GEOSCIENCE INFORMATION SOCIETY

LIBRARIES IN TRANSFORMATION:

Exploring Topics of Changing Practices and New Technologies

Proceedings • Volume 39 • 2008

Proceedings of the 43th Meeting

of the Geoscience Information Society

October 5-9, 2008

Houston, Texas USA

LIBRARIES IN TRANSFORMATION:

Exploring Topics of Changing Practices and New Technologies

Edited by

Lisa Johnston

Proceedings

Volume 39

2008

Geoscience Information Society

GEOSCIENCE
INFORMATION
SOCIETY

ISBN: XXX-0-XXXXXX-XX-X

ISSN: 0072-1409

For information about copies of this proceedings volume or earlier issues, contact:

Publications Manager
Geoscience Information Society
C/O American Geological Institute
4220 King Street
Alexandria VA 22302-1502 USA

Cover illustration: Mud Trouble, oil well firefighters of H.L. Patton and Company based in Houston Texas. Used with permission courtesy of S. Sloane III (www.sloanegallery.com).

TABLE OF CONTENTS

(Continued on next page)

TABLE OF CONTENTS *(cont.)*

PREFACE

The Geoscience Information Society (GSIS) was established in 1965 as an independent, nonprofit professional society. Member include librarians, information specialists, publishers and scientists concerned with all aspects of geosciences information. Members are based in the United States, Canada , Austria, Australia, France, Sweden, Taiwan and the United Kingdom.

GSIS is a member society of the American Geological Institute and is an associated society of the Geological Society of America (GSA). The GSIS Annual meeting is held in conjunction with the annual GSA meeting, and the papers, posters, and forums presented are a part of the GSA program.

Oral presentations of the papers provided in this proceedings volume were given at of the 2008 Annual Joint Meeting of the Geological Society of America (GSA), Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, and the Gulf Coast Association of Geological Societies held in Houston, Texas October 5-9, 2008. The papers are arranged in the order they were presented and where the entire paper was not available due to publishing conflicts, the abstract was provided with the permission of the author.

Organizers experienced a more complicated and challenging situation this year in terms of assigning rooms at the George R. Brown Convention Center. As a result, the dates for the GSIS Technical Session and Poster Session were both scheduled for the afternoon of Wednesday, October 8th. Changes in meeting policy allowed the posters to be presented all day with a two hour author presentation. Even with the difficult time constraints, both sessions were heavily attended. This proceedings volume is divided into three parts as follows:

1. Oral papers presented at the GSA Technical Session 198: “Libraries in Transformation: Exploring Topics of Changing Practices and New Technologies.”

2. Posters presented at the GSA Geoscience Information/Communications poster session.

3. Reports of the 2008 GSIS program sessions.

Thanks to all presenters who made this session a unique and thought-provoking culmination to a rich conference experience. My particular thanks goes to our GSIS 2008 Chair, Susan Larsen, and our in-coming chair and conference planner, Rusty Kimball, for their patience and timely assistance through the session planning. And I own the entire success of the session and the proceedings volume to the invaluable guidance of the 2007 conference convener, Claudette Cloutier, and past proceedings editor Patrica Yocum.

Lisa Johnston
GSIS Conference Convener 2008-9

Part 1: GSA Topical Session T198

Libraries in Transformation:
Exploring Topics of Changing Practices and New Technologies

Information retrieval is rapidly changing how scientific discoveries are made. This session will discuss how these changes affect the way in which geoscience information is created, disseminated, organized, accessed, used and archived.

In short: How has the geoscience library "transformed" itself?

Technical Session Convener

Lisa Johnston
October 8, 2008
1:30 p.m. - 5:30 p.m.

DIGITAL DATA CURATION: INVESTIGATING POTENTIAL COLLABORATION BETWEEN LIBRARIANS AND RESEARCHERS

Lura E. Joseph
Geology Library
University of Illinois at Urbana-Champaign
luraj@uiuc.edu

Abstract — Increasingly, researchers and librarians are faced with questions related to digital data preservation and access. Questions include where data sets of various sizes can be stored, whether to share the data, and if so, with whom, as well as how to discover and access data sets. Problems are compounded by the increasingly interdisciplinary nature of research and by emerging requirements related to storage of digital data that are generated by government-sponsored research. As universities begin to create institutional repositories for both literature and data sets generated by their own researchers, it is appropriate for librarians to become more involved in the process.

INTRODUCTION

Purdue University and the University of Illinois at Urbana-Champaign have recently begun research, supported by a grant from the Institute of Museum and Library Services (IMLS), to analyze researchers' needs related to sharing, archiving, and disseminating various levels of research data. Research methods include interviews with researchers, observations, and case studies of data practices and work flows in order to develop data curation "profiles." From these profiles, a matrix will be developed relating curation needs for particular types of data sets, and user needs for systems requirements that could be implemented by data repositories. This talk will present the background, the research process, and current progress of the research, especially as it relates to the geosciences.

DRIVING FORCES OF A REVOLUTION IN RESEARCH & EDUCATION

We are in the midst of a revolution in research and education. The exponential increase of information is well known and has been ongoing for some time, as has been the creation of digital databases and digital data collections. However, recent technological and social changes are facilitating radical changes in research and education practices.

The increase in amount of data, both in the number and size of data sets, is possible because computing speeds, storage, and network capacity have substantially increased, while costs have decreased and advanced computing power is becoming available to more people. It is becoming cheaper, faster, and more accurate to simulate models than to conduct physical experiments (Atkins et al., 2003). Increasingly, computer modeling covers longer time spans, greater geographical areas with more of a systems orientation, leading to interdisciplinary interaction and new areas of research.

Increased computing capacity and advanced instrumentation are combining to create huge data sets from real-time data streams, for example climate, seismic, and stream gauge data as well as data from satellites. The resulting data sets require even more computing and storage capacity, networking, and curation in order to access and use the data.

Interdisciplinary research is increasing with hundreds of scientists from around the world working on a single project. Completely new areas of research are being created due to easy access to digital data collections. Public access to digital data collections increases scientific observation (for example, input from amateur astronomers) and also will increasingly impact education at all levels.

In 2007, the National Science Foundation (NSF) announced a comprehensive "Cyberinfrastructure Vision for the 21st Century" (NSF, 2007a) which includes a proposal for a sustained petascale-capable system to be deployed in 2009-2010. An NSF Program Solicitation, called DataNet Partners, seeks to create national and global research infrastructure organizations that will provide reliable digital preservation, access, integration, and analysis capabilities for science and engineering data over a decades-long timeline. NSF anticipates awarding up to five grants each totaling up to $100,000,000 (NSF, 2007b).

THE NEED FOR STEWARDSHIP OF DIGITAL DATA

The exponential increase in production and use of digital data is accompanied by the need for data stewardship. Digital data are fragile. For example, data can be lost or rendered unusable without adequate storage capacity, metadata, migration, and finding aids. In addition to the vast amounts of data currently being generated, there have been large numbers of data sets generated over the past decades that reside on individual computers throughout the world; these legacy data are also in danger due to lack of stewardship.

There have been a number of important workshops and reports over the past few years addressing the challenges and opportunities related to the current digital data revolution, including the need for adequate stewardship of data:

- National Science Foundation Blue-Ribbon Advisory Panel on Cyberinfrastructure (Atkins, et al., 2003),
- the National Science Board Committee on Programs and Plans' "Long-Lived Digital Data Collections: Enabling Research and Education in the 21st Century" (NSB, 2005),
- the ARL Workshop on New Collaborative Relationships (ARL, 2006),
- National Science Foundation Cyberinfrastructure Council's "Cyberinfrastructure Vision for 21st Century Discovery" (NSF, 2007a),
- as well as international initiatives such as the UK Digital Curation Centre (Rusbridge, et al., 2005) and "To share or not to share: Publication and quality assurance of research data outputs" (Key Perspectives Ltd., 2008).

These workshops and reports address the need for adequate stewardship, preservation and curation. The geoscience community is also beginning to confront the challenges related to digital data. The Geoinformatics Division has been created within Geological Society of America, and there have been several important related meetings and reports (Sinha, 2006; Brady, et al., 2007).

The National Science Foundation has responded to these various workshops and reports by stating a vision for the near future: "NSF will pursue a vision in which science and engineering digital data are routinely deposited in well-documented form, are regularly and easily consulted and analyzed by specialist and non-specialist alike, are openly accessible while suitably protected, and are reliably preserved" (NSF, 2007a, p.3).

TYPES OF DATA

In the geoscience literature related to data curation, it is often difficult to determine whether the types of data being discussed are physical data, such as samples, cores, print information (maps, well logs, data spreadsheets), or digital data, or a mixture of both. Another confusion is whether the digital data are raw, processed or combined. The distinction is important when considering what data sets to preserve over various time periods, where to store them, with whom to share the data sets, and what metadata are necessary to include with each type.

The NSF Cyberinfrastructure Council divides digital data into three major categories: research collections, resource collections, and reference collections (NSF, 2007a).

- Authors of research collections are individual researchers or small research teams. The research collection is maintained to serve the individual or group for the life of the project. Funding of the project that produces the data is often short lived, limiting curation. Application of data standards is unlikely.

Digital Repositories: A digital repository is a not only a place where data collections and other kinds of scientific and scholarly materials are stored and maintained, but also a set of services required to maintain, preserve, and provide access to the data (Lynch, 2003). The repository can be at one site or distributed over a network.

Examples of institutional repositories:

- Dspace - MIT
- Deep Blue - University of Michigan
- HathiTrust (Shared Digital Repository) - Committee on Institutional Cooperation (CIC)
- IDEALS - University of Illinois
- MINDS@UW - University of Wisconsin
- UC Libraries Digital Preservation Repository - California
- University of Texas Digital Repository

Examples of National and Disciplinary Repositories & Distributed Systems:

- Crustal Dynamics Data Information System, http://cddis.gsfc.nasa.gov/, NASA's archive of space geodesy data
- GSFC Earth Sciences Data and Information Services Center, http://disc.gsfc.nasa.gov/, Global Climate Data
- Global Hydrology Resource Center, http://ghrc.msfc.nasa.gov/ , historical and current Earth science data and derived products
- Land Processes DAAC (Distributed Active Archive Center), http://lpdaac.usgs.gov/, data: biologic, geologic, hydrologic, ecologic, and related conditions and processes.
- National Snow and Ice Data Center DAAC, http://nsidc.org/daac/, data and information for snow and ice processes
- NASA Earth Systems Science Data and Services, http://nasadaacs.eos.nasa.gov/search.html

Digital Libraries: A digital library consists of collections that are stored in digital formats and accessed by computers. The digital content may be stored locally or as part of a network. The actual data sets may be buried in the collections and difficult to identify.

Examples of digital libraries:

- Digital Library for Earth System Education (DLESE
- National Science Digital Library (NSDL)

Digital Directory: A digital directory is an electronic resource that points to subject specific digital collections and resources.

Examples of a digital directories:

- EOS Data Gateway
- Global Change Master Directory (NASA)
- Federation Interactive Network for discovery (FIND)

Journal Suppl. Data SetsJust in passing, in addition to repositories, some journals now provide storage for supplementary data sets related to publications, including Nature, GSA, Elsevier, Science, AGU.

Figure 1: Digital Repositories, Digital Libraries, & Digital Directories: definitions and examples

- Resource collections are created by a community of researchers, and often comply with standards adopted by the community. Budgets are usually intermediate in size, and the lifetime of the collection is mid- to long-term.
- Reference collections are created by and serve large portions of the research community. They generally conform to well established standards. Budgets are often large, and from diverse sources contributing to long term preservation and curation of the data collections.

Over time, research collections may evolve to become resource collections, and resource collections may eventually become reference collections. This possibility makes it difficult for individual researchers to decide what data collections to keep or discard. It is difficult, if not impossible, to accurately predict which research or resource collections will have lasting importance (Cragin & Shankar, 2006). The possibility that a data collection might achieve lasting importance makes the creation and widespread early adoption of universal data standards important at all levels.

PURDUE/UIUC IMLS RESEARCH PROJECT

The Purdue/UIUC research project focuses on the data management and curation needs of scientists and researchers, and the roles libraries might undertake to provide services in those areas. One project goal is to develop a more complete understanding of data practices in relation to scholarly communication and the related implications for data curation. Another project goal is to use the analysis of qualitative data to develop "curation profiles" that will be used to formulate policies for repositories in order to enhance curation of and access to digital data collections. A third goal is to use the experiences of practicing subject specialist librarians to help understand the potential roles of academic and research librarians in eScience and the provision of data curation services.

Methodology

Interviews & Observations

The first phase of this project consists of interviewing researchers in nine disciplines at Purdue University (PU) and the University of Illinois (UIUC), to get a better understanding of differences and similarities of digital data practices across and between disciplines, especially those that are relevant to data curation needs. The disciplines include chemistry, earth sciences, atmospheric science, plant science, chemical engineering, astronomy, biology, and liberal arts and sciences. The researchers include scientists, data managers, and members of labs or research groups who produce, develop and use digital data sets. Interviews are being conducted on-site and are recorded and transcribed.

Case studies will be developed for two of the disciplines. Interviews with multiple scientists in these two areas will provide a deeper view of data management and curation needs. Two focus groups will be conducted with library subject liaisons to learn about their work with academic researchers related to digital data issues.

A pre-interview worksheet is sent to each interviewee. The worksheet helps the researcher begin thinking about his or her own data, and helps direct the interviewer's questions. A guide is used during the interview to structure the session. The following are topics included in the interview guide:

Interview Guide Topics

1. Demographics (publication places & funding)
2. Research data lifecycle (the story of the data)
3. Data management (time spent, migration, resources)
4. Disposition of the data
5. Re-use of the data
6. Making the data available
7. Roles for libraries and librarians

A curation profile will be created for each case data set using parameters that can then be compared across disciplines to analyze data needs, and can be matched with systems requirements.

Data Curation Profile – Possible Categories

- Data Properties
- Attributes/Coverage

- Responsible Parties/Administration
- Life Cycle of the Data
- Identification
- Relationships/Interoperability
- Tools, Services, etc.
- Preservation
- Discovery/Access
- Quality of Data
- Communities
- Standards
- Other issues

The outcomes of this research will hopefully benefit those who are developing institutional repositories. At the time of the presentation at Geological Society of America, the project was at the interviewing stage. Recordings were being transcribed. Subsequently, there have been some follow-up interviews.

Observations Thus far

The role of the author in the project has been as subject librarian liaison. Activities have included identifying researcher interviewees, attending interviews, and participating in focus groups.

Sitting in on the interviews has been a valuable learning experience for the author as a subject librarian. Although most subject librarians have a fairly good idea of the research interests of the geology faculty members they serve, the interviews have taken that knowledge to a whole new level. Beyond learning about their data curation needs, the additional knowledge will serve to help them more with their other information needs.

Following are some thoughts from the interviews:

Before the interview, some interviewees did not think they would have much to offer, but all were eager to discuss their research and their data once the interview started. Some are eager to share their data sets with others, some are slightly cautious due to bad experiences, and others simple do not care to share their data sets. However in each case, during the interview, the researchers all came to the conclusion that librarians and institutional repository staff could be valuable resources in the management of their data collections. All of those interviewed had data sets on their computers, and they had not given much thought toward long term preservation.

There was a very wide variation in the size and format of data even between the small number of individuals interviewed, and even for a single researcher. A single researcher might be involved in both field research and modeling, and therefore might be generating very different sorts of data sets.

Some of the research is discipline specific, and some is very interdisciplinary. This has implications for where the data might be deposited. For the interdisciplinary data, it became apparent that seeking this sort of data might involve searching different disciplinary repositories and directories.

The sources of grants or affiliations of co-researchers also have implications for whether data is deposited, and where the data might reside. For example, some data sets could be deposited in repositories outside the United States, and some might be deposited in repositories specified by the granting agency. If a state or federal geological survey is involved, that might also influence where the data sets are deposited. Grants from industry might require an embargo period before the data could be shared with the public.

During the interviews, it became apparent that researchers are confused about the differences between digital repositories, digital libraries, and digital directories. Interviews revealed that some data sets submitted to a digital library were difficult to find, and some never got added after they were sent. A web site that was created to provide access to data was never populated with the data. The discovery of these problems during the interview surprised the researcher. This is probably not an isolated case.

Researchers are grappling with what data sets to keep (raw/processed/combined), for how long, and how widely to share them. Some researchers were grateful to know that they could discuss these issues with institutional repository staff. The interviews got the researchers thinking more about the life cycle of their data, and curation issues. These are a few of the ideas brought out by the interviews. Once the interviews have been transcribed, analyzed, and compared with interviews from other disciplines, many valuable lessons will be learned, in addition to the actual research goals.

CONCLUSIONS

There is an increasing need for digital data curation, of both newly generated data sets, as well as older, legacy data sets that often reside on researchers' computers. Researchers are expressing a need for some level of help, whether or not they plan to place their data into repositories. Minimally, they would like help in organizing their data.

If they plan to deposit their data some place, then they need to know the repository alternatives and the processes. They want help thinking through what version of data sets to deposit. Some would like help with metadata and organization. They are interested in issues of ownership and migration of data.

NSF is proposing that data curation plans be a part of grant proposals, and that evaluation of funded work will include an evaluation of whether the plan was followed. Researchers will need help when grappling with the issues related to new data curation requirements.

Librarians will increasingly be called upon to help with these issues. If a particular institution has plans to develop an institutional repository capable of handling data sets, librarians are logical liaisons between the repository and the researchers. Even if a particular institution does not have plans to develop an institutional repository, librarians should know the off-site alternatives so that they can help their researchers who are faced with requirements to deposit their research data sets.

Subject librarians are well positioned to encourage researchers to be stewards of their data, and to help them in the process. The subject of data curation is rapidly expanding, and it will take effort by librarians to get up to speed, and stay informed. It will be increasingly important for geology librarians to communicate and cooperate with groups such as the Geoinformatics Division of GSA, and to attend and participate in US and International meetings on geoinformatics and digital data curation, especially as they relate to geology.

Finally, there needs to be a Directory of Geoscience Repositories that lists all of the repositories, worldwide, that contain geoscience data collections. Information for each repository should detail the types of data sets that it contains, what it will accept, from whom, how it can be searched, if and how data sets can be accessed, migration policies, and other features that indicate whether it is a trusted repository.

ACKNOWLEDGEMENTS

This work is supported by IMLS NLG-06-07-0032-

REFERENCES

ARL, 2006, To stand the test of time; Long-term stewardship of digital data sets in science and engineering; A report to the National Science Foundation from the ARL Workshop on New Collaborative Relationships; The role of academic libraries in the digital data universe: Arlington, VA, Association of Research Libraries, 159 p. http://www.arl.org/pp/access/nsfworkshop.shtml

Atkins, D.E., Droegemeier, K.K., Feldman, S.I., Garcia -Molina, H., Klein, M.L., Messerschmitt, D.G., Messina, P., Ostriker, J.P., and Wright, M.H., 2003, Revolutionizing science and engineering through cyberinfrastructure; Report of the National Science Foundation Blue-Ribbon Advisory Panel on Cyberinfrastructure: Arlington, Virginia, The National Science Foundation, 84 p. http://www.nsf.gov/cise/sci/reports/atkins.pdf.

Brady, S.R., Sinha, A.K., and Gundersen, L.C., 2007, Geoinformatics 2007 – Data to Knowledge; Proceedings, May 17-18, San Diego, California: United States Geological Survey Scientific Investigations Report 2007-5199, 104 p. http://pubs.usgs.gov/sir/2007/5199/.

Cragin, M. H., and Shankar, K., 2006, Scientific data collections and distributed collective practice: Computer Supported Cooperative Work, v. 15, n. 2/3, p. 185-204.

Key Perspectives Ltd., 2008, To share or not to share; Publication and quality assurance of research outputs: London, UK, Research Information Network, 69 p. http://www.rin.ac.uk/data-publication.

Lynch, C.A., 2003. Institutional repositories; Essential infrastructure for scholarship in the Digital Age, *in* A Bimonthly Report no. 226: ARL http://www.arl.org/resources/pubs/br/br226/br226ir.shtml.

NSB, 2005, Long-lived digital data collections: Enabling research and education in the 21st Century: Arlington, VA, National Science Foundation, 87 p. http://handle.dtic.mil/100.2/ADA444393.

NSF, 2007a: National Science Foundation Cyberinfrastructure Council, 2007, Cyberinfrastructure Vision for 21st Century Discovery: Arlington, VA, National Science Foundation, 58 p. [NSF-2007-28] http://www.nsf.gov/od/oci/CI_Vision_March07.pdf.

NSF, 2007b, Sustainable Digital Data Preservation and Access Network Partners (DataNet): NSF Program Solicitation NSF-601 http://www.nsf.gov/pubs/2007/nsf07601/nsf07601.htm.

Rusbridge, C., Burnhill, P., Ross, S., Buneman, P., Giaretta, D., Lyon, L., and Atkinson, M., 2005, The Digital Curation Centre; A vision for digital curation: [Paper For: From Local to Global: Data Interoperability--Challenges and Technologies, Mass Storage and Systems Technology Committee of the IEEE Computer Society, 20-24 June 2005, Sardinia, Italy], 11 p. http://www.dcc.ac.uk/docs/DCC_Sardinia_paper_final.pdf.

Sinha, A.K., ed., 2006, Geoinformatics; Data to knowledge. *Geological Society of America Special Paper 397*, 282 p.

REALIZING THE RESEARCH LIBRARY—DATA CENTER ALLIANCE

Rajendra Bose
Center for Digital Research and Scholarship
Columbia University Libraries/Information Services
rbose@columbia.edu

Abstract — Recognizing the conceptual alliance between today's research libraries and scientific data centers, and moving toward creating partnerships, collaboration and even hybrids of these two types of enterprises, are topics that have informed conversations at Columbia University and among participants at recent electronic Geophysical Year (eGY) meetings. Columbia houses a number of both formal and informal data centers across its research disciplines, and is fertile ground for collaboration. The alliance between research libraries and data centers has also been discussed among contributors to the eGY— the 50 year anniversary incarnation of the 1957-1958 International Geophysical Year (IGY). A related session was held at the 2008 annual American Geophysical Union (AGU) meeting, and further ways to move forward with the alliance on all levels, from international to local, are being explored.

REALIZING AN ALLIANCE BETWEEN LIBRARIES AND DATA CENTERS

Today's geoscientists and other researchers are growing accustomed to retrieving some of the written articles and data they need for their work in digital form through rapid searches on the web. Tomorrow's researchers will both expect and demand this capability for most all their needs, both as a complement to, and a replacement for, paper resources. Realizing an alliance between research libraries and data centers, in both senses of the term, will help these institutions meet the growing expectations of their customers.

One sense of the term "realize" implies we should recognize that a natural connection between these two organizations exists. In one base view, the culmination of activity for both research libraries and data centers is a patron's success in discovering and acquiring a digital resource they may need through a web browser. The second sense of "realize" implies we should accomplish or achieve this alliance by actively creating partnerships, collaboration and even hybrids of these two types of enterprises.

These topics have informed conversations at Columbia University and among participants at recent electronic Geophysical Year (eGY) meetings. On one hand, research libraries are striving to achieve the same excellence at managing digital material as they are known for with their print and other media collections. On the other hand, scientific data centers may benefit from research librarians' experience and perspective on long-term preservation and archiving tasks.

