunications infrastructure necessary to extend library information service beyond the walls and operating hours of our library to the faculty, students, and researchers throughout the Philippines, then Asia, and the whole World.

Acknowledgements

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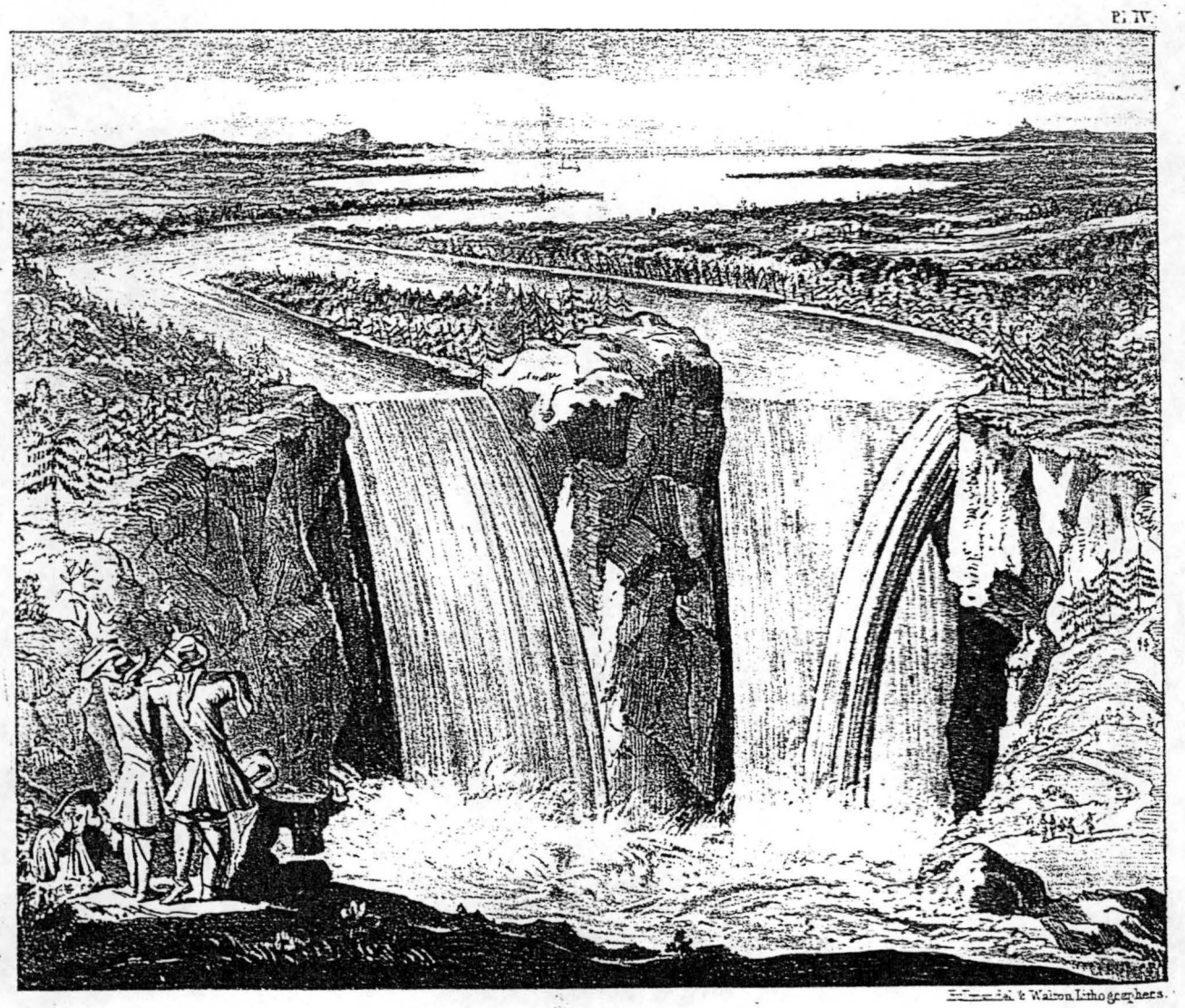
Field Trip:
Niagara Falls and the Niagara Escarpment
October 30, 1999

The annual meeting concluded with a field trip to Niagara Falls, Lake Ontario, and the surrounding country, led by Christopher Rancourt of the University of Toronto. He had prepared a map and brief field guide for the trip participants. Beautiful weather contributed to the participants' enjoyment. Immediate Past President, Connie Manson, organized the trip and coordinated the day's arrangements.



FAC SIMILE OF A VIEW OF NIAGARA FALLS,
by Father Louis Hennepin.
From the original Utrecht Edition 1697.

Drawing: Fac Simile of a View of Niagara Falls, by Father Louis Hennepin, from the original Utrecht Edition 1697, *from* Lyell, Charles, Sir, 1845, Travels in North America; with geological observations on the United States, Canada, and Nova Scotia: London, J. Murray, 251 p.

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Bonnycastle, R.E., 1833, On the transition rocks of the Cataraqui [Ontario]: American Journal of Science, v. 24,

Drawing: Uncaptioned drawing, [sienite (indicated by the letter "S") in limestone]. p. 46

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