EXAMPLE: CONNECTING DATA CENTER AND LIBRARY HOLDINGS

We consider the scenario of discovering geographic data in standard geographic information system (GIS) formats to illustrate the potential to connect access to data center and library holdings. This example is timely, as the number of research disciplines searching for and using GIS data is generally growing at universities including Columbia.

When browsing the GIS data sets available for purchase or download online at specialized national data centers like the USGS Earth Resources Observation and Science (EROS) data center, the National Geophysical Data Center (NGDC), or the National Climatic Data Center (NCDC), customers have access to some of the assistance that libraries traditionally provide to patrons through phone or email help desks. However, the design of many systems to find and retrieve data center products in various formats often tacitly presumes customers already possess a fair amount of discipline-specific knowledge.

At the middle ground in the spectrum from national data centers to research libraries are 'data libraries' which typically focus on the social sciences and include population-related data sets as well as GIS data. One well-established example is the twenty-five year old Edinburgh University Data Library. The Data Library assists university users in the discovery and access of research datasets, including census and map data. The focus on university users and its place within the library organization means it follows a model of patron assistance according to the traditional library model, including the existence of dedicated reference librarians. However, online search for GIS datasets is not accomplished through the standard library catalog, but through a set of web pages representing a separate Data Library catalogue.

This is the same at Columbia's research library, where GIS data sets are not discoverable through the main library catalog, but instead through a link to a Spatial Data Catalog of roughly 1600 data sets. This catalog is the result of efforts of an interdisciplinary GIS group at the university. It is significant that the Columbia Spatial Data Catalog includes some GIS data sets created at Columbia itself. Columbia's Center for International Earth Science Information Network (CIESIN) operates the Socioeconomic Data and Applications Center (SEDAC), one of several Distributed Active Archive Centers supporting NASA's Earth Observing System program. CIESIN research staff create a large number of GIS data products, and some of these are discoverable through the Spatial Data Catalog.

While the integration of standard library catalogs and custom digital data listings may not be a priority for many institutions, for practical as well as philosophical reasons, the Spatial Data Catalog at Columbia demonstrates how datasets created inside a university can receive exposure and recognition within local research groups, as well as externally, through their connection to library holdings.

Furthermore, data centers could benefit from linking directly to journal articles and other publications that cite their datasets. While there is no widely agreed upon standard yet for how to cite data sets, data centers like SEDAC are compiling lists of works that cite SEDAC data products in part to prove to their funding agencies how their data products are of value to others. However, the existing lists of publications that cite SEDAC datasets do not link directly into the library catalog or a university repository, to allow retrieval of the publications, which would bring the library—data center connection full circle.

The idea of more closely connecting access to holdings discussed above is one basic example of the natural pairing and collaboration that could exist between data centers and libraries.

RELATED ACTIVITIES AT COLUMBIA

Columbia University, founded in 1754, has 25 libraries and hundreds of librarians who maintain extensive print, digital and other multimedia holdings. In the 1990s Columbia became home CIESIN and its data center. Thus Columbia is fertile ground for collaboration: Libraries/Information Services staff aim to meet regularly with CIESIN personnel to share experiences with creating metadata and designing digital repositories for university research data. At the same time, CIESIN is developing its own repository for long-term geospatial data archives. The Long Term Archive (LTA) project, set up several years ago at Columbia, includes an LTA board consisting of both library specialists and data center staff who assess which data center holdings meet the criteria for archiving (Downs, 2008). Ultimately, both groups would like to experiment with transferring repository records from the data center into the forthcoming library repository for long-term preservation purposes.

Other formal and informal scientific data centers also exist among the wide variety of research groups at Columbia, which span medicine, public health, the social sciences and the geosciences, among many others. Collaboration activities may spread to some of these other groups in the future.

In addition, a task force convened by James Neal, Columbia University Librarian and Vice President for Information Services, reviewed faculty and staff opinions and perspectives in 2008 regarding the readiness of the university to embrace the changes embodied by the conduct of e-Science. The term 'e-Science' encompasses the services, software and human expertise that "enables distributed knowledge communities that collaborate and communicate across disciplines, distances and cultures." (National Science Foundation, p. i) The final report of this task force will be submitted to the university administration during the first half of 2009. Part of the Association of Research Libraries (ARL) "Agenda for Developing e-Science in Research Libraries" report (2007, p. 4) includes "identifying new roles for libraries in e-science infrastructure and services to the scholarly community," and "outlining new information profession skills and new roles for librarians as part of research teams." We believe partnerships and conversations between the university library and local and other data centers will help inform this process.

THE ELECTRONIC GEOPHYSICAL YEAR (EGY)

The ideas for an alliance between research libraries and data centers have been discussed among contributors to the eGY—the 50 year anniversary incarnation of the 1957-1958 International Geophysical Year (IGY)—most recently at the eGY General Meeting held in March 2008 in Boulder, Colorado. The original IGY was a voluntary international scientific initiative for a comprehensive global study of geophysical phenomena. The eGY focuses on newer e-Science approaches to achieve the same goal, and serves as a resolve, rather than embodying a formal institution. eGY activities, including talks and demonstrations at international gatherings, are funded in part by member institutions, however, and help to refresh scientific data stewardship and other principles from the original IGY.

The related International Polar Year project provides the context for interaction between the National Snow and Ice Data Center (NSIDC) and University of Colorado, Boulder libraries. Columbia and Colorado are exploring ideas for informatics research initiatives related to this project, which thus far has included a successful session of twelve invited and submitted presentations on "The Library—Data Center Alliance in Earth and Space Sciences" at the December 2008 annual American Geophysical Union (AGU) meeting. This session was co-convened by the author and Mark Parsons, program manager at the NSIDC and World Data Center for Glaciology in Boulder.

MOVING TOWARDS THE ALLIANCE

In addition to continuing activities at Columbia, plans are being made for follow-up activities to the 2008 "Library—Data Center Alliance" AGU session. The hope is for conversation and partnerships to develop at international and national as well as local levels. Some organizations, for example the National Oceanic and Atmospheric Administration (NOAA), have many years of experience operating both types of institutions. NOAA operates a number of data centers as well as a physically distributed central library which networks with over 30 regional NOAA libraries. By engaging the directors and staff of such national bodies in conjunction with other institutions, the research library—data center alliance will move ahead in the years to come.

ACKNOWLEDGEMENTS

The author would like to acknowledge discussions with Mark Parsons, Bob Chen, Bob Downs, Rob Cartolano, Peter Fox, Bill Peterson, Charlie Barton, Dan Baker and other members of the Columbia, eGY, and Earth and Space Science Informatics communities who contributed to the ideas expressed in this paper. The author also acknowledges the financial and logistical support provided by Bill Peterson and the Laboratory for Atmospheric and Space Physics at the University of Colorado which supports U.S. eGY activities and which allowed the presentation of this work at the annual Geoscience Information Society meeting in Houston in October 2008. The ideas presented in this paper are the opinion of the author and do not necessarily reflect the official policies or services of the Center for Digital Research and Scholarship, Columbia University Libraries/Information Services.

REFERENCES

ARL Joint Task Force on Library Support for

E-Science, 2007, Agenda for Developing E-Science in Research Libraries: Final Report & Recommendations (Nov. 2007), (http://www.arl.org/bm~doc/ARL_EScience_final.pdf).

Downs, R., Chen, R., Cartolano, R., and Bose, R. (2008), Collaborative Establishment of a Long-Term Archive for Stewardship of Interdisciplinary Scientific Data, *Eos Trans. AGU, 89* (53), Fall Meet. Suppl., Abstract U23A-0047.

National Science Foundation, 2007, Cyberinfrastructure Vision for 21st Century Discovery (March 2007), (http://www.nsf.gov/pubs/2007/nsf0728/index.jsp).

Neal J., 2008, The Research Library and the E-Science Challenge: New Roles Building on Expanding Responsibilities in Service of the Science Community, *Eos Trans. AGU, 89* (53), Fall Meet. Suppl., Abstract U13D-01.

Parsons M., 2008, Data, Libraries, and Scientists: Understanding the Arctic and the Earth. A Position Paper for the 2nd Global Research Library 2020 Workshop, March 2008, Tirrenia, Italy, (http://www.grl2020.net/uploads/position_papers/Mark_A._Parsons.pdf).

CHALLENGES OF THE PRINT TO ELECTRONIC TRANSITION: A SOCIETY PUBLISHER'S PERSPECTIVE

Neal Marriott
Director of Publishing
Geological Society of London
neal.marriott@geolsoc.org.uk

Abstract — The Geological Society of London has a long and prestigious publishing record. Founded in 1807 it has had a continuous print publication record since the first volume of the Transactions of the Geological Society of London was made available in 1811. Thirty four years later the Quarterly Journal of the Geological Society was launched, but more than a century passed before a third title was added.

Today the Geological Society publishes around 10-12 000 pages of new peer-reviewed content annually, much of it within its well known Special Publications series. The 21st century challenge for the Society has been to bring this content together, building a comprehensive and highly functional electronic collection of content in order that users can extract maximum value from the Society's accumulated content. The result is the widely praised Lyell Collection, launched in 2007 – the Geological Society's bicentenary year.

Society publishers are often significant within their field, yet can rarely rely on the scale of resources, connections or economies of scale enjoyed by the large commercial publishers with which they compete. It is essential, therefore, that these not-for-profit organizations work efficiently and intelligently, applying their resources as effectively as possible and utilizing external expertise as required. Most importantly, success for the society publisher in tomorrow's predominantly electronic world will be contingent upon establishing collaborative relationships and partnerships with suppliers, authors, readers – and librarians.

DIGITAL WATERSHEDS: ONE LIBRARY'S APPROACH TO EXPANDING ACCESS TO WATER RESOURCES INFORMATION

Andrea A. Wirth
Geosciences and Environmental Sciences Librarian
Oregon State University
andrea.wirth@oregonstate.edu

Abstract — Oregon State University Libraries has developed a variety of digital collections that support the university's commitment to natural resources research. Two of these collections are the Umpqua Basin Explorer and the Middle East Water Collection. The existence of both of these digital initiatives represents the ongoing collaborative work between librarians, natural resources specialists, and researchers – particularly those involved in water policy and management. This paper describes the unique collaborative structure that has evolved for both of these collections as well as the technology used to develop each collection.

Oregon Explorer (www.oregonexplorer.info) was created in order provide efficient access to the information needed by Oregonians to make informed natural resources decisions. The content for the Umpqua Basin Explorer (a portal of the Oregon Explorer) is being developed through collaboration with the Partnership for Umpqua Rivers (PUR). PUR has provided insight into the needs of the stakeholders and the Umpqua Basin natural resources community (agencies, organizations, consultants, etc.). We have used PUR's regional expertise in conjunction with the libraries' technical capabilities and comprehensive natural resources collection to develop a digital library for the Umpqua Basin community.

The Middle East Water Collection (http://digitalcollections.library.oregonstate.edu/mewaters/) provides access to 9000 items on political, socio-economic, demographic, and legal issues of water in the Middle East that originate from a variety of publishers and national and multinational agencies and organizations. Though only a small portion of this collection has been digitized, the database is a discovery tool for the entire collection.

INTRODUCTION

Oregon State University Libraries (OSUL) have developed a wide variety of new digital collections in recent years, many of which focus on science and natural resources. These efforts are due in part to the university's and the libraries' historic commitment to natural resources which includes strong programs and collections in forestry and agriculture. This history combined with the current library strategic plan that embraces the natural resources focus of the university has given momentum to many of the libraries' digitization efforts. These efforts have resulted in several collections of importance to water and watershed researchers and stakeholders.

In this paper I describe two of our digital collections – one, the Umpqua Basin Explorer, is a portal within an established and robust digital initiative (Oregon Explorer: Natural Resources Digital Library) and the other, The Middle East Water Collection, as a standalone, unique resource. Both of these resources address water bodies, watersheds, and stakeholder interest in the health of water resources, represent the unique collaboration between the library and other organizations, campus groups and individuals; and are the products of the creative use of technology.

NATURAL RESOURCES, WATER, AND GEOSCIENCES CONNECTIONS

The term "natural resources" has different associations for different people. In some cases, the term conjures images of forests and timber harvests, in others oil and minerals, and still others animals, land, air or water. It is this last natural resource that is the focus of this paper. As described in greater detail below, Oregon State University (OSU) places much emphasis on natural resources education through a variety of programs. One of these is the Department of Geosciences, which includes both Geology and Geography (physical and human). OSU also has a Water Resources Graduate Program which relies heavily on faculty expertise from Geosciences, Engineering, and others. As the Subject Librarian for Geosciences and the Water Resources Graduate Program (and several other areas), I have had the opportunity to learn much about the diverse types of research in the fluid (forgive the pun) realm of "water". Both the physical and social sciences are well represented in the water resources research at OSU and it is from this perspective that this paper is written for the Geoscience Information Society (GSIS).

OSU'S FOCUS ON NATURAL RESOURCES/WATER

Land Grant influence

As a Land Grant institution, Oregon State University has a strong history of serving people beyond campus. The colleges of agriculture and forestry as well as OSU's extension program exemplify OSU's longstanding outreach to other parts of the state. More recently, organizations focusing specifically on areas of natural resources have come to OSU, and new programs that educate the next generation of natural resources professionals are being developed. These new institutes and programs reflect the OSU’s strategic plan (Ray, 2007) as well as impact the direction of OSUL in important ways.

Institutes

The Institute for Natural Resources (INR) is an Oregon University System entity that "is charged with creating a comprehensive coordinated natural resource information system for Oregonians" (Oregon State University, 2007, p. 2). The charge comes directly from the state legislature through the Oregon Sustainability Act of 2001 (Institute for Natural Resources, 2006). With this mandate the INR and OSU Libraries saw an opportunity for collaboration on a new digital resource -- Oregon Explorer: Natural Resources Digital Library (http://oregonexplorer.info). With INR's mandate and OSU's history of collecting in forestry, agriculture, and other science and natural resource disciplines, a successful partnership has formed.

The Institute for Water and Watersheds (IWW) was established in 2005 although two organizations had preceded it for several decades: The IWW leads the campus on water-related issues, bringing together faculty from multiple departments to provide a comprehensive water program that "connects students, staff, and faculty with stakeholders and statewide water issues, and pursues solutions to water and related environmental problems of Oregon, the Pacific Northwest, the USA, and the world by assembling research teams from a broad spectrum of disciplines" (Institute for Water and Watersheds, 2008).

New Water Resources Program

In 2003, OSU approved the Water Resources Graduate Program (WRGP) which draws upon expertise from multiple departments (as the IWW does) to provide degrees in three areas: Water Resources Engineering, Water Resources Science, and Water Resources Policy and Management. In addition to Oregon water issues, WRGP research addresses international topics as well (i.e. the Program in Water Conflict Management and Transformation).

OSU LIBRARIES COMMITMENT TO NATURAL RESOURCES

OSU’s Land Grant history is reflected in the depth and breadth of our library collections in natural resources. In the areas of agriculture and forestry, particularly as those subjects pertain to Oregon, we have substantial holdings in journals, monographs, government documents, and extension service publications. With natural resources' status as an area of emphasis in the OSU Strategic Plan, the OSU Libraries have been able to further develop services and collections (digital and otherwise) that continue to improve support for research and education in this broad area. Digital collections include: projects led by University Archives such as the Gerald Williams Collection (US Forest Service history) and the Pacific Northwest

Stream Survey; projects like Oregon Explorer (described in more detail below); and significant additions to our institutional repository in fields such as forestry, fisheries, wildlife, and Extension Services. A hybrid collection (print and digital) named "The Middle East Water Collection" (described below) also illustrates the Libraries' interest in growing our collections in the natural resources and support for water-related research specifically.

Water Support

The interdisciplinary nature of research on water and watersheds draws from these natural resources collections. However, with increased educational programs, research, and outreach on campus on the topic of water, our current services and collections are adapting. For example, ways in which OSUL is supporting water resources research directly include: dedicating a fund line (albeit small) specifically to water resources monographs purchases; protecting most journals that support water research during recent budget cuts; assigning a subject librarian to address water resources reference inquiries; collaborative development of a research guide (in process) specifically for water resources; and several digital initiatives, two of which are the focus of the remainder of this paper.

WATER AND WATERSHED COLLECTIONS

<u>Oregon Explorer</u>

As mentioned above, the libraries, through the direction and leadership of the University Librarian, have worked in partnership with INR to develop the Oregon Explorer Digital Library (OE). The digital library represents a purposeful expansion of the OSUL mission to serve the broader Oregon community in a targeted way. Through Oregon Explorer, we are hoping to help inform the decisions of stakeholders and others interested in Oregon's natural resources - whether or not they have any direct affiliation with OSU.

Oregon Explorer consists of a series of topic-based and place-based portals. Currently, topics such as wildlife, land use, rural communities, and wildfire risk are addressed. The place-based portals are developed around river basins and at this time include the Umpqua Basin Explorer, Willamette Basin Explorer, and the North Coast Explorer.

Each portal, whether addressing a region or a topic of statewide interest, has unique features including stories that provide context for the issues, reports and publications, photos and videos, and tools that allow people to work directly with natural resources data for Oregon. The mapping tool allows users to create maps of varying complexity, using a number of available framework and thematic data layers (Figure 1), and provides a method of downloading data in formats compatible with geographic information systems.

<u>Umpqua Basin Explorer</u>

As a place-based portal the Umpqua Basin Explorer (UBE) (http://www.umpquaexplorer.info) addresses issues facing the basin and its inhabitants. As the term "basin" implies, the focus of the portal is the Umpqua watershed in southwestern Oregon. Fish, habitat, water quality, water use, and history of the region are the focus of the portal. The UBE provides users with information in the form of interest stories, documents, tools, and local contacts (Figure 2). Additionally, as of Fall 2008, K-12 curriculum materials have been added .The success of Oregon Explorer and the Umpqua Basin Explorer in particular is due in large part to successful collaborations that go well beyond funding and sponsorship. The Partnership for the Umpqua Rivers (a watershed council) plays a major role in the continued development and upkeep of the portal. Their contributions will be described in more detail below.

<u>Middle East Water Collection</u>

The Middle East Water Collection (http://digitalcollections.library.oregonstate.edu/mewaters/) provides access to over 9000 items on political, socio-economic, demographic, and legal issues of water in the Middle East and includes journal and newspaper articles, books, and government documents. Both the collection and database behind it were donated to the OSU Libraries by Dr. Thomas Naff, Professor Emeritus of Asian and Middle Eastern Studies (University of Pennsylvania). The collection is a hybrid of a digital library and print collection. All of the materials

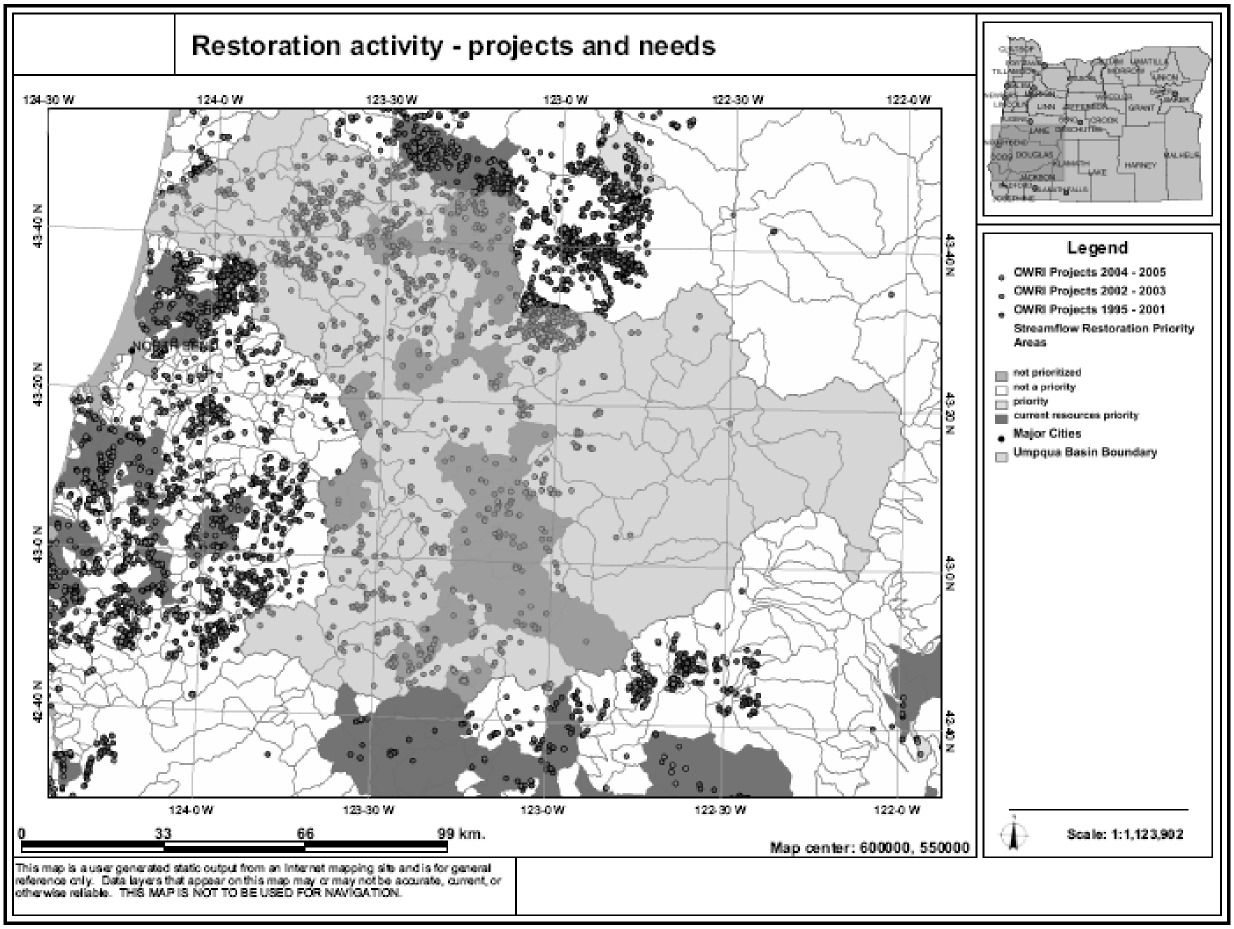


Figure 1. Map of restoration activities and needs in the Umpqua Basin as an example of output from the advanced mapping tool.

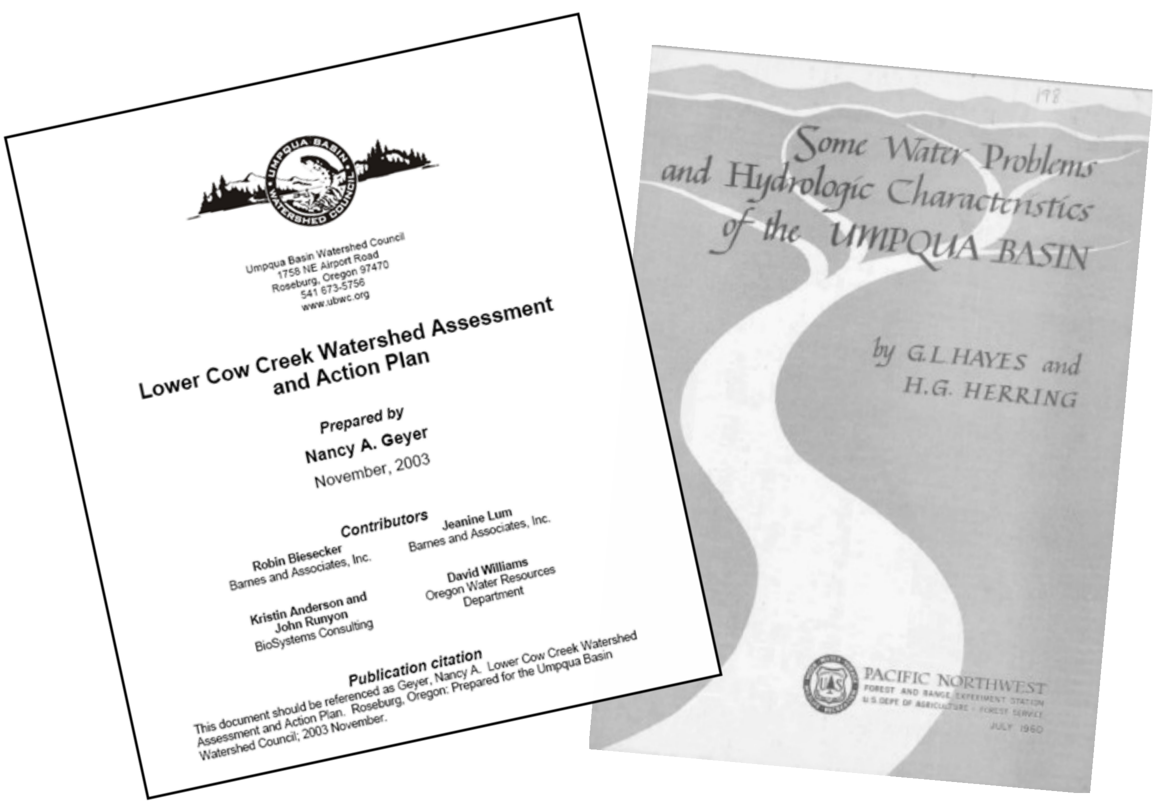


Figure 2. Example of documents available via the Umpqua Basin Explorer.

are discoverable through a CONTENTdm interface and those which are in the public domain or for which we have received permission to digitize are available online (Figure 3). Materials that are not yet digitized are available to researchers in the library. This collection is being digitized and made available for researchers (locally and internationally) who are studying topics addressing water in the Middle East.

COLLABORATION

Both the Umpqua Basin Explorer and the Middle East Water Collection projects have opened up unique opportunities for collaboration at the OSU Libraries.

Umpqua Basin Explorer

The Partnership for the Umpqua Rivers (PUR), stakeholders, Institute for Natural Resources, and OSU Libraries have contributed to the continued success of the Umpqua Basin Explorer.

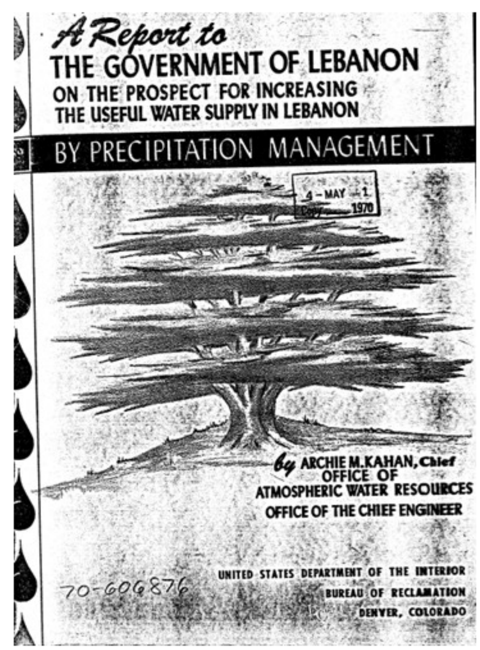
PUR has been involved from the beginning including funding, design, content contributions, and consultation. The Partnership is proactive in its continuing commitment to the success of UBE. For example, their contributions to the portal include uploading content to the site, providing PUR reports to the document collection, and more recently giving guidance on the selection of top priority resources (mostly from OSUL's collections) for digitization.

As a voluntary, non-profit group, PUR does not fall into the traditional group of "faculty, staff, students" served by OSU Libraries. This portal is an example of how outreach beyond traditional campus boundaries can be successful and has been enabled through technologies and university and statewide initiatives.

Although PUR itself is representative of the stakeholders for the region's water resources, there are others that OSU Libraries have consulted with and have turned to for expert advice and input on collection-building and site development. For example, the Oregon Department of Fish and Wildlife (ODFW) suggested important documents and scholarship from their field office library to include in the Umpqua Basin Explorer. Also, the Alder Creek Children's Forest contributed to a pilot project for Oregon's K-12 students through the Oregon Virtual School District. The learning tools will help educators teach children (current stakeholders/future decision-makers) about Umpqua Basin.

The Institute for Natural Resources is the Libraries' partner in all things related to Oregon Explorer. The core Oregon Explorer team (administrators, project managers, and technical staff) includes people from both OSU Libraries and INR. INR provides much of the natural resources expertise and is responsible for meeting the mandate to provide "a coordinated natural resources information for Oregonians" (Oregon State University, 2007, p. 2).

In addition to shared management of Oregon Explorer, major roles for the OSU Libraries are sub-



Report to the Government of Lebanon on the prospect for increasing the useful water supply in Lebanon by precipitation management

Access this item.

Record Number	2271
Journal or Book Title	Report to the Government of Lebanon on the prospect for increasing the useful water supply in Lebanon by precipitation management
Primary author or editor	Kahan, Archie M., 1917-
Publisher	US Dept. of the Interior, Bureau of Reclamation
Place of Publication	Denver, Colo.
Subject(s)	Climate; Precipitation; Geography of catchment area; Hydrology
Water Basin(s)	Litani; Orontes
Countries	Lebanon
Keywords	cloudseeding; precipitation; costs
Page(s)	p. 1-73
Language	English
Date	1969-11-00
Copy @ AMES/IES	Yes
IsFullText	Yes

Figure 3. Example of document (and its CONTENTdm record) available from the Middle East

ject expertise and knowledge of the information landscape. Classified staff, librarians, and archivists worked together on the most recent phase of the UBE in order to identify and locate content relevant to the Umpqua Basin. Selection of archival materials, a literature search resulting in a comprehensive bibliography of materials related to the Umpqua Basin, and review of the literature collections of the PUR office and the regional office ODFW were completed by library personnel. In addition, OSUL technical services staff digitize and create metadata for the materials added to the UBE collection.

Middle East Water Collection

As with the Umpqua Basin Explorer, the Middle East Water Collection was developed through the cooperation of several groups and individuals. The Middle East Water Collection was a new type of collection for the OSU libraries and provided some unique collaborative opportunities both within and outside the libraries. Many people and several groups played important roles from “discovery” of the collection and the early discussions between the library administration and Geosciences/Water Resources Faculty, to the eventual incorporation of the collection into the OSUL collection.

The Middle East Water Collection was first brought to the libraries' attention when the Director of the Program in Water Conflict Management and Transformation alerted the libraries to the availability of the collection and expressed interest in having it on campus. After careful consideration, the University Librarian gave the go-ahead to receive this unique collection containing the research materials of Dr. Thomas Naff (Professor Emeritus, University of Pennsylvania).

From that point forward OSUL librarians worked collaboratively with several people in the Water Conflict program. In addition, the details of getting the materials from their former home at the University of Pennsylvania to the OSU Libraries required significant organization and funding. The Institute for Water and Watersheds paid for shipping of the materials and subsequently funded the initial digitization of materials. Librarians from the Technical Services department worked to ensure the data in the original database were transferred to a format that could be used in CONTENTdm. The Digitization unit worked to identify materials that could be digitized immediately, and the Geosciences Subject librarian began seeking copyright permissions from authors and publishers.

Several librarians and the Database Manager (also a PhD student) from the Water Conflict program met frequently to discuss the details of development of the search interface and homepage as well as the collection's official launch event held in May 2008.

Individually, each of these tasks are within the realm of traditional digital library development. Taken as a whole however, the work that went on between so many different groups to make this collection possible is unique and could serve as a model for collaboration on other projects to come.

TECHNOLOGY

Umpqua Basin Explorer

Some of the unique technology that has gone into the development of the Umpqua Basin Explorer as well as other Oregon Explorer portals includes a mixture of locally developed and commercial software. A sampling of the software used to develop and maintain UBE includes LibraryFind, CONTENTdm, DSpace, Moodle (newly incorporated in Fall 2008), ESRI's ArcIMS, and Microsoft's Virtual Earth.

Oregon State University uses DSpace for the institutional repository (IR). OSUL's IR has some important successes – it holds content designated specifically for Oregon Explorer as well as a fertile collection of digital materials that Oregon Explorer can harvest from. For example, even though our electronic theses and dissertations (ETDs) are in their own separate IR collection they can be incorporated into OE as they are cataloged. OSU has also digitized grey literature from our print collection that can be used in the same way as the ETDs. Currently, careful description of items added to DSpace allows them to be incorporated into the different explorer portals. In the future, we hope to have more integrated searching that allows for seamless harvesting of content not only from the IR, but from our other digital collections as well.

The community nature of DSpace allows us to not only preserve materials and make them accessible for UBE, but it also allows us to open up the contributions to partners outside the library. Expanding on the user-contributor functionality of DSpace, the members of the Partnership for the Umpqua Rivers are able to control some of the content that is incorporated into Umpqua Basin Explorer.

CONTENTdm collections are also important for Oregon Explorer. This platform currently hosts most of the digital archival collections. As collections are identified for their relevance to Umpqua Basin and digitized, they are incorporated into the Photos and Videos section of the Umpqua Basin Explorer.

LibraryFind is an open source metasearch tool developed by librarian-programmers at OSUL. LibraryFind allows OSU patrons to search through numerous collections and databases at the same time, minimizing the need to repeat searches in multiple sources. LibraryFind provides the search tool on all the Oregon Explorer sites including the Umpqua Basin portal. Though some work remains to be done to make this tool a more powerful feature of the digital library, its potential was recognized early by the OE team and the complete incorporation of LibraryFind into Oregon Explorer remains a priority.

Middle East Water Collection

The technology of the Middle East Water Collection is much simpler in that a single software is used to display the database and digital images - CONTENTdm. CONTENTdm gives OSUL the benefit of making a standalone collection of the materials and allowed us to re-use rather than redo the original database as well.

That CONTENTdm could provide an environment that made sense for both the database that came with this collection in addition to the digitized portions of the collection itself made it a good choice for Middle East Water. It was our first collection in CONTENTdm where the software doubles as a search interface for the entire collection (print and digital) with a growing online collection.

Significant effort was required to convert the original database (in FileMaker Pro) into CONTENTdm. Though the database came pre-made from University of Pennsylvania and included descriptive records for each item in the collection, the conversion from one format to another proved time consuming for programmers in the library. The patience and ingenuity of the people that worked on the technical side of this problem is very much appreciated by the author.

CONCLUSION

These two digital projects at Oregon State University were successfully developed with the funding and contributions of groups within and outside of the university. Identification of the collections' relevance to researchers and stakeholders locally and worldwide, their connection to the immediate priorities of the university, the knowledge, persistence and adaptability of library staff and faculty, as well as availability of the right technologies, were all factors in the successful development of these digital collections.

REFERENCES

Institute for Natural Resources, 2006, About INR, http://inr.oregonstate.edu/about_index.html (Accessed January 5, 2009).

Institute for Water and Watersheds, 2008, About IWW, http://water.oregonstate.edu/about/index.htm (Accessed January 5, 2009).

Oregon State University, 2007, Oregon Explorer Business Plan, http://umpquaexplorer.info/ExternalContent/OregonExplorerBusinessPlan.pdf (Accessed January 5, 2009).

Oregon State University Libraries. (n.d.). About libraryfind.org, http://libraryfind.org/about, (Accessed January 2, 2009).

Ray, E., 2007, From Discovery to Impact: 2007 President's Report, http://oregonstate.edu/leadership/president/2007Report/2007PresidentReport.pdf (Accessed January 29, 2009).

RESEARCH IN THE DIGITAL LIBRARY: A ONE CREDIT COURSE FOR UNDERGRADS

Patricia B. Yocum
Shapiro Science Library
University of Michigan, Ann Arbor
pyocum@umich.edu

Abstract — Learning to navigate, use and exploit the digital library can be challenging especially for first and second year undergraduate students. But learn they must. Academic libraries are increasingly digital and undergraduate curricula are increasingly research oriented. If they are to succeed academically, undergraduates must learn new concepts, systems, sources and skills. Structured learning, such as that provided in credit-bearing courses, is an established, effective learning mode. Although credit-bearing courses which help students develop their digital research skills can be found throughout the USA, courses focusing on science resources and designed for first and second year undergraduate students are not common. "Digital Research in the Natural Sciences: Critical Concepts and Strategies" at the University of Michigan speaks to this situation. Now in its 3rd year, the one-credit course is a joint initiative between the College of Literature, Science and the Arts and the University Library. Still evolving, the course aims to lay a foundation for academic research and life-long learning in the digital environment. It enrolls students who hope to major in a natural science as well students who plan other majors. Through a variety of methods, the course explores concepts, techniques and discovery tools, as well as search strategies, digital sources and academic integrity. This talk explores the major aspects of the course, examines results of efforts to date and discusses the benefits and challenges emerging.

INTRODUCTION

Digitization and the development of the Web have, without question, won the endorsement of academe. Convenient and easy to use, the Web is quick to provide results. The quality and relevance of those results, however, may vary greatly, requiring close evaluation. Further, many scholarly sources and services lie deep within networks, with access restricted to qualified individuals such as students currently enrolled. Knowing where and how to search may involve specific knowledge of local as well as remote systems. In addition, understanding relationships among systems can be a prerequisite to exploiting their power to communicate with each other. Appropriate, legal, and ethical use must also be considered.

As the volume of digitized sources grows and systems become more sophisticated and integrated, effective digital research for academic work becomes more challenging. To meet the challenges, professors, graduate students and other experienced researchers may draw upon skills developed over many years. Students who are new to higher education, however, may well lack digital research skills adequate to their academic needs. Such needs can be pronounced and urgent. In some instances these needs may be most effectively addressed via structured learning such as that provided in credit-bearing courses.

STRUCTURED LEARNING

Credit-bearing courses devoted to research in the digital environment can be found in colleges and universities throughout the United States. A Winter 2005 study reported on 100 introductory courses whose syllabi were publicly available on the Web (Hrycaj, 2005). Courses shielded behind institutional walls as well as courses with disciplinary foci would augment the number. A 2008 Association of Research Libraries survey (ARL, 2008) showed extensive instructional activity

activity within the membership including several credit-bearing courses. Courses devoted to science resources and designed for first and second year undergraduate students, however, are not common. In this regard "Digital Research in the Natural Sciences: Critical Concepts and Strategies" at the University of Michigan appears to be unique.

COURSE DESCRIPTION

"Digital Research" is a one-credit, full term course offered on a credit/no credit basis by the College of Literature, Science and the Arts (LSA) and taught by a University of Michigan science librarian with an overload appointment as a university lecturer. Designed for first and second year undergraduates, the course, informally called UC 170, meets weekly for one hour in a campus computer lab over a fourteen week term.

The 2008 LSA course catalog describes the course in this way:

> The goal of this 1-credit, lecture/lab course is to lay a foundation for academic research in the emerging digital environment with an emphasis on the Natural Sciences. Interactive learning features hands-on use of technology and authoritative sources in the "Deep Web". Learning modes include discussion, case studies, online searching, readings, and lectures. Student work is done solo as well as collaboratively and includes exercises, reports, and development of a technology skills resume. The course explores new concepts, techniques and discovery tools, and addresses academic integrity, source citations and use, search strategies, and evaluation of digital sources.
>
> Section 001 is directed toward students taking course(s) in the Natural Sciences.
>
> *(University of Michigan, 2008)*

Through Fall 2008 the course has been offered four times with a fifth scheduled for Winter 2009. Additional sections focus on the Humanities and Social Sciences.

IMPETUS

At the same time that it offers countless attractive features, the digital world includes some disconcerting aspects. There are, for example, mistaken notions that all information can be found on the internet ("It's all on the Web"), that all information is free, and that all students are computer "whizzes." A new attitude toward quality, summarized as "Good enough is good enough," can also raise concern about the value of digital results and their use.

These were some of the concerns shared in March 2006 when an Assistant Dean of LSA and two UM librarians met. The Assistant Dean noted the increasing role research plays in the undergraduate curriculum, the large, positive effect research has on student retention especially among minority students, and the anticipated conversion over time to a research curriculum for all undergraduates. Factors already evident, however, might compromise success. There was, for example, uneven quality in student research papers while use of academic sources, especially library sources, was not as frequent as expected. There were also disquieting instances of plagiarism most of which seemed to result from lack of skills rather than willfulness.

The librarians appreciated the perspective. Aware of the demands for learning which the digital library makes, UM librarians had increased their instructional offerings in number and kind. Although able to reach many students, we observed that student research skills had changed and often appeared inadequate for academic purposes. Irrespective of design, instructional events were often too brief and discontinuous to develop skills to the degree necessary. We were ready to try new modes and were encouraged that LSA saw a strong role for the library in undergraduate research. The practical question at hand was how the Library might expand its role and partner with the College to help more first year students in particular to know and use library resources.

Several possibilities were considered with a one credit-course emerging as attractive. A successful form of structured learning, credit-bearing courses are central to higher education where they enjoy a long history of effectiveness. Courses give students time and opportunity to focus on concepts, learn content, and hone skills. Development is incremental, observable and measurable. Courses also provide instructors opportunity to teach to different learning styles so that all students, whether their learning preference is visual, aural or kinetic, have favorable conditions for learning. Courses also promote development of instructional relationships which can be pivotal for student progress.

PREREQUISITES AND INITIAL VERSION

Converting an idea into an actual course entailed fulfilling many institutional requirements. Major ones included drafting a formal proposal and presenting it to the College Curriculum Committee, securing approval of the Committee as well as of both College and Library administrators, and securing funding to cover costs. In addition to addressing library research basics, the course was envisioned as featuring core sources and protocols in the humanities, social sciences and natural sciences. Three instructors would each specialize in one of these areas and liaise with a similarly focused First Year Seminar. Job descriptions were drafted and posted in compliance with University and union rules. Following interviews, the three librarians selected received formal appointments augmenting their Library appointments and bringing their individual effort to 111% for the term.

Preparations for the course, to be offered on a trial basis during Fall 2006, were intense. They included articulating lesson objectives, designing a syllabus, preparing lectures, crafting exercises, and creating assignments. Efforts also had to be coordinated among the three instructors. In less than six months an idea was converted to a reality with moderately satisfactory results. Significant changes, however, were advised.

FOCUS ON THE NATURAL SCIENCES

The attempt to introduce a sampling of sources in three disciplines, though worthwhile, was beyond the capacity of a one-hour weekly course. Thus, beginning Winter 2007 each discipline was given its own section and separate instructor. The arrangement was a boon for the natural sciences. In addition to dealing with basic systems such as course management software, network storage space, and the library's online catalog, the specialized section could explore scientific sources such as Georef, Ecology Abstracts, and Web of Science. Secondly, scientific topics and terminology could be used throughout for illustration and to reinforce learning. For example, John McPhee's *Annals of the Former World* and the formation of California served as topics in an exercise on searching the library catalog. Similarly, Kirtland's warbler, an endangered species which summers in Michigan, was the focus of an exercise examining ProQuest.

A specialized section, so named, publicly acknowledges the role of digital information in the discipline and suggests the value of systematically learning about it. With an identified focus the

	W 2007	F 2007	W 2008	F 2008
Students enrolled in UC 170 Natural Sciences	4	17	9	16
Students enrolled concurrently in natural science courses *	3	12	5	14
Biology courses currently enrolled	0	4	7	8
Chemistry courses currently enrolled	1	9	2	13
Other natural sciences courses currently enrolled	3	1	0	0

* Students can enroll concurrently in more than one science course

Figure 1. Enrollment

natural sciences section attracted many students concurrently enrolled in natural science courses (Figure 1). Anecdotal information indicated that many of these students hoped to major in one of the sciences. Finally, on a practical level, a specialized section allowed more opportunity to relate course content to that of LSA natural science courses.

CRITICAL CONCEPTS

In designing a course few steps are as important as identifying which concepts should rest at its core. Among academic libraries *Information Literacy Standards for Higher Education* of the Association of College and Research Libraries (ACRL, 2000) are a popular framework. Extending those standards, the ACRL *Information Literacy Standards for Science and Engineering/Technology* offer specialized performance indicators and sample outcomes (ACRL, 2006). Scientific associations, such as the American Chemical Society, also identify information skills their students should demonstrate (ACS, 2008).

Consistent with these standards and guidelines a one-credit course is nonetheless constrained to feature only a few. For UC 170 Natural Sciences, acculturating students to the context in which the scientific literature exists appeared to be a foremost concept. If students understand how the literature is produced and presented, it was reasoned, they would be better positioned to access and use the literature effectively.

Four aspects elaborate the concept of science culture. First is the notion that science is based in community. No scientist has exclusive access to researching a natural phenomenon. Moreover, contemporary scientific research is commonly conducted in teams whose members are often disbursed geographically. Secondly, scientific communication is essential to scientific progress and reflects the way science behaves. New discoveries build on previous work and allow for future advances. Third, scientific literature plays a central role in the advancement of science. The scientific literature makes discoveries publicly available, serves as the record of discovery, and shows relationships to preceding discoveries as well to those which will come subsequently. Finally, the scientific literature can be characterized and understood as a system. Though that system has largely become digital, the print record remains valuable.

COURSE CONTENT

Software and systems

These notions as well as others are delivered through the contents of the course. Broadly speaking contents for UC 170 Natural Sciences can be viewed in two groupings: 1) software and systems, and 2) sources. Each grouping is further refined. For example, course software includes generic types such as Microsoft Word, Powerpoint, and Internet Explorer. All students are minimally familiar with these at the start of the term, with some students demonstrating advanced skills. Digital systems specific to the University of Michigan, available by virtue of student status, include CTools (Sakai course management software), MFile (campus network storage space) UM Lessons (online testing), and RefWorks (bibliographic management software). Widely used across the campus, CTools hosts the course syllabus, instructor Powerpoints, assignments and instructions, as well as student submissions. MFile gives students digital storage space and access to material from anywhere on and off campus. RefWorks furnishes a tool to save and use citations responsibly, thus encouraging students to observe appropriate citation practices.

Sources

Sources featured in the course constitute those internal as well as external to the UM. Among the former, the Library homepage, catalog (Mirlyn) and search engine (Searchtools) are imperative to know. Sources external to the UM range more broadly. Of these it can be safely assumed that all students are familiar with Google although many are not familiar with its advanced features. Including Google early in the course provides common ground, introduces new types of sources such as scholarly articles and e-books, and prompts discussion of research methods and principles.

Because the literature plays a key role in science it is important to spend time examining it. A common exercise in basic library skills classes is to distinguish popular magazines from scholarly journals. UC 170 Natural Sciences adapts this model by pairing tertiary publications in various subjects with scholarly ones. Pairs might include *Earth* and *Geology*, *Science News* and *Behavioral Ecology*, and *C&E News* and the *Journal of the American Chemical Society*. The focus of the exercise is to discern the parts of each publication, their language and tone, types of authorship, likely audience and how the two types of publications differ. Special attention to the citations in the scholarly articles provides easy entrée to discussion of the scientific process and publishing. Students are reassured that understanding the content of articles especially in the scholarly journals is a bonus and not a requirement at this stage of their studies.

Pairing is also an effective device for examining print and digital versions of the same title. Familiar with magazines in paper format, students are asked to identify the parts of the printed *Scientific American* and to characterize its features including strengths and weaknesses. Next, students are asked to consult the same issue in its digital version, again characterizing its parts and noting strengths and weaknesses. The two versions are then compared to each other, with advantages and disadvantages noted. AAAS' *Science* is similarly explored. All examinations provide time for discussing the nature of scientific communication and the scientific literature, and to develop a deeper understanding of published sources. In addition, the exercises offer opportunity to teach digital search, retrieval and download skills and to reiterate the importance of correctly capturing references for future attribution.

Abstract and Index services (A&I's) continue to have value in the digital environment, especially when they link references to full text journal articles available via library subscriptions. For a course such as UC 170 choices are framed by which A&I's the library carries, cover the natural sciences, and are navigable by lower division undergraduates. ProQuest, for example, serves as an entry level database from which searching methods and techniques are taught. Subject databases on ecology and environmental science, offered by CSA, represent a next level of complexity. Because both ProQuest and CSA also cover the humanities and social sciences, there is opportunity to note application to other disciplines and the transferability of research skills.

The same holds for the ISI Web of Science. As a concept, cited reference searching can confuse students early in their studies and is better avoided. As a source database, however, the Web of Science is quite hospitable to students within reasonable parameters. It has particular appeal to students already working in research labs, those whose professors recommend papers authored by a specific scientist, and students working on assignments which ask them to find peer reviewed papers. Other subject databases such as SciFinder Scholar, INSPEC and PubMed can be examined depending on student interest and readiness.

INSTRUCTIONAL AND LEARNING MODES

Course content is conveyed in a variety of modes. Lectures, demonstrations, hands-on exercises, homework assignments, discussion, readings and quizzes are all employed to promote learning. Lectures, loosely defined and lasting ten to fifteen minutes, introduce topics, highlight the most important aspects, and give directions. The accompanying Powerpoints remain on CTools for reference throughout the term. Offered when introducing a new source, demonstrations are also given to elaborate key elements, refresh concepts and correct mistakes.

Active Learning

Arguably the most effective learning mode in the course is active learning which includes in-class hands-on exercises, homework assignments and quizzes. Most assignments are graded and frequently introduced as the in-class exercise (see Figure 2).

Quizzes

Extending research done in the 1930's, recent research shows that quizzing students shortly after they are exposed to new information promotes retention of that information (Chronicle of Higher Education, 2007). Quizzes in UC 170 are brief, slated to take ten to fifteen minutes to complete in class, and graded on a point basis (Figure 3).

Quiz performance provides valuable information about student progress which can be used to shape subsequent learning. Summary results for the class as a whole are shared with students (Figure 4) to help them know where their skills stand relative to their peers. Such information is important in an ungraded course so that students whose skills are falling behind are alerted to their need for additional study and encouraged to seek help.

Readings

Selecting reading material suitable to a specialized one-credit course is a challenge. Few publications focused on research in the natural sciences are appropriate to first year students. Further, material can quickly become outdated in the digital environment. If written for another university it may be useable only for its principles but then at the risk of confusing students. Fortunately, many digital systems and nearly all subscription sources provide helpful information whose currency is usually well maintained. About Us and FAQ sections help users understand coverage, structure, features and idiosyncrasies. Including these in assignments is a convenient way to introduce the sources. It also models learning which can be applied elsewhere. Some digital sources, such as Ref Works, have tutorials which are assigned in whole or part. Finally, because consulting the literature is a core practice in science, *Scientific American* and *Science,* are used to examine the literature, demonstrate its accessibility, and, optimally, cultivate long-term reading practices in students.

UC 170 Section 001 Digital Research Fall 2008
Assignment #6 MIRLYN Searching
Due Oct 1
The assignment is worth 20 points

For each question below search in MIRLYN and record your results.

1. **Your friend recommended a book you'd like to read this weekend. It's called *Annals of the Former World.***

   a. Which library owns a copy? **a.** ____________________

   b. What is the call number? **b.** ____________________

   c. Is the book available right now? **c.** ____________________

2. **You'd like to read more books by the same author.**

   a. Find and note the titles of two such books. **1.** ____________________

   2. ____________________

   b. Mark the MIRLYN record for each

   c. Put each book on "My Shelf"

   d. Using only one E-mail send all three records to yourself

   e. Forward a copy of your email to pyocum@umich.edu
   In the email Subject line put "UC 170 #6"

3. You're getting more interested in the California geology but MIRLYN is giving you a lot of records. Construct a focused search on an aspect of the topic that interests you and produces fewer than 25 records. Note the successful strategy you used including the search parameters (Word(s) Anywhere, Title, Author etc.).

Number of results (records Mirlyn gives you):

Search strategy used:

Figure 2. Assignment #6

UC 170 Fall 2008 Section 001 Your Name

____

Quiz #1

You are talking to a friend about the different types of science periodicals. Explain to him
how he might identify a **primary** periodical by listing 3 characteristics he is likely to see. (15)

____

____

Figure 3. Quiz #1 Fall 2008

FEEDBACK

A course which includes new concepts and much new content will be most effective for students if it includes extensive comment to them regarding their work. Students new to the college level may also need the additional encouragement and reassurance such comment can provide. UC 170 Natural Sciences class meetings furnish opportunity for immediate feedback from the instructor as well as from the students themselves. More structured feedback is given via graded assignments and quizzes ideally returned to students during the next class meeting. Although the course is offered as credit/no credit students are expected to attend all classes, complete all assignments and quizzes, and develop their digital research skills. By grading students' work, both instructor and student have an explicit record of student progress and a basis on which to award credit.

With few precedents upon which to draw for guidance and few peers to consult for advice, UC 170 Natural Sciences remains a course in "pilot" mode. Changes, including some quite significant, are made every term as new ideas are tried and judged for effectiveness. Observation and reflection are thus essential practices for the instructor

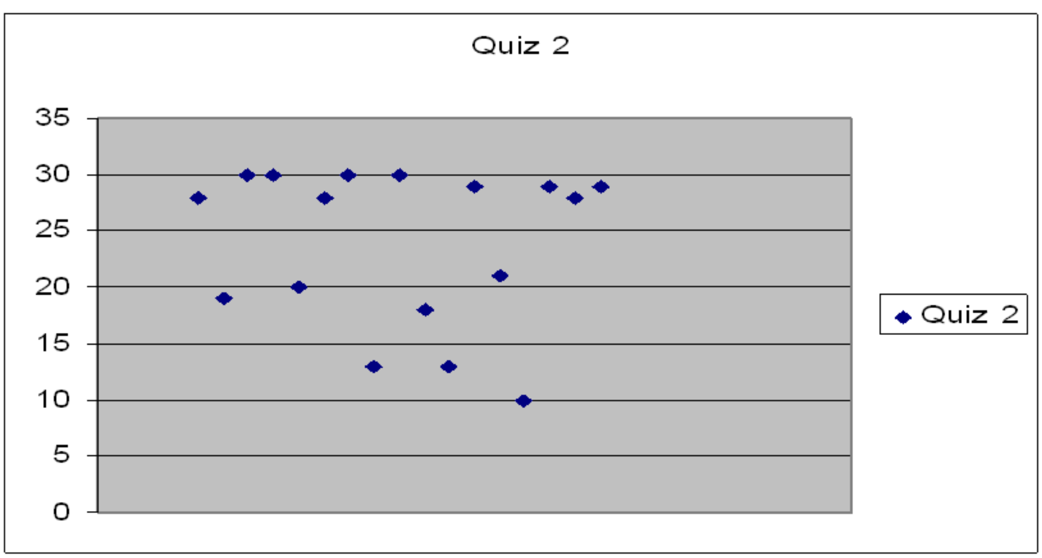


Figure 4. Quiz #2 Results Fall 2007

who must be willing to experiment, take risks, and evaluate outcomes. Student feedback in this process is very important. Body language, class attendance and participation, and quality of work submitted are examples of informal student commentary.

Twice each term formal student comment is invited. The first, requested by LSA, invites open-ended written comment (Figure 5) submitted anonymously to the instructor who collates comments and shares aggregated results in the next class meeting.

The second type of formal comment, required by the UM, is provided at term's end. Students are asked to evaluate course content and instructor performance presented as Likkert items selected from a university file. The first four questions are mandatory while additional questions are selected by the instructor apropos to the course (Figure 6).

Student responses are anonymous, confidential, and submitted to a central university testing unit which tabulates the data and forwards summaries to the instructor and college administration. Particularly for a new course such feedback is helpful in confirming areas of strength and identifying areas where revision is desirable.

QUANTITATIVE PROFILE

There are many ways to measure the dimensions of a course and most can be useful in the search for balance. Important in shaping the effort expected of students, attending to course metrics is critical for the instructor for whom a small change in one variable can trigger a large change in effect. As shown in Figure 7, increasing the enrollment from nine to sixteen students (+77%) results in a corresponding increase in assignments to grade. Options for counterbalancing this effect may include reducing the amount of individualized feedback, abbreviating assignments, decreasing the number of assignments, and/or "borrowing time" from elsewhere in the instructor's allotment.

Few options come without cost. For example, though searching exercises can be finely structured to limit results, the versatility of the digital environment as well as student ingenuity can easily produce creative results which require additional instructor time to confirm, amend or correct. Moreover, confining searching experience too narrowly may minimize opportunity for students to discover the wealth of quality sources the digital library offers, thus compromising a key objective of the course.

DISCUSSION

Teaching a course for credit differs significantly from the guest lectures or one-shot instructional sessions which librarians typically deliver. A course such as UC 170 Natural Sciences has its own dynamic, requirements and rewards. There are few precedents to draw upon for guidance and

UC 170 SECTION 001 FALL 2007

MID-TERM EVALUATION

What's going well in this class? What has been especially effective for you as a learner?

What about this class needs improvement?

Please comment on course materials and assignments.

Figure 5. Mid-Term Evaluation

		Overall, this was an excellent course.
		Overall, the instructor was an excellent teacher.
		I learned a great deal in this course.
		I had a strong desire to take this course
	121.	I gained a good understanding of concepts/principles in this field.
	122.	I learned to apply principles from this course to new situations.
	199.	The instructor presented material clearly and understandably
	202.	The instructor made good use of examples and illustrations.
	219.	The instructor was willing to meet and help students outside class.
	220.	The instructor gave individual attention to students in the class.
	240.	The amount of material covered in the course was reasonable.
	256.	Working with other students helped me learn more effectively.
	351.	Electronic presentations were a valuable part of this course
	355.	Computer tutorials were a valuable part of this course.
	891.	The workload for this course was (5=LIGHT ... 1=HEAVY)
	892.	Students felt comfortable asking questions.
	895.	Students´ difficulty with the material was recognized.
	900.	Comment on the quality of instruction in this course.
	907.	How would you change this course?
	908.	Which aspects of this course were most valuable?
	909.	Which aspects of this course were least valuable?

Figure 6. Final course evaluation questions

	W 2007	F 2007	W 2008	F 2008
Students	4	17	9	16
Weekly Sessions	13	13	14	14
Attendance	84.6%	95.5%	95.24%	94.6%
Assignments	13	12	13	14 *
Assignments Graded	52	201	117	206
Quizzes	1	2	3	2
Quizzes Graded	4	34	27	32

* One assignment was ungraded

Figure 7. Selected course metrics

little extant, science-focused library research material such as textbooks, workbooks, lesson plans or exercises to use. Thus, the instructor is challenged to develop suitable content while experimenting with its delivery in an authentic setting. This tension between design and delivery is significant but not overwhelming. It is a source of creativity while suggesting that the course still be viewed as experimental.

That such a course is needed seems evident from observing students enrolled to date in UC 170 Natural Sciences. Three areas of need stand out in particular. The first is Google. Students' preferential and often exclusive reliance on Google is pervasive and deeply rooted. It is also insufficient for honing the critical skills a research curriculum requires. Students, sometimes encouraged by their parents or academic advisors, appreciate this limitation and seek systematic help for redressing it.

A second persistent challenge students face is understanding which data elements constitute a reference. Although the concept of crediting sources for what they produce is simple, its application in the digital world is far from clear, standard, consistent or stable. Rather, there is a multitude of practices and, in the sciences, an absence of a universal protocol. As a result students often remain confused about how to cite sources properly.

Closely related, the third critical challenge for students is avoiding plagiarism. While intentions are honorable, practice may not always follow suit. A contributing cause may be digital "habits" such as copy-and-paste and liberal downloading used in recreational activities and transferred to the academic sphere. Another is the lack of understanding of what material needs to be credited. Perhaps the most conspicuous cause is underdeveloped writing skills especially those for paraphrasing and summarizing. Any of these factors can thwart students in their attempts to practice good academic citizenship and lead to instances of plagiarism.

CONCLUSION

A credit course such as UC 170 Natural Sciences is a systematic way to help students develop their knowledge of digital research and the skills needed to pursue it effectively. There is an abundance of germane topics upon which to build a syllabus, an ample supply of sources to consult, and unique opportunities to pursue a thematic approach in exploring the research process. As yet another mode which facilitates student learning, a credit course focusing on digital research in the sciences has a place in higher education for students who prefer or need a structured approach to their academic development.

REFERENCES

American Chemical Society, ACS Guidelines for Bachelor's Degree Programs: Chemical Information Retrieval. 2008. http://portal.acs.org Accessed April 2, 2009.

Association of College and Research Libraries (ACRL). Information Literacy Competency Standards for Higher Education. 2000.

http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm Accessed April 14, 2009.

Association of College and Research Libraries (ACRL). Information Literacy Standards for Science and Engineering/Technology. 2006. http://www.ala.org/ala/mgrps/divs/acrl/standards/infolitscitech.cfm Accessed April 14, 2009.

Association of Research Libraries. Research Library Virtual Resources & Instructional Initiatives: Survey 2008 Results. Washington, D.C. 2008 http://www.arl.org/rtl/roles/vrii/index/shtml. Accessed April 14, 2009.

Glenn, David. You Will be Tested on This. The Chronicle of Higher Education. v. 53, no. 40, p. A14. June 8, 2007.

Hrycaj, Paul L. An Analysis of Online Syllabi for Credit-bearing Library Skills Courses, College & Research Libraries, v. 67, no 6, pp. 525-35, November 2006.

University of Michigan, College of Literature Science and the Arts. Course Guide. Ann Arbor, Fall 2008.

STATE GEOLOGICAL SURVEY LIBRARIES: AN ANALYSIS OF THEIR STRENGTHS AND CHALLENGES

Jody Bales Foote
Youngblood Energy (Geology) Library
University of Oklahoma
jbfoote@ou.edu

Abstract — State geological survey libraries are important repositories of geologic information. Their holdings include survey bulletins, reports, circulars, open-file reports, maps, aerial photos, monographs, journals, theses, and dissertations about the geology of the fifty states.

This study examined the status of these unique and special libraries that serve state geological surveys. Telephone interviews with librarians and supervisors of these libraries produced useful information about their collections, services, and users.

Results from the survey acknowledged that these libraries continue to maintain their unique print collections while at the same time strive to provide digital and online access to their resources. These collections serve a varied clientele of state government employees, university faculty and students, professional consultants, and the general public.

Participants in the survey were asked about administrative and fiscal responsibility for the library, services to users, staffing for the library, and size of collections. Participation in exchange programs, a long-established program in which state and international geological surveys share publications, was also examined in the study.

LOST IN THE STACKS: ASSESSING A MAP ROOM FOR CONTENT, SERVICES, AND SPACE CONSIDERATIONS

Angelique Jenks-Brown
Science Reference Librarian
Binghamton University
ajbrown@binghamton.edu

Abstract — The Binghamton University Libraries' Map Room is a facility which primarily houses maps from the US Federal Depository program and individual purchases. Environmental conditions prompted an assessment of the Libraries' Map Room for its' content, services, and space usage. The librarian gathered map reshelving statistics, interviewed departmental faculty library liaisons and a map librarian colleague, and observed patron use in the Map Room to determine the usage of space and perceptions of services. It was found that the USGS quadrangles, cataloged maps, and the atlases had the highest usage based on reshelving statistics. Various departmental faculty suggested the purchase of paper maps, data sets, a scanner, and for more flexible loan periods. It was observed that many students used the Map Room for practicing presentations, and group study sessions. Services such as printing on demand, as well as scanning and plotting maps were considered.

After recommendations were submitted, challenges to implementing recommendations include staffing, funding, and alternate space options. Concerns about services include providing accessibility to materials in multiple formats. Despite these challenges, higher priority activities were identified such as staffing and training with a goal of increasing access to the map collection. The librarian wrote a grant proposal to acquire equipment and students were hired trained to work on specific projects including reshelving, processing, cataloging and barcoding maps.

BACKGROUND

The Binghamton University Libraries' Map Room is located in the Science Library on campus. It houses maps from the US Federal Depository Program and individually purchased maps and atlases. There is a separate GIS Core Facility on campus that handles GIS services and data. The map budget is small with enough funds to purchase requested maps, but not enough funds to acquire large map sets. The Map Room is a self-service facility, meaning that it is not staffed. From the main service desk, Science Library staff informally offer assistance finding a map, color map duplication, and loaning maps to patrons for a length of time they request. The assessment of the Map Room was prompted by environmental conditions.

ASSESSMENT

The assessment consisted of interviews, observations, and statistics (Dunn et. al., 2006). Interviews were conducted with a more experienced map librarian from Cornell University, Science Library staff, and university departmental liaisons for geology, geography and the GIS Core Facility. Students were observed at random times over a period of one semester. Reshelving and map circulation statistics were collected from January 2005 to August 2008.

Map Collection Needs

Faculty from the geology, geography, and GIS Core Facility commented that they would like missing USGS topographic maps replaced, more geologic maps, more recent US Census Maps, and more up-to-date atlases for various world regions.

Library staff noted that the most important map collection needs are to update the Map Room ref-

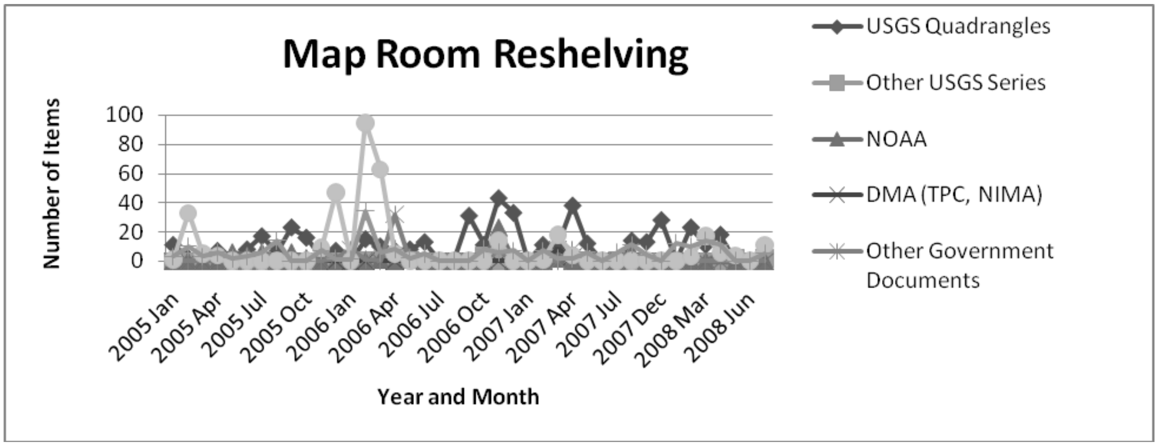


Figure 1. Reshelving Statistics January 2005 – August 2008

Total Reshelving Statistics by Series

456 USGS Quadrangles	63 NOAA
345 Cataloged Maps	58 Other Gov Docs
229 Atlases & Reference Books	13 Other USGS Series

erence collection, continue to catalog non-cataloged maps so they can more easily be found by patrons, and better incorporate electronic maps in the collection and in the collection guidelines. It was also suggested to explore deselection and transfer from the collection, however, some departments are uncomfortable transferring materials to an off-site storage facility.

Map Room Use

Through observations and discussion, we determined that the maps are mostly used by the Geology Department for the following courses: structural geology, tectonics, geomorphology, geophysics, and igneous and metamorphic petrology. Most noted by the Geology and Geography Departments are the USGS topographic maps. Faculty and students traveling to international locations for research also use the map collection. Reshelving statistics show that the USGS topographic maps receive the highest usage, second are the cataloged maps (these would include geological and geophysical maps), and third are the atlases. Circulation statistics show that the maps do not circulate often, the highest count was 13 maps in October 2007 and April 2008. Library staff informally offer services such as assistance finding maps, color photocopies of maps, and extending loan periods. I observed that students also use the room as a group study space and as a place to practice their class presentations.

MAP ROOM SERVICES & EQUIPMENT

The existing strategy of a self-service map room is recommended with the current staff level. Due to a 300+ backlog of unprocessed maps more staff hours are required to catch-up. Leaks in the Map Room have forced staff to identify alternate locations. Making a scanner available in the Map Room for patron use, or perhaps a scan-on-demand service would be beneficial for students and faculty. Since a plotter printer has been located on campus that is available for use by any student or staff member. I investigated the need for printing-on-demand and found that printed maps from other print-on-demand services did not have the detail and clarity needed for geology research.

ASSESSMENT RECOMMENDATIONS

It was recommended that the Map Room should be maintained as a self-service facility since hiring an additional employee is not an option. However, the Libraries was able to hire two part-time student assistants. Tasks were identified that would improve services in the Map Room. I trained two students to process new maps and reshelve maps, and a third student to barcode maps that had been previously cataloged.

The map collection should incorporate electronic maps, and more cataloged maps. Electronic maps should be added to the collection, either through scanning efforts, or acquiring image databases, as well as linking directly to the images search screen in EBSCO's Academic Search Premiere to offer basic map images. I investigated the possibility of adding the David Rumsey Map Collection and NASA Images to our Library Catalog but found that we would have to subscribe to Luna Images' Insight library catalog. The Librarian for Geography purchases GIS data which is incorporated into a CD-Rom collection housed in the main library. It has been a long-standing goal to catalog the entire Map Room collection as individual maps or map sets.

The Map Room needs to be relocated and, after discussing this with departmental faculty, it should remain on campus and in a single location rather than sending low-use materials to an off-site storage facility.

CHALLENGES TO IMPLEMENTING RECOMMENDATIONS

There have been two main challenges to implementing the above recommendations: a lack of funding and low use of the Map Room compared with other facilities. Many of the above recommendations require funds which the Libraries do not have so alternate funding options are being explored such as grants and partnering with other departments on campus. Map Room usage hasn't been high enough to justify spending purchasing a plotter printer or map scanner or hiring additional employees. However, we have been able to hire more student assistants to increase service, increase collections in the areas specified by departmental faculty, and include links to map scanning project registries on map web pages.

REFERENCES

Dunn, L., Zellmer, L., Musser, L., Twiss-Brooks, A., & Yocum, P. (2006, October). *Geoscience Librarianship 101*. Preconference seminar at the Geoscience Information Society Annual Meeting, Philadelphia, PA.

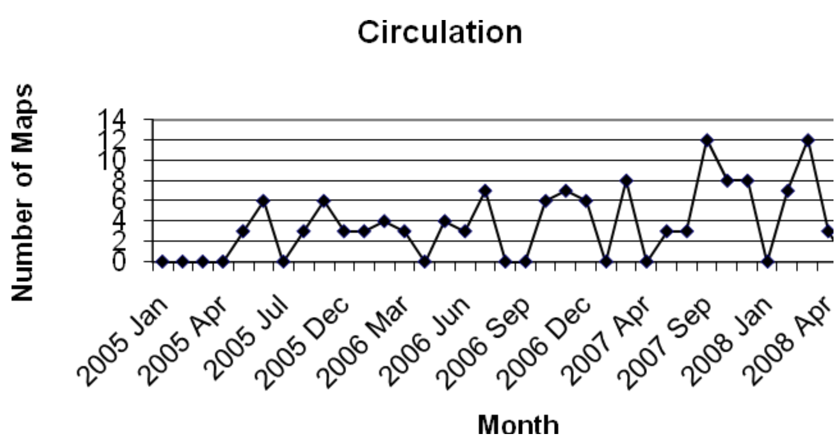


Figure 2. Circulating Statistics January 2005 – August 2008

GOOGLE MASHUPS: A NEW METHOD FOR LOCATING AND ACCESSING LIBRARY MAP COLLECTIONS

Kristi Jensen*, Lisa Johnston, Gary Fouty
Borchert Map Library
University of Minnesota
kjensen@umn.edu

Abstract — The University of Minnesota Libraries implemented a pilot project to create a Google mashup interface which provides access to a portion of the map collections housed in several library locations across campus. Steps taken to create a map-based access system, which we call MapHappy, included the selection, extraction, and manipulation of existing data from the online catalog and the creation of an intuitive user interface. Challenges involved in the creation and output of a geospatial interface designed to facilitate access to other maps and next steps to provide access to the entire map collection will be discussed in this paper as well.

INTRODUCTION

Library users seeking cartographic information face the challenge of interpreting their need into the correct search terms, subject headings, or classification codes used to describe and organize maps held in library collections. Users often encounter difficulties when attempting to utilize existing access points into map collections. In fact, users frequently require an intermediary or library staff member to help them find appropriate cartographic resources.

While print and online library catalogs used to organize maps have provided adequate access to many collections, new technologies allow libraries to explore alternative, geospatial interfaces which enhance a user's ability to independently find an appropriate map. Given existing technologies, it is possible to create an online map which allows users to geographically browse for and identify needed print and digital maps.

Searching for Maps is Hard....Browsing is Inconvenient

Many large and small libraries have rich and unique collections of cartographic materials. How do users find maps? The answer to this question is driven by how libraries have historically organized and described maps in their collections. Maps have long been classified and stored based on their location in the world. Classification has allowed users to easily browse collections but this method of finding maps is inconvenient – it requires users to visit the library to discover materials. Card catalogs and eventually online library catalogs allowed users to do text based searches for maps – for example, keyword, subject, author or title searches. This type of searching requires users to translate their geographic inquiry into words that will produce a successful search. This may lead to failed searches if the users do not understand how maps are cataloged. If the user does get to a catalog record they must interpret a range of information – including the scale and the size of the map to determine whether or not it might be useful. This interpretation can be difficult for users who are not familiar with these concepts.

How Can We Improve It?

After reading an article by Freeland et. al. (2008) demonstrating how literature with a geographic component could be mapped, Lisa our team brought together a small working group in the Libraries at the University of Minnesota to investigate whether or not we could improve the process users go through to locate and access the cartographic materials in our collections. We have data about many of our maps in our online catalog or

OPAC (see Figure 1) and the technology exists to utilize this data and present it in a map mashup. A mashup is an online tool combining information from different sources – in this case the library OPAC and Google's geocoding service.

The key to the success of this type of web-development project is pulling together the right group of people. Our project involved librarians from the Science and Engineering Library and the John R. Borchert Map Library some with programming and database skills. For expert knowledge we consulted with individuals in the Libraries' Digital Library Development Lab and the OPAC systems department for essential support. The result was a web-based search tool we call "MapHappy".

MAPHAPPY: HOW WE DID IT

The three basic steps we went through to create MapHappy involved: extracting the Marc Records (Data) from the library OPAC, transforming the record data into XML and uploading it into a SQL database, and finally, creating the Google Map search and display interface. This talk will provide an over simplified overview, for more detail see upcoming article in the *Journal of Map and Geography Libraries* (Johnston, 2009).

Step 1: Get the Data

Answering the question, "How are we going to pull the existing data from our OPAC?" was an important variable in determining whether MapHappy would be possible.

For the pilot phase of our project, we initially did a manual extract (searching and saving results ourselves) from the library OPAC. We also limited our focus to "Minnesota" maps during the pilot

```
FMT     MP
LDR        nem  2200361 a 4500
005     20080821114933.0
007     aj canzn
008     841101s1886    ilu      a    0   eng d
0341    |a a |b 2330000 |d W0971500 |e W0893000 |f N0492300 |g N0433000
0341    |a a |b 2330000 |d W0961500 |e W0890000 |f N0404500 |g N0360000
040     |a MnU |c MnU
050 4   |a G4140 1886 |b .G2
052     |a 4140
052     |a 4160
24500   |a Minnesota |h [cartographic material] ; |b Missouri / |c engraved for Gaskell's atlas of the world.
255     |a Scale [ca. 1:2,330,000] |c (W 97°15'--W 89°30'/N 49°23'--N 43°30').
255     |a Scale [ca. 1:2,330,000] |c (W 96°15'--W 89°00'/N 40°45'--N 36°00').
```

Figure 1. Example MARC Record Coordinate Field

project. Given these parameters, we extracted approximately 2000 map records. The data extraction was easy when the scope was limited to Minnesota maps, but would potentially be much more challenging when attempting to extract all cartographic materials from the OPAC.

We did explore extracting records on the fly (or on demand) and pulling the data into MapHappy, just like users performing a search in the OPAC, but there were a number of limitations that made this option untenable.

The library OPAC restricted the number of results we could pull at on time and existing query structures did not allow us to create the queries necessary to filter for our cartographic-specific data. Also, the tool would be slow to process each request when relying on the OPAC. Therefore, we chose to create a separate database which contained the data extracted from the OPAC.

We did negotiate with our library systems office for a system-generated map record output from the OPAC to supply the data describing maps and other cartographic materials. This anticipated automated updates of this information to refresh our stand alone database with newly cataloged maps. We did not anticipate continued manual extracts of the information needed to create MapHappy, but this has yet to be fully realized.

Once we figured out how to get the data, the next question was what exactly are we getting. The pilot showed about 66% of the records had some coordinate information (with a small fraction in need of minor coordinate clean-up). Knowing this, we decided to include all cartographic records whether they had coordinates or not. MapHappy can display records without coordinates within the results summary list and map the items that have coordinates. Results within MapHappy are similar to those from an OPAC search, but geospatially enhanced when possible. MapHappy will ultimately be able to highlight the records without coordinates and then link back into the OPAC.

A typical problem with the data was format. The coordinates pulled from the catalog were not always entered in a standard format. So they had to be standardized before they were useful for our project. One obvious example was missing leading

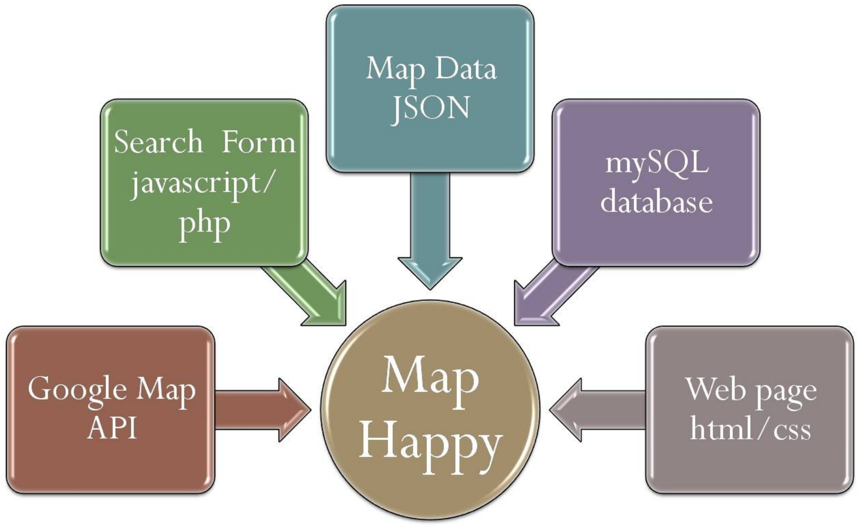


Figure 2. MapHappy Programming Components

zeros. Another presented itself later, when the data was mapped. Faulty cardinal direction (N, S, E, W) information added additional errors only identified by human spot-checking: Minnesota maps displaying in Missouri for example. Knowing where all the maps should fall (limited to one state for our pilot) was an excellent way to begin our project. Correcting faulty data will likely be an ongoing, and difficult, process.

Step 2: Build the Database

Since we were unable to extract the needed data on the fly, we had to choose how we would format the data so that it could best be pulled into this new interface. We had two options: We could have created a simple XML file of all the data, but this would be slow and we wanted a quicker, more robust interface. Hence, we had to build our own database for users to query.

The corrected records from the pilot data were downloaded into a custom-build SQL database, created around the MARC fields we found valuable. We selected fields to extract from the OPAC records based on how searches would be executed and what information would be most useful in the interface and display. We selected data needed to populate the map with center point markers, and data that might be incorporated later (like scale).

We also discussed the possibility of using various fields to provide the users with facets to help refine their search, such as subject information, but not necessarily author. We had to do an analysis of subject terms and see how useful they would be for refining searches based on the number of occurrences.

During this phase, an interesting issue surfaced. Getting access to a server that runs SQL was difficult due to the level of permissions required. Security can be a limiting issue and once you get access to needed technology there may not be a lot of support in learning to access and use the needed resources. We had to rely fully on technology staff to upload the data and create the database before we could make changes to it. This paper won't talk at length about this issue but expect to run into unexpected technological roadblocks when undertaking a project like this one.

Step 3: Map to Interface

The final phase of our pilot was to connect the data to the Google Map interface (see Figure 2) using the open source (free) Google Map API (application programming interface). To use the API, we first needed a Google Map API key, generated from their website, that allows your server to talk to their server.

Once you have the key, you can use javascript to format the map for your purposes. Scroll bar, hybrid view, center point of map, marker color, size definitions, etc. are all properties of the Google

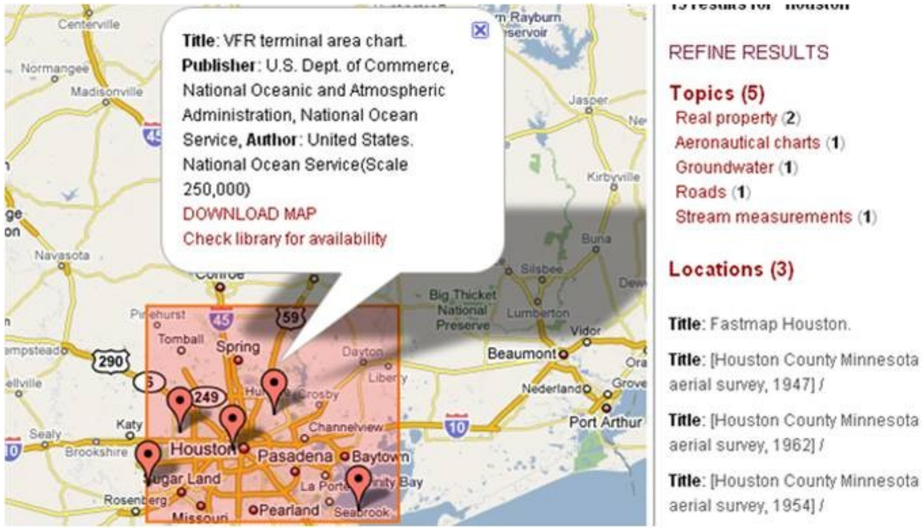


Figure 3. MapHappy Record Display (screen shot)

Map API. How the map displays is based on what is available from the Google Map API and you will have to become familiar with their tagging names which are available in their documentation.

For the mashup, we must add additional information to our map. Our decision to create our own separate database proved useful since we could tag the information ourselves and organize the data logically. This allowed us full control over how the data is searched and thereby supports the users needs. Based on the SQL database structure we built a search form, using PHP and javascript, that pulls the map data into the Google map for display as a generated JSON file, a format processed faster than XML.

The final component was a basic HTML web page and CSS code pulling all of these components together into a polished look and feel.

MapHappy combined many programming components with a range of complexity involved in this assembly process. For any project, there are a variety of paths you can take to create your own mashup. A wide range of variables may come into play in your decision making process.

The MapHappy interface solves some basic challenges involved with map searching by providing geographic indicators correlated to search results. Not only do map center points display for each mapped item, but the data provides four corner coordinate points which are represented by an overlay. The overlay appears when users place their mouse over a pin on the map.

The four-corner overlays help solve any problem users might have determining exactly where the center point for a particular geographic extent might display on the map by indicating the estimated coverage area of the selected map (see Figure 3). The interface displays maps based on their center point, then links back to the catalog record.

To keep the interface simple, MapHappy still relies on the catalog for availability and call number information with a link back to the map record in the OPAC from the Google Information Window.

MAPHAPPY: MOVING FROM PILOT TO BETA

By creating a mashup of library records with Google Maps, MapHappy retains a familiar interface that doesn't require a lot of instructions for users to effectively utilize the search tool. With the success of our pilot testing we hope to refine the process of updating the database and hopefully get us closer to an automated of the full 35,000 cataloged map records in our library system.

Of course, the current system still has issues and limitations. For example:

- Scalability: MapHappy doesn't accommodate map sets or any records not individually cataloged. Further effort will be needed.

- Integration into library catalog: Current plans include targeted promotion strategies for likely map-users in the University system.

- Digital Maps: Initial user-testing suggests that MapHappy users expect each record in this electronic environment to link to a digital map. How we attempt to meet those needs in an increasingly digital-preferred world.

TRY IT OUT

Our pilot version of MapHappy in its developmental form is available at http://www-dev.lib.umn/scieng/maps. Please use the feedback link to send us your comments.

Thanks to Jan Fransen, Heather Hessel, and Blagovest Dachev for their invaluable programming support.

BIBLIOGRAPHY

Freeland, Kalfatovic, Paige, and Crozier. Geocoding LCSH in the Biodiversity Heritage Library. *The Code4Lib Journal*, Issue 2. 2008.

Johnston, L. Jensen, K.. MapHappy: A user-centered interface to library map collections via a Google Maps mashup. *Journal of Map and Geography Libraries,* v. 5, no. 2, Jul-Dec 2009.

THE GEOSCIENCES IN APPROVAL PLANS: A COMPARATIVE REVIEW

Linda R. Zellmer
University Libraries
Western Illinois University
LR-Zellmer@wiu.edu

Abstract — Over the years there has been occasional discussion about approval plans. For the most part, the discussions concerning approval plans for geoscience materials have been favorable, but they are all based on various librarians' experiences rather than a detailed comparison of what each approval vendor offers. Librarians who work with geoscience materials are aware of some approval plan weaknesses, especially when it comes to the small press and regional publications such as field trip guidebooks frequently used by geoscientists. In addition, most major approval plan vendors do not deal with maps, and probably have never heard about geospatial data. Since the longest discussion on Geonet in the mid-1990s, there have been many changes in approval plans. Academic Book Center merged with BNA, leaving us with two major vendors for our approval plans (Blackwell and Yankee). In addition, we now have the opportunity to select both print and electronic materials

A detailed comparison of the materials profiled by two major geoscience approval plan vendors provides some interesting results and answers a number of questions: Which vendor profiles more titles (print and electronic) in the geosciences? What is the level of coverage (scholarly or general)? What publishers are covered by the vendors? Do both vendors treat the materials about the same time, or is there a lag between the time an item is published and the time that it is treated by the vendor? The results of this comparison could be useful when choosing an approval vendor for geoscience materials.

RESEARCH LIBRARIANSHIP IN THE GEOSCIENCES: TRANSFORMING TO MEET INFORMATION CHALLENGES IN THE PETROLEUM INDUSTRY

Janet B. Heagy
Training and Information Services
ExxonMobil Upstream Research Company
jan.b.heagy@exxonmobil.com

Abstract — In the corporate library environment we share a similar goal with academic or other special libraries. We seek out, analyze and deliver quality information to our customers. We strive to make effective use of emerging technologies to meet our goal. Additional factors that impact the corporate library world include market dynamics, mergers and globalization.

At ExxonMobil Upstream Research Company, library research is managed in the Technical Information section of Training and Information Services. Our research librarians collaborate with geoscientists and engineers as they identify, develop, and produce petroleum resources.

Over the past eight years Technical Information has responded to meet new challenges in a variety of ways. This paper will describe the evolution of our current research librarian model and how we expect to creatively address changes in the dynamic world of petroleum research.

INTRODUCTION

In the corporate library environment we share a similar goal with academic or other special libraries. We seek out, analyze and deliver quality information to our customers. We strive to make effective use of emerging technologies to meet our goal. Additional factors that impact the corporate library world include market dynamics, mergers and globalization.

At ExxonMobil Upstream Research Company, library research is managed in the Technical Information section of Training and Information Services. Our research librarians collaborate with geoscientists and engineers as they identify, develop and produce petroleum resources

The Research Librarian role at ExxonMobil Upstream Research Company is continuously evolving. This paper reviews changes over the last eight years and describes new developments on the horizon.

BACKGROUND

ExxonMobil Upstream Research Company conducts research on oil and gas exploration and production. In Technical Information, our customer base is located worldwide. The main disciplines I support as an upstream research librarian are geoscience and engineering.

In 2000, Exxon and Mobil had recently merged. With the merger, the heritage Mobil upstream research facilities were relocated from Dallas, Texas and combined with the heritage Exxon upstream facility in Houston, Texas.

In Technical Information, we gained an outstanding research librarian from heritage Mobil. We also gained an extensive, but complementary, library collection. The two collections used different classification schemes and two different integrated library systems.

Much of the first two years after the merger were involved in assimilation of collections and staff. We had a new organization and new management. We also had the opportunity to revisit our processes and to make improvements. An image that comes immediately to mind is the do-it-yourself home improvement television programs. It looks as easy as 1-2-3 as the host walks the viewer through a home restoration. But the reality is the project requires lots of hard work and adjustments along the way.

By 2002, we were ready to make changes based on our own experiences and research we conducted in the library literature. A central Integrated Functions Team gathered process information from staff and created an overall flow chart that incorporated all current processes. Librarians were heavily involved in research and team stewardship.

As illustrated (see Figure 1), we envisioned the Integrated Library System (ILS) as the "hub" with different teams as the "spokes." The ILS is a common denominator among all Technical Information functional teams. The diagram illustrates this and can also represent various team interactions. For example, the Research Team frequently collaborates with other teams such as Document Delivery and Marketing.

RESEARCH LIBRARIAN ACTIVITIES

The diagram (see Figure 2) represents the various activities encompassed in the Research function. In practice, there is a lot of interaction among the different activities.

Historically, some reference functions were handled at two different customer contact points based on document type: a "reports window" for proprietary reports and records management and a "reference desk" for published material. Circulation was also handled at both service points.

SINGLE SERVICE POINT TRIAL

In February 2004, we began a "Single Service Point" trial. The trial goals were to:

- expedite the move towards integration,
- present a unified Technical Information presence to customers,
- identify areas for service point workflow adjustments,
- provide a good venue to experiment with service point solutions,
- and, facilitate process development for the Circulation and Gifts teams.

Research librarians staffed the new single service point, which we called the Reference Desk. Librarians handled reference, circulation and proprietary activities such as lab notebook distribution. Activity statistics and customer and staff

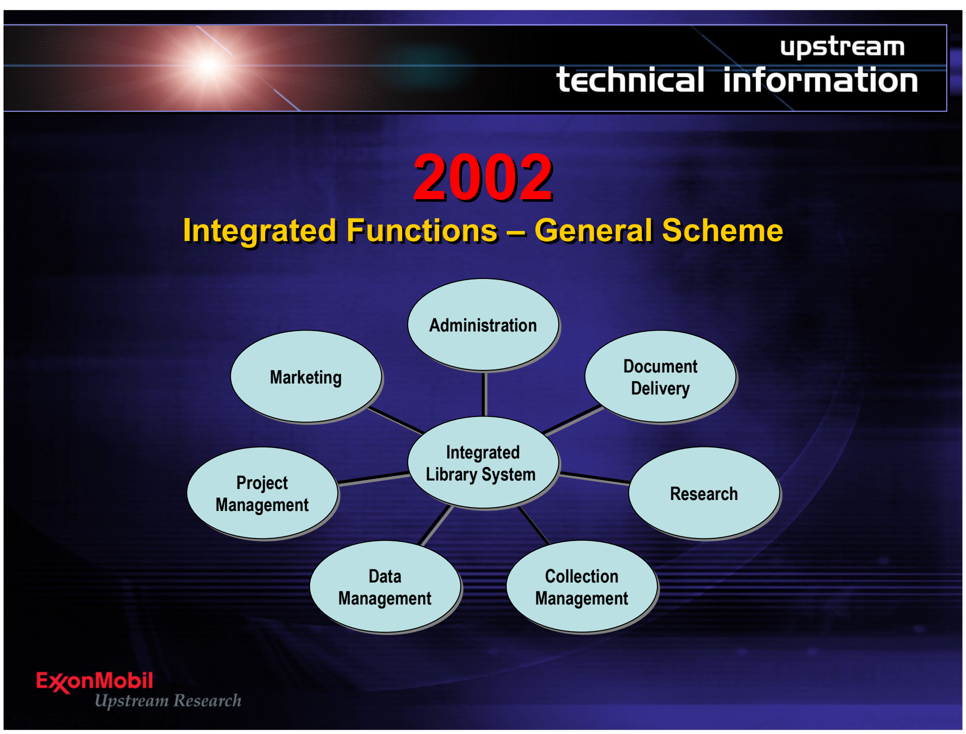


Figure 1.: Integrated Library System (ILS) as the "hub."

comments were carefully recorded for analysis. The librarians also developed detailed process documentation for the single service point.

Concurrent changes included a new physical layout, signage, and telephone and e-mail consolidation. A single shared e-mail address and telephone exchange were established. Librarians at the Reference Desk monitored e-mail, telephone and walk-in requests.

During this time, all of the functional teams were still under development. By 2005, the Gifts/Returned Materials and Circulation processes had been streamlined and a Document Delivery Team was chartered.

SINGLE SERVICE POINT EVOLVES

In January 2007, the Single Service Point underwent a review with our Technical Information Leadership Team. All functional teams were now organized and able to undertake Single Service Point activities that were not purely "Reference and Research."

Functional team interfaces with the Single Service Point included:

- Collection management
- Data management
- Document delivery
- Integrated Library System
- Marketing – Tours
- Customer training
- Research – Online searching, ready reference
- Statistics

The decision was made to eliminate the "Reference Desk" as a customer contact point and to establish an "On Call Librarian" team. We found that much of the activity conducted by the librarians at the Reference Desk was transactional in nature and left little time for more value-added efforts. Another important factor was the increasing availability of electronic desktop products for our customers via our internal webpage. We needed more time to educate customers on the use of these tools.

Again, we modified the physical layout and improved signage, as well as redefined our processes. The new configuration included:

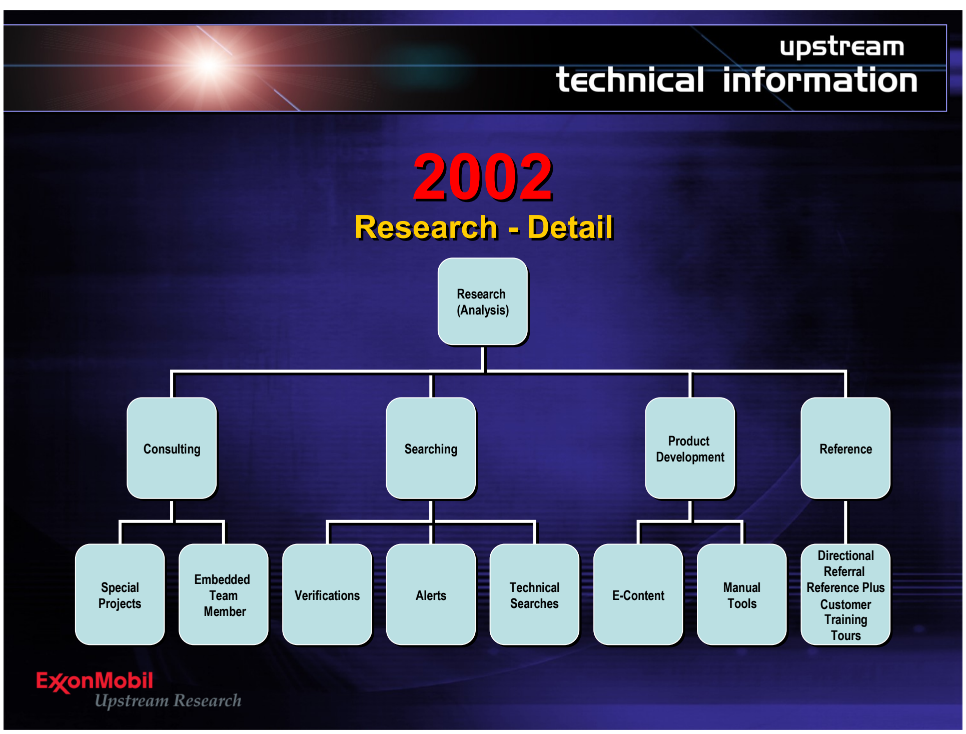


Figure 2.: Research function activities

- "Customer Business Center" for self checkout
- "Customer Collaboration Area" – with comfortable seating and wireless capabilities
- Directional kiosk
- "On Call Librarian" directional signage

Redefined processes included:

- Document Delivery Team supports circulation, Customer Business Center, and shared mailbox monitoring
- Collection Management Team supports material check-in

NEW ROLES

As anticipated, the elimination of the Reference Desk allowed the Research Librarian role to evolve. We were able to expand our roles in several ways. For example, we developed:

- web-friendly PowerPoint training materials
- How to Guides
- customer training sessions: single, group, in person, via telephone and the intranet
- increased customer collaboration

These new roles provided new opportunities to offer our expertise.

One librarian was dedicated to a planning group to collaborate on an extended intellectual property project. This meant actually relocating her office to be close to the customer group. The project has now grown to two librarians who are co-located and embedded into a customer team. Although these librarians are dedicated to specific projects, they also collaborate with librarian colleagues located in the Information Center. For example, as librarians we discuss searching techniques, new products and contribute to industry advisory councils.

We have leveraged new technology to expand our marketing and customer training. This includes virtual meeting tools such as NetMeeting and Webex. With NetMeeting, we can conduct interactive webpage sessions with our customers. We use Webex for third party meetings with vendors to discuss new products. We have beta-tested products and supplied feedback to vendors as well.

We also saw our established role as searchers evolving. Since our customers can use the desktop products we provide to conduct their own basic searches, we find that the inquiries we field are much more complex.

FUTURE TRENDS

The reference librarian roles as collaborators and consultants will continue to evolve as we test and implement new electronic products. Electronic formats of former print often require more training to use. Some customers want to try systems out for themselves, but many simply do not have the time to invest in information retrieval. The research librarian bridges the gap by learning the systems and providing the results in a customer-friendly, easy-to-absorb format.

Staff development is also more complex. Our new hires experience a steep learning curve as they assimilate into our corporate environment and hone expert reference skills. We have had successful experiences with summer library school interns. Managing intern programs does place an additional load on the staff; however, the practical experience it affords interns benefits future employers with a higher quality pool of incoming new hires. In addition, interns have the opportunity to contribute to our team activities and to experience special librarianship in real time.

The physical layout of the information center is evolving. We see more emphasis on:

- expanding areas for customer training and researcher collaboration,
- reconfiguring staff offices for improved staff collaboration
- continuously improving signage and customer interfaces

KEYS TO SUCCESS

Management support is critical to success. Our supervisor has the vision and skills to be sure our management recognizes the contributions we make. Our management supports our efforts by allocating resources and challenging us to attain step-change goals.

Strong teams enable us to creatively address the challenges. At the same time, as team members and as individuals we have ample opportunities for professional and personal growth. This type of environment is ideal for the continuing evolution of my role as a research librarian at ExxonMobil Upstream Research Company. Combined with the dynamics of the petroleum industry, research librarianship just keeps getting more interesting.

PROGRESS IN THE CITATION OF GEOSCIENCE DATA

Linda R. Musser
Fletcher L. Byrom Earth & Mineral Sciences Library
Pennsylvania State University
Lrm4@psu.edu

Abstract — It has been five years since the publication of the National Research Council's report and recommendations regarding the citation of geoscience data. This study investigated progress towards fulfillment of this recommendation by examining practices for citation of data in geoscience journals. A survey of geoscience journal editors revealed some progress towards adoption however the majority of editors still do not require or allow citation of data.

INTRODUCTION

In 2003, the Geoscience Information Society (GSIS) formed the Task Force on Citation of Geoscience Data in response to a report by the U.S. National Research Council (NRC) Committee on the Preservation of Geoscience Data and Collections (National Research Council, 2002). The report indicated that lack of citation to geoscience data such as well logs, field notes, core collections, and fossil and mineral specimens contributed to an impression that those materials were not being used and therefore not worth preserving. The Committee recommended that geoscientists begin citing these materials in reference lists as a way of documenting their value. The GSIS Task Force activities included creation of a website to promulgate good practices and contacting editors of geoscience journals to advocate for the citation of geoscience data and collections by geoscientists (Geoscience Information Society, 2005). This study examined the progress towards broader citation of geoscience data by geoscientists in the five years since the completion of the Task Force activities and NRC report.

CHANGING LANDSCAPES

There have been significant changes since the original NRC report was published in 2003. In 2005, the U.S. government funded the National Geological and Geophysical Data Preservation Program, an initiative designed to create a national catalog of geoscience collections and data (USGS, 2006). The funding of this program, another recommendation in the NRC Committee's report, is one step towards creation of standards for the cataloging of data and collections. On the publishing side, the landscape of scholarly publishing changed. Online journals are now the version of record, making it easier (and cheaper) to include data with the published article. The online format simply makes it easier for publishers to accept and publish material such as video, data, and other supplementary material. The gradual adoption of the digital object identifier (DOI) has provided a standardized identifier for varied digital objects. Websites are now considered legitimate information sources and are routinely cited. Finally, data are becoming increasingly valuable and valued. Big science projects such as genome research, space-based instrument platforms, and the like are extremely data intensive and have raised awareness of the long-term value of data. Given the huge expense involve in these projects, maximizing utilization of the data is an important part of the justification for renewed funding (see Figure 1). Funding agencies have begun to institute more stringent requirements related to the sharing and long term retention of data collected during grants. For example, the National Science Foundation (NSF) has a policy on the sharing of findings and data that states that the NSF “expects investigators to share with other researchers... the data, samples, physical collections, and other supporting materials created or gathered in the course of the work." (National Research Council, 2002, p.104).

HOW HAVE JOURNAL CITATION POLICIES CHANGED?

As part of this study, one hundred-fifty editors of geoscience journals were contacted to determine whether their journal's citation policy requires the citation of data; if so, where such citation occurs (in the text or in the reference list); or if not, whether the issue had been discussed by the editorial board. On the positive side, a handful of editors responded that they encourage citation and that it is a topic at their periodic editors' meetings (see Figure 2). A few shared their preferred style of data citation or referenced a standard style (one editor mentioned using the GSIS Task Force webpage). Some responded that they had never considered the concept but would make it a discussion topic for their editorial board. The majority however reported that citation of data was not required. There were some sentiments towards outright rejection of the concept of data citation. One respondent stated that such citations would be considered 'illegitimate' since they referred to unpublished materials; that such citations are an artificial way of increasing citation counts. Others allowed citation but restricted its use (see Figure 3). For example, allowing citation only if material is deposited in a museum or large repository. One respondent stated that citation would be allowed only if the data were important or in the public domain.

> "Authors are encouraged to present full data in support of their discussion and conclusion" — *Terra Nova*
>
> "ESM, electronically supplementary material, is allowed" — *Aquatic Geochemistry*
>
> "Submission of lengthy data tables is allowed in the online version" — *Quaternary International*

Figure 2. Journal policies for data

FUTURE DIRECTIONS

Based upon this survey of geoscience journal editors, there is still a long way to go before citation

> "Carbon Monitoring for Action is all about making information available to the public. At the same time, we want to ensure that the data is afforded proper citation in print and web publication. If you use CARMA data, please cite it as `Data from CARMA - www.CARMA.org'" — Carbon Monitoring for Action, 2007
>
> "Citation of PDS data in the scientific literature should include the components listed below... The words 'NASA Planetary Data System' should be included in the citation as the publisher of the data" — NASA, 2009
>
> "The Geological Survey of Canada currently makes digital data available FREE to anyone on the Internet. However, continuing budgetary pressures have made it difficult… In order for us to maintain this service, we need to enlist the support of our users. Please include a citation to `The Geological Survey of Canada' in your work. It would be helpful if you would send a citable reference for any publication that use CNSN data" — Natural Resources Canada, 2008
>
> "To recognize the valuable role of data providers…and to facilitate repeatability….in keeping with the scientific method, users of IPY data must formally acknowledge data authors… Where possible, this acknowledgement should take the form of a formal citation such as when citing a book or journal article. Journals should require the formal citation of data used in the articles they publish" — International Polar Year, 2007

Figure 1. Data repository examples for data citation

of data becomes uniformly accepted among the geoscience publishing community. Many editors do not yet see the value of adopting this practice and will need to be convinced that such a change is merited. While the decision to cite data ultimately lies with geoscientists themselves, there are actions that can be taken to increase the pace of adoption by the geoscience community. The need for trusted data repositories will increase in the future and so will the need for standardized metadata policies, public access, and archiving. Libraries and archives may be able to play an important role in filling the role of a trusted repository but this will require new roles and responsibilities for librarians and archivists, such as data curation and data management. Professional organizations such as the Geoscience Information Society and the American Association of State Geologists can continue to proselytize and publicize the issues. Government and funding agencies can also exert influence on professional practice by modeling, affirming, and/or mandating adoption of new practice. The Organization for Economic Cooperation and Development provides an excellent example in its *Data and Metadata Reporting and Presentation Handbook*, which states "If citation of datasets is to be taken seriously, a concerted effort must be made by national agencies and international organizations … to encourage a culture of data citation both inside and outside the organization wherever data is used. This awareness can be raised by contacting all known users of the organization's data, all editors of publications known to use an organization's data, etc. requesting that they follow the citation policy for the organization in future publications" (Ward, 2007).

Also important are examples of leadership by respected members of the geoscience community. Changes in community practice occur best when promulgated by community members themselves therefore individual geoscientists should cite data and consider including original data with article submission to journal editors. Geoscience journal editors should make their citation policy a matter of discussion with their editorial boards and continue the process of adaptation to electronic publishing by supporting the inclusion of references to data in manuscripts. Finally, it is essential that scientists end the segregation of references - some in the reference list, some in the text, and some not allowed in at all based upon the perceived 'legitimacy' of the reference. Second class citizenship of references based on their published or unpublished nature, their format, or repository status has little benefit to scientific community. In a hyperlinked world, separation of references makes little sense.

"Data sets cited…must meet the same type of standards for public access and long-term availability as are applied to citations to the scientific literature. The data cited…must be permanently archived in a data center that meets these criteria:

- are open to scientists throughout the world,
- are committed to archiving data sets indefinitely, and
- provide services at reasonable costs

Data sets that are available only from the author, through miscellaneous public network services, or academic government or commercial institutions not chartered specifically for archiving data, may not by cited in AGU publications. This type of data set availability is judged to be equivalent to material in the gray literature. If such data sets are essential to the paper, authors should treat their mention...in the body of the paper but not in the reference list"

— American Geophysical Union, 1996

Figure 3. Example of limited data citation

Citation of data should not be a controversial or a difficult task. Indeed, the report *Towards 2020 Science* states the "There is already ample evidence of electronic journals that provide links to the underlying and associated data. There are also emerging examples of where the association data can be accessed and manipulated" (Microsoft Research, 2006). It is time for the geoscience community to embrace twenty-first century science and begin to legitimize and cite all their information sources, including data.

REFERENCES

American Geophysical Union, 1996, Policy on referencing data in and archiving data for AGU publications. http://www.agu.org/pubs/data_policy.html.

Carbon Monitoring for Action, 2007, Citation policy.

http://carma.org/blog/about/citation/

Geoscience Information Society, 2005, Task Force on Citation of Geoscience Data. http://www.geoinfo.org/TFGeosciData.htm.

International Polar Year, 2007, International Polar Year 2007-2008 data policy. http://classic.ipy.org/Subcommittees/final_ipy_data_policy.pdf

Microsoft Research, 2006, Towards 2020 science. 86 p. http://research.microsoft.com/en-us/um/cambridge/projects/towards2020science/downloads/T2020S_ReportA4.pdf.

NASA, PDS Geosciences Node, 2009. Policy for Citations of PDS Data http://pds-geosciences.wustl.edu/citations.html

National Research Council, Committee on the Preservation of Geoscience Data and Collections, 2002, Geoscience data and collections: national resources in peril: Washington, DC, National Academies Press, 128 p. http://www.nap.edu/catalog.php?record_id=10348.

Natural Resources Canada, 2008, CNSN data citation policy. http://earthquakescanada.nrcan.gc.ca/stnsdata/nwfa/citation_policy_e.php.

U.S. Geological Survey, Data Preservation Working Group of the National Cooperative Geologic Mapping Program Federal Advisory Committee, 2006, Implementation plan for the National Geological and Geophysical Data Preservation Program: Reston, VA, U.S. Geological Survey, 26 p. http://datapreservation.usgs.gov/docs/2006DataPreservation.pdf.

Ward, Denis, 2007, Data and metadata reporting and presentation handbook: Paris, Organization for Economic Co-operation and Development, 158 p.

DATA INFORMATION LITERACY: NEW COMPTENCIES IN A CYBERINFRASTRUCTURE-ENABLED WORLD

Michael Fosmire*, C.C. Miller
Physical Science, Engineering and Technology Libraries
Purdue University
fosmire@purdue.edu

Abstract — In the Earth Sciences, as in all areas of science, cyberinfrastructure and ‘e-science' have become increasingly important to the collection, display, processing, evaluation, and interoperability of data. Scientists flooded with edata (who are, themselves, contributing to the flood) need increasingly complex and intelligent ways to consume, handle, and produce research data. As a result, librarians can no longer just provide access to the published literature and must instead be involved much earlier in the publication process; at the point where data are first engaged and produced. In addition to being involved in the building of systems and technologies that foster data stewardship and retrieval, librarians must be able to help researchers leverage those tools, to interact with data, and to contribute derivative (or original) data to disciplinary or institutional repositories that comply with the standards of the scholarly community. Because much of the power of e-science is lost, or at least not wholly realized, without an understanding of these structures and concepts of information management, our next generation of researchers will be doing a disservice to their scientific communities if they are not trained to find, use, evaluate, and contribute data in the same way they are trained to work with scientific literature. By expanding our notions of information literacy to include data information management, then, librarians can help provide a foundation of skills to researchers to more fully actualize the promise of e-science. To this end, in Spring 2008 the authors taught a three credit graduate course in geoinformatics within our Earth and Atmospheric Sciences department wherein we attempted to develop 'data information literate' scientists. We will briefly discuss the course we offered and extrapolate from our experiences what it means to be 'data information literate.'

DO *AND* TEACH: GEOINFORMATICS AS A FUNCTION OF THE UNIVERSITY LIBRARY

C.C. Miller, Michael Fosmire*
Earth & Atmospheric Sciences Library
Purdue University
ccmiller@purdue.edu

Abstract — Given the importance of data and information management to the full scope of geoinformatics, one would expect it sprang from the mind of a librarian and not the collaboration of domain scientists, computer scientists, and IT types. Although one could argue that librarians should have invented geoinformatics, librarians are nevertheless increasingly involved in the development of the more intelligent and complex systems that make up geocyberinfrastructure. Given the unique situation (as discipline-agnostic agents of both education and technological solutions) and nature (often highly technical systems builders, just as often front-line service providers) of librarians, they seem likely candidates to be – like libraries are generally – positioned in that softer area between big-time systems and the user population that may or may not be aware of them, able to access them, or able to operate them. In the same ways librarians were once go betweens for users needing to translate an information need into Dialog syntax, geoscientists now and in the immediate, urgent future will need help learning, accessing, and negotiating the powerful concepts, methods, and technologies that result from geoinformatics progress. The authors will argue that librarians are uniquely skilled, uniquely positioned, and uniquely charged with ensuring that the tools of the future won't be left to atrophy with no users capable of driving them to geoscientific discovery.

The authors will discuss work done at Purdue University Libraries illustrating librarian contribution to geoinformatics not only on the "business end," by building and applying applications that take advantage of data interoperability and modular design, but also in the less sexy arena of end-user education and data literacy. A geoinformatics course taught by Purdue librarians will be discussed, as will past and ongoing geoinformatics-y projects to which Purdue librarians contribute.

GEOREF, ISI WEB OF KNOWLEDGE, GOOGLE SCHOLAR - WHAT IS THE FUTURE FOR ABSTRACTING AND INDEXING SERVICES IN THE GEOSCIENCES?

Mary W. Scott
Geology Library
Ohio State University
scott.36@osu.edu

Abstract — Access to previous results of research is basic to all research. Recent articles on information resources in high-energy physics and engineering have raised questions about the relevance of commercial abstracting and indexing services in those fields. Do the same questions apply to the geosciences? What is the first choice for students and researchers for searching today? Preliminary results from a survey of faculty and students suggest that GeoRef is not the first place they look.

INTRODUCTION

In April 2008 two papers were published, *Information Resources in High-Energy Physics* and *Google Scholar's Coverage of the Engineering Literature: An Empirical Study*. Both these papers discuss the role of the Internet in improving access to scholarly information. In the field of high-energy physics a survey of about 10% of researchers revealed almost no use of commercial services. Their primary sources for information were the community-based services such as the arXiv and SPIRES systems. These services have made the content available for harvesting which benefits users of Google or Google Scholar. (Gentil-Beccot et al., 2008) The second paper compared Google Scholar's coverage to Compendex, a commercial service. The conclusion of this study was that Google Scholar is a "useful new tool for accessing the engineering literature published in the last ten to fifteen years." (Meier and Conkling, 2008)

At the time these two papers were published and discussion on listservs about them started, I was looking at a serial budget problem, reviewing undergraduate research project posters, and editing entries for the Bibliography of Ohio Geology, a new online database the Ohio Geological Survey is developing. These combined events caused me to wonder about geoscience databases:

- What were my faculty and students using?
- Was there anything I could cancel?
- What was the future of commercial databases?
- What about the niche databases such as Ohio Geology?

There are several papers reporting on different aspects geoscience databases. Two of them are comparisons of Google and GeoRef. (Tahirkheli, 2003; Musser and Fletcher, 2008) The most recent by Linda Musser is being presented as a poster at this meeting. Others have dealt with content analysis by comparing serial lists. (Scott, 2004; Scott, 2003) Lura Joseph compared retrieval performance of several databases for Quaternary research. (Joseph, 2007)

SURVEY

A survey of the faculty and graduate students in my department revealed that most were using the ISI Web of Knowledge℠-Web of Science® database as their first choice. I also asked a colleague at another university in Ohio to do the same survey. Those returns indicated a preference for GeoRef. The survey was simple: only a list of databases and a request for them to indicate their first choice.

The databases included in the survey are listed below. (For descriptions from the various database information pages see Appendix A.)

Academic Search Complete
American Geophysical Union Digital Library
Arctic & Antarctic Regions
BIOSIS Previews
Chemical Abstracts/ SciFinder Scholar
Compendex.
EJC-OhioLINK Electronic Journal Center
Environment Complete
Environmental Sciences and Pollution
GEOBASE
GeoRef database
GeoScience World
Google Scholar
IEEE Xplore
ISI Science Citation Index
Science Direct
Scirus

Database	Number of Positive Responses
GeoRef®	13
ISI Web of Knowledge℠-	13
Electronic Journal Center (OhioLINK)	6
Google®	5
Academic Search Premier	1
IEEE	1
SciFinder Scholar	1
GEOBASE®	1

Figure 1 Survey Results

SURVEY RESULTS

Responses were fairly good considering it was summer and geologists are not typically around. I had a 33% return from the faculty and about 50% from the graduate students for my department and about a 50% return from the faculty at the other school. The combined totals are summarized here (see Figure 1).

GeoRef and ISI are equal but there are 5 others that were first choices for 15 people. This was a very small sample group but often collection managers in libraries need to make quick decisions about serial cuts with very little data. So I decided to look at this small sample to see what I could learn and to see if a larger survey was warranted.

ANALYSIS

The references cited in recently published papers by faculty from both schools were searched in GeoRef and ISI databases and the results analyzed. (A list of the papers is attached as Appendix B.) A total of 828 references were searched. Of these 655 were found in GeoRef and 506 in ISI. There were 80 references that did not appear in either. While 245 were unique to GeoRef and 82 were unique to ISI.

References from two papers, a total of 118 references, were also searched in Google. A distinction was made between finding the full text of the article or just a citation for it. Of the 118 references, 67 links to the full text were found, and 30 links to a citation for the article. These two articles had 8 references that were not in either GeoRef or ISI. All 8 of these were found by Google, but Google did not have 12 of the references that were in GeoRef or ISI.

The references cited that were in GeoRef and not indexed in ISI included primarily monographs or chapters in monographs. Many of these were special publications of societies. The second largest group was references in journals not covered by ISI. References to articles in foreign publications were another large group. Also included in the list were references to government publications, the USGS as well as state geological surveys; abstracts; guidebooks, conference proceedings; theses and dissertations; and maps. This list includes document types that ISI does not index.

The references cited that were in ISI and not in GeoRef were in a variety of journals but could be grouped into broad subjects of physics, biology, environment, remote sensing, and chemistry --

subjects or journals normally included in GeoRef.

The subjects of the papers included paleontology, physics, remote sensing, climate change, geochemistry, groundwater, stratigraphy, tectonics, sedimentology, marine biology, and ecology. The range of subjects indicates the interdisciplinary nature of geoscience research today. In turn this requires access to multiple databases. This can be a challenge to support with today's library budgets. It can also be a challenge for library bibliographic instruction. Many researchers do not know about all the various options, or are they aware of what is included or not included in any given database. They also do not want to take the time to search more than one or at the most two databases.

CONCLUSIONS

1. There is not one database that provides everything. Even Google does not index everything. So I will need to continue to provide access to multiple databases, at least for a few more years. The future for geoscience databases should include some expansion of subject coverage to reflect the wider definition of geoscience research. As more commercial publishers and also societies provide open access to at least the table of contents and maybe abstracts for their journals, Google Scholar and other web search engines might reach a point of becoming the primary database. I say "might" because we are a long way from this happening. The active journals may soon be there, but there are a lot of dead journals that contain a great deal of important information. Databases such as GeoRef provide access to some of this information. Federated or multi-database searching is one option, but often the list of databases that can be included in a search is not comprehensive. As nice as the idea of federated searching is, there are problems such as duplicate records and indexing differences between databases. Development work is still needed to make this a good option.

2. Are GeoRef, ISI and other commercial databases still important in the geosciences? Yes, I believe they are. The questions are how many do we need? and which ones should we support? From this survey I feel I need to continue support for GeoRef and ISI on my campus. But the other databases on my list may need more review.

3. I need to do a better job of educating my faculty and students about the various databases, what they index, and when they might need to use more then one. This does not mean I will change their preferences, but they will be more knowledgeable when they make their decision.

4. The quality of a database depends in part on feedback from librarians. If you discover errors, you should report them.

5. Would a larger survey be useful? I don't think so. I am not sure that we would learn anything different.

6. The activity of searching all the references from the various faculty papers was interesting. It provided a different view of their research and has given me some leads for collection development. I found—especially when I was searching in Google—a lot of new online free resources which I can have added to the library catalog. These were not necessarily resources the faculty had referenced: I just spotted them in the list of results and took time to look at them. I also got some ideas for areas that I should expand on the Geology Library web page.

7. The last question is about niche databases such as state or specific subject bibliographies: Should we continue to support and develop these? I have been involved in two of them, the first one for North Dakota, and now one for Ohio. I know they include historical material and regionally published material that is probably not in GeoRef or any other commercial database. They also can provide some more local or specialized indexing that a large database is not going to provide. However, since they are labor intensive to develop and maintain, I suspect their future is limited.

REFERENCES

Gentil-Beccot, Anne, Annette Holtkamp, Heath B. O'Connell; and Travis C. Brooks. Information Resources in High-Energy Physics. 2008 [cited May 29, 2008 2008]. Available from http://arxiv.org/abs/0804.2701.

Joseph, Lura. 2007. Comparison of retrieval performance of eleven online indexes containing information related to Quaternary research, an interdisciplinary science: Reference and User Services

Quarterly,v.47 (1), p.56-65.

Meier, John J., and Thomas W. Conkling. 2008. Google Scholar's coverage of the engineering literature: an empirical study: Journal of Academic Librarianship, v.34 (3), p.196-201.

Musser, Linda R., and L. B. Fletcher. 2008. Comparison of GeoRef and Google Scholar: Geological Society of America, Abstracts with Programs, v. 40 (6), p.469.

Scott, Mary W. 2004. Searching for current international geoscience information: Geoscience Information Society Proceedings, v. 35, p. 9-12.

Scott, Mary W. 2003. Status of bibliographic control of pre-1900 geoscience literature: Geoscience Information Society Proceedings, v. 34, p. 105-108.

Tahirkheli, Sharon N. 2003. Google vs. GeoRef: effective information retrieval: Geological Society of America, Abstracts with Programs, v. 35, (6) p. 359.

APPENDIX A

DESCRIPTIONS OF THE DATABASES INCLUDED IN THE SURVEY

(All information directly provided by the database producers)

Academic Search Complete is the world's most valuable and comprehensive scholarly, multi-disciplinary full-text database, with more than 5,990 full-text periodicals, including more than 5,030 peer-reviewed journals. In addition to full text, this database offers indexing and abstracts for more than 9,990 journals and a total of more than 10,400 publications including monographs, reports, conference proceedings, etc. The database features PDF content going back as far as 1887, with the majority of full text titles in native (searchable) PDF format. Searchable cited references are provided for more than 1,000 journals. There are 259 journal titles listed under the subject of geology.

American Geophysical Union Digital Library is a comprehensive collection of more than 100 years of Earth and space science research. The library contains more than 90,300 articles from all the journals published by AGU and will eventually include an additional ~25,000 articles from books and the weekly newspaper for AGU. The library starts with volume 1, issue 1 of *Terrestrial Magnetism* published in 1896.

Arctic & Antarctic Regions (AAR) is the world's largest collection of international polar databases. With over 1 million records from 1800 to the present, Arctic & Antarctic Regions covers a wide variety of sources from multiple disciplines. Many sources are indexed only in Arctic & Antarctic Regions making it the best resource for research on cold regions anywhere, from temperate regions with cold winters to the Himalayas of Tibet.

BIOSIS Previews, including Biological Abstracts, contains references to journal articles, reports, literature reviews, conference papers, patents, and book synopses in the life sciences. Coverage includes 5500 journals and 1500 international meetings in agriculture, biology, biotechnology, environment, wildlife, ecology, agriculture, forestry and the health sciences. The journal list includes 29 titles under Geology and 28 under Geosciences interdisciplinary.

Chemical Abstracts/ SciFinder Scholar is the largest and most comprehensive database of chemical literature in the world. It covers not only the core areas of chemistry, but also chemistry related sciences such as biotechnology, agricultural chemistry, toxicology and environmental science among others. SciFinder Scholar is an interface to four databases: Chemical Abstracts Plus, the Registry File, CASREACT and now MEDline.

Compendex is a comprehensive interdisciplinary engineering database, the electronic equivalent of the print Engineering Index. Compendex covers the entire spectrum of engineering, in depth, with abstracts from over 2,600 international journals, conference papers and proceedings, and technical reports.

EJC-OhioLINK Electronic Journal Center – Electronic Journals subscribed to by OhioLINK, it includes about 130 geology journals. The EJC provides a search by author, title, subject, keyword of all the journals or subject subsets of journals or a single journal.

Environment Complete offers deep coverage in applicable areas of agriculture, ecosystem ecology, energy, renewable energy sources, natural resources, marine & freshwater science, geography, pollution & waste management, environmental technology, environmental law, public policy, social impacts, urban planning, and more. *Environment Complete* contains more than 1,957,000 records from more than 1,700 domestic and international titles going back to the 1940s (including 1,125 active core titles). The database also contains full text for more than 680 journals and 120 monographs. There are 130 titles in the journal list under the subject Geology.

Environmental Sciences and Pollution Management provides unparalleled and comprehensive coverage of the environmental sciences. Abstracts and citations are drawn from over 6000 serials including scientific journals, conference proceedings, reports, monographs, books and government publications.

GEOBASE is a bibliographic database of the global literature in earth science, ecology, geography and marine science. The range of sources abstracted make this tool appropriate for searching multidisciplinary topics such as environmental or geographical studies and other areas that cross traditional subject boundaries.

***GeoRef* database**, established by the American Geological Institute in 1966, provides access to the geoscience literature of the world. GeoRef is the most comprehensive database in the geosciences and continues to grow by more than 90,000 references a year. The database contains over 2.9 million references to geoscience journal articles, books, maps, conference papers, reports and theses.

GeoScience World - A comprehensive Internet resource for research and communications in the geosciences, built on a core database aggregation of over 40 peer-reviewed journals indexed, linked, and interoperable with the GeoRef index.

Google Named for the mathematical term "googol," Google is widely recognized as the "world's best search engine" because it is fast, accurate and easy to use. Google's breakthrough technology and continued innovation serve the company's mission of "organizing the world's information and making it universally accessible and useful."

Google Scholar finds scholarly literature (peer-reviewed papers, theses, preprints, abstracts, technical reports) from a wide variety of academic publishers, professional societies, preprint repositories and universities and across the web. Google Scholar also automatically analyzes and extracts citations and presents them as separate results, even if the documents they refer to are not online, so search results may include citations of older works and seminal articles that appear only in books or other offline publications.

IEEE Xplore provides full text access to IEEE & IEE journal articles and conference papers from 1988 to present; current IEEE standards; selected IEEE pre-1988 content; and IEEE periodicals cover-to-cover beginning in 2004.

INSPEC scans papers from approximately 4,200 journals, 1,000 conferences, and other publications, adding over 250,000 records each year. INSPEC is an excellent source of information on: Computing, Control Technology, Electronics, Electrical Engineering, Information Technology, Physics.

ISI Science Citation Index indexes 5,300 major journals across 164 scientific disciplines and contains searchable, full-length, English-language author abstracts for approximately 70 percent of the articles in the database.

Science Direct is the index to the Elsevier online journals.

Scirus is the most comprehensive scientific research tool on the web. With over 450 million scientific items indexed at last count, it allows researchers to search for not only journal content but also scientists' homepages, courseware, pre-print server material, patents and institutional repository and website information.

APPENDIX B

PAPERS USED IN THE STUDY

Bevis, Michael, Douglas Alsdrof, Eric Kendrick, Luiz Paulo Fortes, Bruce Forsberg, Robert Smalley Jr., and Janet Becker. 2005. Seasonal fluctuations in the mass of the Amazon River system and Earth's elastic response*: Geophysical Research Letters, v. 32*, L16308, doi:10.1029/2005GL023491.

Bonelli, Jr, James R., Carlton E. Brett, Arnold I. Miller, and J. B. Bennington. 2006. Testing for faunal stability across a regional biotic transition: quantifying stasis and variation among recurring coral-rich biofacies in the Middle Devonian Appalachian Basin: *Paleobiology, v.32* (1), p.20-37.

Carey, Anne E., Christopher B. Gardner, Steven T. Goldsmith, W. Berry Lyons, and D. Murray Hicks. 2005. Organic carbon yields from small, mountainous rivers, New Zealand: *Geophysical Research Letters, v. 32*, L15404, doi:10.1029/2005GL023159.

Chocyk-Jaminski, Marzena, and Craig Dietsch. 2002. Geochemistry and tectonic setting of metabasic rocks of the Gneiss Dome Belt, SW New England Appalachians: *Physics and Chemistry of the Earth, Parts A/B/C, v. 27* (1-3), p.149-167.

Freedman, Vicky L., and Motomu Ibaraki. 2003. Coupled reactive mass transport and fluid flow: issues in model verification: *Advances in Water Resources, v.26* (1), p.117-127.

Kamrer, Thomas W., and William I. Ausich. 2006. The "Age of Crinoids": a Mississippian biodiversity spike coincident with widespread carbonate ramps: *Palaios, v. 21* (3), p.238-248.

Kim, Jeongkon, Franklin W. Schwartz, Leslie Smith, and Motomu Ibaraki. 2004. Complex dispersion in simple fractured media: *Water Resources Research, v.40*, W05102, doi:10.1029/2003WR002631.

Krause, R. A.,Jr., and D. L. Meyer. 2004. Sequence stratigraphy and depositional dynamics of carbonate buildups and associated facies from the Lower Mississippian Fort Payne Formation of southern Kentucky, U.S.A.: *Journal of Sedimentary Research, v. 74* (6), p.831-844.

Lyons, W. B., Kathleen A. Welch, Anne E. Carey, Peter T. Doran, Diana H. Wall, Ross A. Virginia, Andrew G. Fountain, Bea M. Csatho, and Catherine M. Tremper. 2005. Groundwater seeps in Taylor Valley Antarctica; an example of a subsurface melt event: *Annals of Glaciology, v.40*, p.200-206.

Moreno, Patricio I., George L. Jacobson Jr., Thomas V. Lowell, and George H. Denton. 2001. Interhemispheric climate links revealed by a late-glacial cooling episode in southern Chile: *Nature (London), v. 409* (6822), p.804-808.

Mortimer, Estelle, Isabelle Coutand, Lindsay Schoenbohm, Edward R. Sobel, José Sosa Gomez, and Manfred R. Strecker. 2007. Fragmentation of a foreland basin in response to out-of-sequence basement uplifts and structural reactivation; El Cajon-Campo del Arenal Basin, NW Argentina: *Geological Society of America Bulletin, v. 119* (5-6), p.637-653.

Munk, LeeAnn, Gunter Faure, Douglas E. Pride, and Jerry M. Bigham. 2002. Sorption of trace metals to an aluminum precipitate in a stream receiving acid rock-drainage; Snake River, Summit County, Colorado: *Applied Geochemistry, v. 17* (4), p. 421-430.

Panero, Wendy R., and Lars P. Stixrude. 2004. Hydrogen incorporation in stishovite at high pressure and symmetric hydrogen bonding in δ-AlOOH: *Earth and Planetary Science Letters, v. 221* (1-4), p. 421-431.

Saltzman, Matthew R. 2005. Phosphorus, nitrogen, and the redox evolution of the Paleozoic oceans: *Geology, v. 33*(7), p.573-576.

Turgeon, Steven C., Robert A. Creaser, and Thomas J. Algeo. 2007. Re–Os depositional ages and seawater Os estimates for the Frasnian–Famennian boundary: Implications for weathering rates, land plant evolution, and extinction mechanisms: *Earth and Planetary Science Letters, v. 261* (3-4), p.649-661.

PART 2: GSA Poster Session no. 300

Geoscience Information/Communication

Abstracts and Posters

October 8, 2008

CASTING A WIDER NET: USING SCREENCAST TUTORIALS TO ADVANCE LIBRARY INVOLVEMENT IN SUPPORTING RESEARCH PRACTICES

Angelique R. Jenks-Brown
Science Reference Librarian
Binghamton University
ajbrown@binghamton.edu

Abstract — The Binghamton University Libraries' distributed a survey to university faculty and teaching assistants through the University's Assistant Provost for Curriculum, Instruction and Assessment. An outcome of this survey was that the Libraries created online tutorials to support the critical research practices of students.

Online tutorials were created both as web pages and as screencasts. Support documentation such as production guidelines, best practices, suggested scripts, and step-by-step instructions using Camtasia were created. The screencast tutorials were then cataloged using MARC and Dublin Core standards, added to the library catalog (infoLINK), and placed as flash files on the Libraries' web server. The tutorials were also part of a discussion about the licensing of library faculty creative output.

The tutorials are currently available on the Libraries' website for students, teaching assistants and faculty to use as part of course instruction on the content management system (Blackboard).

INVESTIGATING CRITICAL RESEARCH PRACTICES

The Library Critical Research Practices Committee (CRPC) was formed to investigate and discover ways the Libraries' could support information literacy needs on campus. The CRPC consisted of four library faculty, three university faculty, and a graduate student. The CRPC developed a Faculty/TA Survey and a Reference Librarian Tally Sheet to discover how students perform research and how student research practices evolve as students progress through Binghamton University's curriculum. Based on the Faculty/TA Survey and Reference Librarian Tally Sheet results, the CRPC decided that the Libraries could create and pilot online screencast tutorials and web pages to provide support in two main areas: how to access appropriate research material and how to evaluate research material (Mulligan et. al., 2008).

Faculty/TA Survey

The Faculty/TA Survey was developed by the CRPC and administered by the Office of the Provost, distributed to the deans' secretaries to reach faculty, and the Graduate School to reach teaching assistants. There were 256 Respondents to the survey, consisting of 100 Faculty, 150 TA's, and six unstated. The survey results showed that:

- Students use unreliable internet sources: 44% always or often
- Students have trouble narrowing their topic: 42% always or often
- Students using the same resources: 35% always or often

Instructors comments indicated that students inappropriately use Google and Wikipedia, rely on sources that are immediately available, lack critical assessment, and expressed general concern about student's use of resources for research.

Reference Librarian Tally Sheet

The Reference Librarian Tally Sheet was developed by the CRPC and completed by reference librarians to collect information about student research. Results suggested that students are unaware of the amount of time needed to conduct research, perform ineffective search strategies, change topics to suit availability of resources, and fail to use the appropriate number of resources for their assignments.

GETTING SUBJECT LIBRARIANS INVOLVED

The CRPC created two screencast tutorials (*Finding Journal Articles* and *Finding Books*) and two web pages (*Webpage Checklist* http://library.lib.binghamton.edu/search/webcheck.html and *What Is A Scholarly Journal?* http://library.lib.binghamton.edu/instruct/scholjour.html) that could be used by instructors. These teaching tools were piloted by a university faculty member in one of her classes. She found them to be successful stating, "It saved instructors much time putting together a lesson plan that would cover the material."

It was felt that tutorials demonstrating specific databases should be created by subject librarians. To aid subject librarians, supporting documentation was created, training sessions offered, and laptops made available with the software to make the tutorials. The Libraries decided to use the proprietary software Camtasia Studio to create screencast tutorials. This software is loaded on four laptops and one desktop computer for use by library staff. This allows staff to record and edit their tutorials in their offices, and the library has purchased five licenses to be used by fifteen+ subject librarians. Supporting documentation was made available on the staff wiki and included a set of step-by-step instructions for creating screencasts within a work flow routine, and guidelines that explain considerations and best practices. Training sessions demonstrated the Camtasia software using the step-by-step instructions, and software upgrades. Sessions were given to subject librarians during standing meetings, as scheduled sessions, and to individuals upon request.

Finding the Tutorials

The Libraries provide a wide variety of screencast tutorials that faculty can choose from tutorials to use for their classes, and the students have access to these research tools at their point-of-need. To help patrons discover the tutorials they are cataloged and added to the library catalog (Strong, 2008), metadata is included in the web page source code by the author so the tutorials can be found by web crawlers and site searches, and all of the tutorials are uploaded to our web server and made available through a single web page, *Library Tutorials* (http://library.binghamton.edu/media/index.html).

The tutorial web page consists of an alphabetical listing of the tutorials. Since the Libraries have created over twenty tutorials we would like to improve the web page design to make it easier to browse. We plan to accomplish this by categorizing the tutorials according to patron feedback by conducting a card sort usability study.

Using the Tutorials

The university offers a class called the First Year Experience (FYE). It is designed to introduce students to student life on campus and prepare them with the tools and guidance they will need to succeed in college. The Libraries participate in this program by offering library scavenger hunts, library instruction sessions, and supporting research guides. The Libraries do not have enough staff to offer library instruction for all of the FYE classes. In Fall 2008, the Libraries offered the option of using the online tutorials instead of having a library instruction session to the instructors who had taught the FYE class before. This has lessened the burden of instruction on library staff, and FYE instructors seem to enjoy the freedom of scheduling class time (Maximiek, 2008).

Marketing

After a tutorial has been created, placed online, and cataloged, individual subject librarians are encouraged to promote their own tutorials. Subject librarians notify other Binghamton University subject and reference librarians that the new tutorial is available, create a link to the tutorial on the appropriate subject page, draw attention to the tutorial during library instruction sessions and workshops, notify departmental liaisons of the tutorial, and suggest to course instructors that they can link to the tutorial on their class web page or through the course management software.

Semester	Action
Spring 2006 – Summer 2007	Critical Research Practices Committee
Fall 2006	Survey administered to campus instructors and teaching assistants through the Office of the Assistant Provost for Curriculum, Instruction, and Assessment. Tally sheet filled-out by reference librarians at desk.
Summer 2007	Web page and screencast tutorials created: "Finding Journal Articles",
Spring 2007	Tutorials uploaded to web server and placed on a web page.
Fall 2007	Documentation created, demonstration & training to subject librarians.
Spring 2008	Cataloging Creative Commons License used for copyright Updated Documentation
Fall 2008	Card sort usability study

Figure 1. Timeline

In the near future, the Libraries will collaborate with the Department of Media Relations, Communications and Marketing on campus to add the tutorials to the University's You Tube web site, http://www.youtube.com/BinghamtonUniversity.

REFERENCES

Maximiek, S. Telephone interview. 19 Sept. 2008.

Mulligan, B., et. al. "Critical Research Practices at Binghamton University: A case study in collaboration." College & Research Libraries News 69 (Number 7, 2008): 382-385.

Strong, M. "Cataloging screencast tutorials in Dublin Core and MARC," poster presentation, Online Audiovisual Cataloger (OLAC) Conference, Cleveland, OH, September 27, 2008.

COMPARISON OF GEOREF AND GOOGLE SCHOLAR

Linda R. Musser
Fletcher L. Byrom Earth & Mineral Sciences Library
Pennsylvania State University
Lrm4@psu.edu

Abstract — This study compared the overlap in coverage between GeoRef and Google Scholar. References from GeoRef were searched in Google Scholar. Results indicate that the overlap is fifty-five percent, which is higher than reported in previous studies. Articles from scholarly journals have an even higher percentage of overlap. The English language bias of Google Scholar was confirmed.

INTRODUCTION

Many researchers and practitioners are turning to freely available, easily accessible, and familiar tools such as Google Scholar yet how well does this tool perform in providing access to the research literature? Numerous studies have investigated this query although few touch upon the geological sciences. Neuhaus et al. performed one of the most comprehensive studies by comparing the content of Google Scholar with forty-seven other databases. Their study examined Google Scholar's content, including date and language of publication, with the content of other bibliographic databases and determined that while Google Scholar had strong coverage of the sciences, there were exceptions such as GeoRef with which Google Scholar only overlapped by twenty-six percent. Additionally, the authors reported that coverage of non-English language resources was weak and older material was somewhat lacking. A review by Burright mentioned that Google Scholar's limitations included issues related to accuracy, timeliness, and thoroughness. A 2006 review of Scopus by Bosman et al. included a comparison with Google Scholar. Their analysis of a small sampling of articles found that Google Scholar indexed approximately sixty-two percent of the selected earth science articles. The most focused comparison of Google Scholar and GeoRef was done in 2007 by Tahirkheli who examined primarily the functional differences between the two resources. Her results echoed that of previous researchers finding that Google Scholar was less precise than GeoRef and that Google Scholar's timeliness and coverage of non-English language materials may be less strong than that of GeoRef.

METHODOLOGY

This study was undertaken to gain a clearer picture of the extent to which content in Google Scholar compares to the content in GeoRef, the premier bibliographic database for the geosciences. The GeoRef database contains references to the geological literature from the late 1600s to date for North America and from 1933 to date for the rest of the world. Many formats (books, journal articles, maps, etc.) and languages are included with the highest proportion being journal articles (84%) and English-language materials (82%). Google Scholar, launched in 2004, features the familiar Google interface and is multidisciplinary in scope. Extent of coverage is unclear since the parent company, Google, does not release much information about the composition of the Google Scholar database.

A random sample of 229 references was selected from GeoRef then searched in Google Scholar (a seven percent error rate). References were selected using a combination of random numbers and dates of publication. Results were tabulated as to whether the reference appeared in Google Scholar, the language of the item, and whether the item was a journal article. A subset of 100 scholarly journal articles was also analyzed.

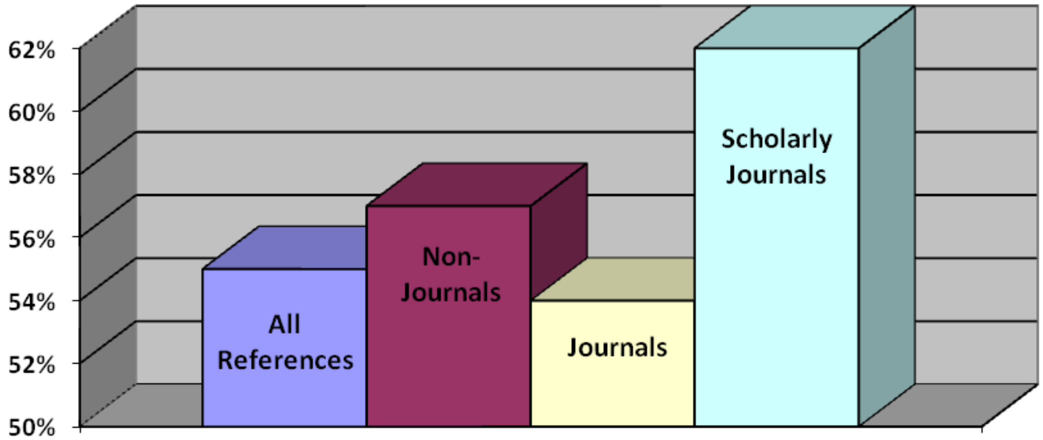


Figure 1. Type of Reference

RESULTS

Overall, 55% of the sampled GeoRef references were in Google Scholar. An analysis of references by format – journal articles/non-journal articles - yielded equivalent results by format (within the margin of error). Of a subset of scholarly journal articles, however, 62% were found in Google Scholar.

Of the total sample, 83% were English language publications. Of these references, 63% were found in Google Scholar. For non-English language references only 16% were found in Google Scholar. Examining all the references that were found in Google Scholar, English language publications comprised 95% of the total. For the GeoRef references not found in Google Scholar, English language publications comprised 69% of the total.

An examination of the data related to the date of publication showed a gradual increase in percentage of items found in Google Scholar as a function of age (i.e., the newer the item, the higher probability that Google Scholar would include it), however, a significantly larger sample would be required to analyze this aspect with any degree of statistical accuracy.

SUMMARY AND CONCLUSIONS

In 2006, Neuhaus reported a 26% overlap in coverage between GeoRef and Google Scholar whereas this study finds the overlap to be 55%. The percentage is even higher when confined to the subset of scholarly journals, which yielded an overlap percentage of 62%. In their 2008 study of Google Scholar and the engineering literature, Meier and Conkling documented a similar difference in coverage overlap by type of journal. This study confirms the English language bias in Google Scholar as reported by Neuhaus and others. Non-English language materials are significantly under-represented in Google Scholar as compared to GeoRef. Finally, the overlap in coverage between GeoRef and Google Scholar appears to be increasing over time.

REFERENCES

Bosman, Jeroen, Ineke van Mourik, Menno Rasch, Eric Sieverts, and Huib Verhoeff, 2006, Scopus reviewed and compared: the coverage and functionality of the citation database Scopus, including comparisons with Web of Science and Google Scholar: University of Utrecht. http://igitur-archive.library.uu.nl/DARLIN/2006-1220-200432/Scopus doorgelicht & vergeleken - translated.pdf.

Burright, Marian, 2006, Google Scholar – Science & Technology *in* Database Reviews and Reports section: Issues in Science and Technology Librarianship. http://www.istl.org/06-winter/databases2.html.

Meier, John J. and Thomas W. Conkling, 2008, Google Scholar's coverage of the engineering literature: an empirical study: Journal of Academic Librarianship, v.34, no.3, p.196-201.

Neuhaus, Chris, Ellen Neuhaus, Alan Asher, and Clint Wrede, 2006, The depth and breadth of Google

Scholar: An empirical study: portal-Libraries and the Academy, v.6, no.2, p.127-141.

Tahirkheli, Sharon, (in press), GeoRef and Google Scholar – Similarities and differences: Proceedings of the Geoscience Information Society.

A COLLABORATIVE EFFORT TO CREATE INTERACTIVE UTAH GEOLOGIC MAPS

April Love*, David L. Morrison, Kenneth W. Rockwell, Ronald M. Bitton
Science & Engineering Division, J. Willard Marriott Library
University of Utah
april.love@utah.edu

Abstract — The Geographic Information Systems (GIS) Committee at the J. Willard Marriott Library of the University of Utah is working in collaboration with the Geologic Mapping Program of the Utah Geological Survey (UGS) and the Marriott Library's Institutional Repository to generate a web-based interactive geologic map using CONTENTdm. The University's Department of Geology and Geophysics thesis maps will be scanned, so as to provide both preservation and access to a difficult-to-access resource. These geologic maps will be retrievable via a mouse click on a State of Utah web-map.

DIGITIZATION OF GEOLOGIC MAPS USING ARCINFO SOFTWARE: A METHOD FOR IMPROVING ACCESS TO MAPS AND CUSTOMIZING BASE MAPS FOR USE IN THE FIELD

Ephraim Taylor
Jackson School of Geosciences
University of Texas at Austin
ephraimtaylor@mail.utexas.edu

Abstract — Digitization of paper maps using ArcINFO software provides a method for preserving the original material while making base maps for use in the field readily available and easy to modify to fit the users' specific needs. Original paper maps are digitized using a scanner. ArcINFO software is then used to rectify and replicate the original map features using vector shapefiles. The symbology of the original map may be maintained or modified at the user's discretion. When working from scanned maps, data is replicated at a higher scale than that of the original map to minimize errors due to pixelation of the scanned image. This data may then be converted into readily accessible formats for wider distribution than the original maps. External digital data, such as roads, hydrology, aerial photographs, and elevation models may be incorporated to provide added information. Field base maps may then be created and customized using the digitized geologic map and additional data. Field data may then be collected using a GPS unit or drawn onto these base maps, which can then be digitized and rectified to the original digital data. Geologic maps are fundamental tools in structural investigations. ArcINFO software allows for new data to be added to previously digitized geologic maps rapidly. Furthermore, ArcINFO software provides a system for data management and easy modification of data to produce customized finished maps.

WEB-BASED GIS DATA ACCESS AND MANAGEMENT TECHNOLOGIES CAN FACILITATE BOTH GEOSCIENCE CLASSROOM INSTRUCTION AND STUDENT RESEARCH: SOME EXAMPLES

Jeffrey Ryan
Department of Geology
University of South Florida
ryan@shell.cas.usf.edu

Abstract — Web-accessible geospatial information system (GIS) technologies have advanced in concert with an expansion of data resources that can be accessed and used by researchers, educators and students. These resources facilitate the development of data-rich instructional resources and activities that can be used to transition seamlessly into undergraduate research projects.

GeoMapApp (www.geomapapp.org; Carbotte et al, 2004) is a GIS focused on the oceans that is utilized heavily in classroom activities developed for the MARGINS Data in the Classroom project. Both "packaged" datasets (i.e., global earthquake foci, volcanoes, bathymetry) and "raw" data (seismic surveys, magnetics, gravity) are served, along with WFS linkages to other resources (GPS/seismic, geochemical, and drillsite results), permitting comprehensive characterization of many regions of the ocean basins. Geospatially controlled data of all sorts can be imported into GeoMapApp visualizations. GeoMapApp results, interfaced in some cases with Google Earth, are key to MARGINS "Mini-Lesson resources based on research results from several NSF-MARGINS Program Focus Sites. These materials are available for use and testing from the project webpage (http://serc.carleton.edu/margins/).

JMARS (jmars.asu.edu) maintained by the Mars Space Flight Facility at ASU, permits study of composite image datasets (topography, photography, infrared spectroscopy, magnetics, etc.) from the Viking, Mars Global Surveyor and Mars Odyssey missions, with linkages to original MOC, Viking, and THEMIS image strips. JMARS permits dynamic integration of datasets, permitting the recognition of phenomena not evident from any single source. Mars orbiter source data and imagery is public domain, so anyone use it for undergraduate planetary science investigations. I have developed a sequence of flexible activities using JMARS and its associated data and imagery for an introductory planetary geology course, that transition from feature identification to studying the geologic histories of student-selected planetary regions. Early results indicate students enjoy these activities, but I have no "takers" so far for pursuing independent research.

THE HOCES DEL RÍO RIAZA NATURAL PARK, SPAIN: A POSSIBLE NEW MEMBER OF THE EUROPEAN GEOPARKS NETWORK, GLOBAL GEOPARKS NETWORK, UNESCO

José F. García-Hidalgo*, Fernando Barroso-Barcenilla,
Javier Temiño, Javier Gil, and Manuel Segura
Departamento de Geología
Universidad de Alcalá
jose.garciahidalgo@uah.es

Abstract — The "Hoces del Río Riaza" Natural Park is located in Spain, at the southern border of the Tertiary Duero Basin. The Riaza River, tributary of the Duero River, crosses lengthwise the Park with deep gorges on its margins. The geology of the park comprises continental to marine Cretaceous sediments, and unconformally overlaid by continental Neogene-Quaternary deposits. The Alpine Orogeny folded the Cretaceous materials, and controlled the sedimentation of the Neogene-Quaternary deposits, which are composed of several stacked alluvial fans, grading laterally into fluvio-lacustrine sediments. The compression stresses of this orogeny also originated faults and joints. This park also shows a good representation of Mesozoic and Cainozoic organisms, such as bivalves, gastropods, cephalopods, ostracods, foraminifers and algae. Thus, the "Hoces del Río Riaza" Natural Park can be considered an excellent example of geological heritage, and it could become a possible new member of the EGN, Global Geoparks Network, UNESCO.

INTRODUCTION

Environmental issues, such as the climatic change and the extinction of species have increased the perception of the need to protect natural environment. An important part of this environment is composed of rocks, minerals, fossils, soils and landforms, what can be called "Geological Heritage". Moreover, geological resources and landscapes have greatly influenced society development and, in last instance, the entire human civilization. Understanding how Earth processes have operated in the past (soil formation and erosion, desertification, earthquakes and volcanoes, etc.) contributes to understanding the problems of the present and to the assessment of future hazards.

Geological heritage has, then, to be valued from scientific, cultural and educational point of views. The society must be aware of its high vulnerability because when any element or part of this heritage disappear, all the geological information related to a wide variety of past processes (climates, plate positions, volcanoes, etc.) also disappear. In order to understand the principles of geology, to illustrate the processes of landscape evolution and, for training and education is important the development of geological heritage sites. These sites may contribute also to value the aesthetic and historical quality of the landscape as part of this heritage.

The European Geoparks Network was created in 2000 with the support of the European Union using geological heritage (Eder and Patzak, 2004), primarily for the development of geotourism (Patzak, 2000; Buckley, 2006). The Global Geoparks Network was established in 2004 by UNESCO acting in response to the requirements expressed by many countries for an international framework to connect geological heritage with issues such as sustainable development, geoconservation and geodiversity (Eder and Patzak, 2004).

GEOLOGICAL HERITAGE IN SPAIN

Spain is a country with a great geodiversity; the forest cover is not very important due to the Mediterranean climate and geology is clearly shown in many parts of its territory. Besides, the geological knowledge is high enough to allow an appropriate selection of the more representative and valuable geological outcrops (Durán et al., 1997). Many universities in Europe and the USA bring their students to Spain to do field trips and practices.

On the other hand, the Spanish geological heritage is poorly known and not well-valued among the own citizens and governments. There is a clear imbalance between the consideration of biological and geological aspects, although disparities are more pronounced in some regions than in others. Less than 25% of the Protected Natural Areas (PNAs) in Spain has been significantly influenced by geology (Gallego and García Cortés, 1992). And of these, a more detailed analysis led to conclude that in 96% of the cases the landscape or geomorphological aspects were the main points for protection, ignoring almost completely the values that explain the regional geological history, whether stratigraphical, petrological, paleontological, tectonic or mineralogical.

Nevertheless, given the suitable characteristics of the territory and the proper degree of geological knowledge, we must build on the existing network of mainly biological PNAs, a geological counterpart network, to preserve its geodiversity as an intrinsic property of the territory. This also allows locating the geological heritage in a natural and broader social context. The vision and study of the natural environment involves the participation of the geological conditions in shaping the landscape and the dynamics of enclaves of high ecological value, allowing understanding them as multifunction systems that until now had studied every scientific discipline only under their particular perspective. This vision can be easily supplemented with key stratigraphical, geomorphological, paleontological, petrological and tectonic features of these PNAs.

In this way the potential of geological heritage can be used as a resource able to improve local development. Several areas in Spain show that this potential is a reality; good examples of this is the creation of geoparks, such as those in Sobrarbe, in the Pyrenees (N Spain), or the "Cabo de Gata", Almería, SE Spain (Rigol and Chica-Olmo, 1996). These initiatives play a very important educational and cultural role, which in addition bear positive socio-economic aspects, especially at the local level.

In this paper, we propose the "Hoces del Río Riaza" Natural Park as an area capable of be included in the European Geoparks Network. The narrow canyon of the Riaza River, abandoned meanders, various types of rocks, karstic forms, folds, slides, etc. Some of the most significant geological features of the site can be easily observed and understood. They also provide means for teaching geoscientific disciplines and broader environmental issues and for illustrating methods of understanding the last 100 Ma (or 100 Million years) of geological history, landscape development and change, all which make this site a great place to visit and enjoy, and to understand that geology can be much more attractive and closer to us what we think.

THE "HOCES DEL RÍO RIAZA" NATURAL PARK

Location and origin

The "Hoces del Río Riaza" Natural Park has an area of 5,185 ha and is located in the northeastern part of the Segovia province (Spain). The Riaza River, a tributary of the Duero River, cut through the park lengthwise, leaving deep gorges on its banks and those of its tributary streams; occupying the SE part of the park, the Riaza river is damming (Linares dam).

The recognition of the natural values of this area dates back to 1975 when the "Montejo de la Vega Birds of Prey Refuge" (2,100 ha) and the "Arroyo de Linares Refuge" (315 ha) were opened. These two areas were declared as refuges for hunting, which was prohibited; at the same time it protected the most representative species in the area. It should be noted that this area contains one of the colonies of griffon vulture most important of Spain and Europe. On the other hand, agricultural and livestock uses suffered no restriction or modification.

Since then it has not stopped receiving recognition embodied in several different categories of PNAs. The Institute for the Conservation of the Nature, in 1975, included the area in its "National Inventory of Excellent Landscapes". In 1985, was considered "Geomorphological Relict" by the Annals of the Botanical Garden of Madrid. In 1989, was classified as a Special Protection Area for Birds

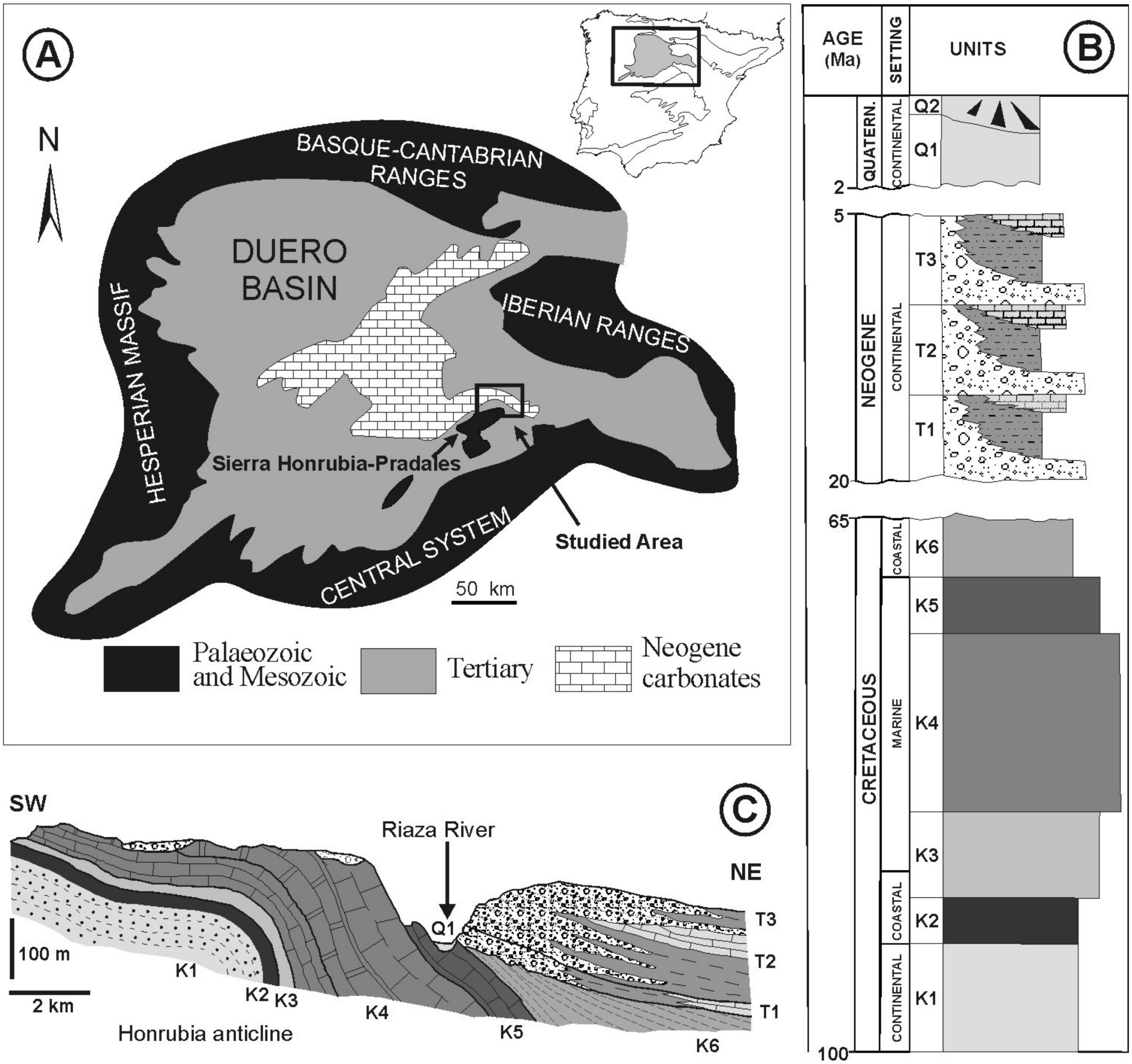


Figure 1A, 1B, 1C. Location and geology of the "Hoces del Río Riaza Natural Park". A) Location of the Tertiary Duero Basin in northern Spain (inset); the Park is located in the southern part of this Basin. B) Composite stratigraphic section, showing Cretaceous, Tertiary and Quaternary units, ages and environments. C) Cross-section showing the main structure (Honrubia anticline) and the entrenchment of the Riaza River.

and the International Council for Bird Conservation incorporates the "Hoces del Riaza" in the inventory of Important Bird Areas in Europe. In 1990, was listed as a Point of Geological Interest by the Geological Survey of Spain (IGME). In 1991, for all its unique natural features, was included in the Plan of PNAs of Castilla-León Autonomous Community with the name "Hoces del Río Riaza." The year 1999, through Directive 92/43/EEC, was proposed as a Site of Community Importance with a surface that agreed with that occupied by the current Nature Reserve. It was also included in the European Natural 2000 Network.

The year 2004 was declared a "Natural Park", for its unique geomorphological and botany, as well as for the rich bird community living in the rock cliffs. Among the main objectives of the Park is to protect its fauna, flora and geology, as well as promote socio-economic development of municipalities that are part of its territory within the PNA or in its peripheral protection area. It is currently being developed by the nomination dossier to obtaining the European Charter for Sustainable Tourism, through which sets out the principles of sustainable tourism in this space and its applicability in the territory.

The Park provides and organizes support tools and activities to communicate geoscientific knowledge and environmental concepts to the public through a Visitor's Centre. A network of trails with sign-posts run the different ecosystems of the natural park and crosses the different formations and geological features of interest. This set of 6 routes is the only part accessible to the public. It is important to note that in order to walk along 2 of them between January 1st and July 31st, it is necessary to apply for approval at the Visitor's Centre, being limited the maximum group size to 10 people. This restriction is implanted so as not to interfere in a negative way in the reproductive cycle of birds.

Geological framework

The "Homes del Río Riaza" Natural Park is located in the southern part of the Tertiary Duero Basin. This was a large basin filled with sediments during the Neogene and currently has lowlands reliefs bordered southwards by mountains where Palaeozoic and Mesozoic rocks crop out (Sierra de Honrubia-Pradales, Fig. 1A).

This is an area where Cretaceous and Neogene sediments are predominant (Fig. 1B and C). Cretaceous rocks are folded, the main structure is the Honrubia anticline (Fig. 1C), the N flank is almost vertical whereas the S flank is almost horizontal, with minor folds related. The Riaza River cut this fold from SE to NW and have produced a deep gorge with steep cliff areas, where canyons are the main landscape in the southern sub-horizontal flank, and "cuestas" and crests with a more open and hilly landscape in the northern dipping flank. This produces a strong contrast and, geomorphological diversity and outstanding landscape beauty. Tertiary sediments fringe Cretaceous rocks by the north, resting uncomfortably with a superb progressive unconformity.

Nearly all sedimentary rocks are represented in the Park, from detrital to biochemical: conglomerates, sandstones, claystones, gypsum, chert, limestones, dolostones and marls. Organic structures (stromatolites and oncolites) and fossils are also common. Cretaceous rocks (Fig. 1B) are composed of six lithostratigraphic units, from base to top: K1) whitish siliceous sandstones with caolinitic mudstones; K2) brown and greenish, glauconitic, sandstones and mudstones with oysters, ammonites and echinoids; K3) fossiliferous (bivalves, ammonites) marls and nodular limestones; K4) massive limestones and dolostones; K5) limestones and marls; and K6) red mudstones with gypsum beds intercalations. The massive limestones and dolostones unit is about 200 m thick and it forms the most prominent cliff gorge landscapes in the eastern part of the Park. Exo and probably endokarstic processes are commonly found on the limestones, dolostones and gypsum.

Tertiary units are composed of three tectosedimentary cycles (T1 to T3, Fig. 1B), which grade upwards and northwestwards from coarse conglomerates, mainly composed of Cretaceous limestones and dolostones blocks and cobbles; to mudstones with cross-bedded, channelized, sandy beds and caliche soils intercalations; and then to limestones with gastropods and oncolites. The lower cycle has a slight dip (about 15º-45º N), but the overlying two cycles are horizontal or sub-horizontal.

Close to the Park, there is a Aragonian fossils site in which lagomorphs, rodents, rhinos, antelopes, wild pigs, horses, cats and other rare species of vertebrates were described (Mazo et al., 1998; Domingo et al., 2007). They have an age of about 15 Ma, and these organisms lived in a semi-arid climate with very strong seasonality, but with water availability (Mazo et al., 1998).

Quaternary sediments are composed of fluvial sediments in the Riaza River (Q1, Fig. 1B and 1C) and small alluvial fans (Q2, Fig. 1B) related to the higher reliefs.

Landscape evolution through time

This Park is an exceptional observatory on the last 100 Ma of Earth history in this area. Some of the footprints left by geological evolution on this landscape are unique elements in the region.

<u>Cretaceous</u>

Cretaceous rocks were deposited in a shallow intercontinental basin (Iberian Basin), which communicated the proto-Atlantic Ocean (NW) and the Tethys Sea (SE). This basin about 100 Ma ago

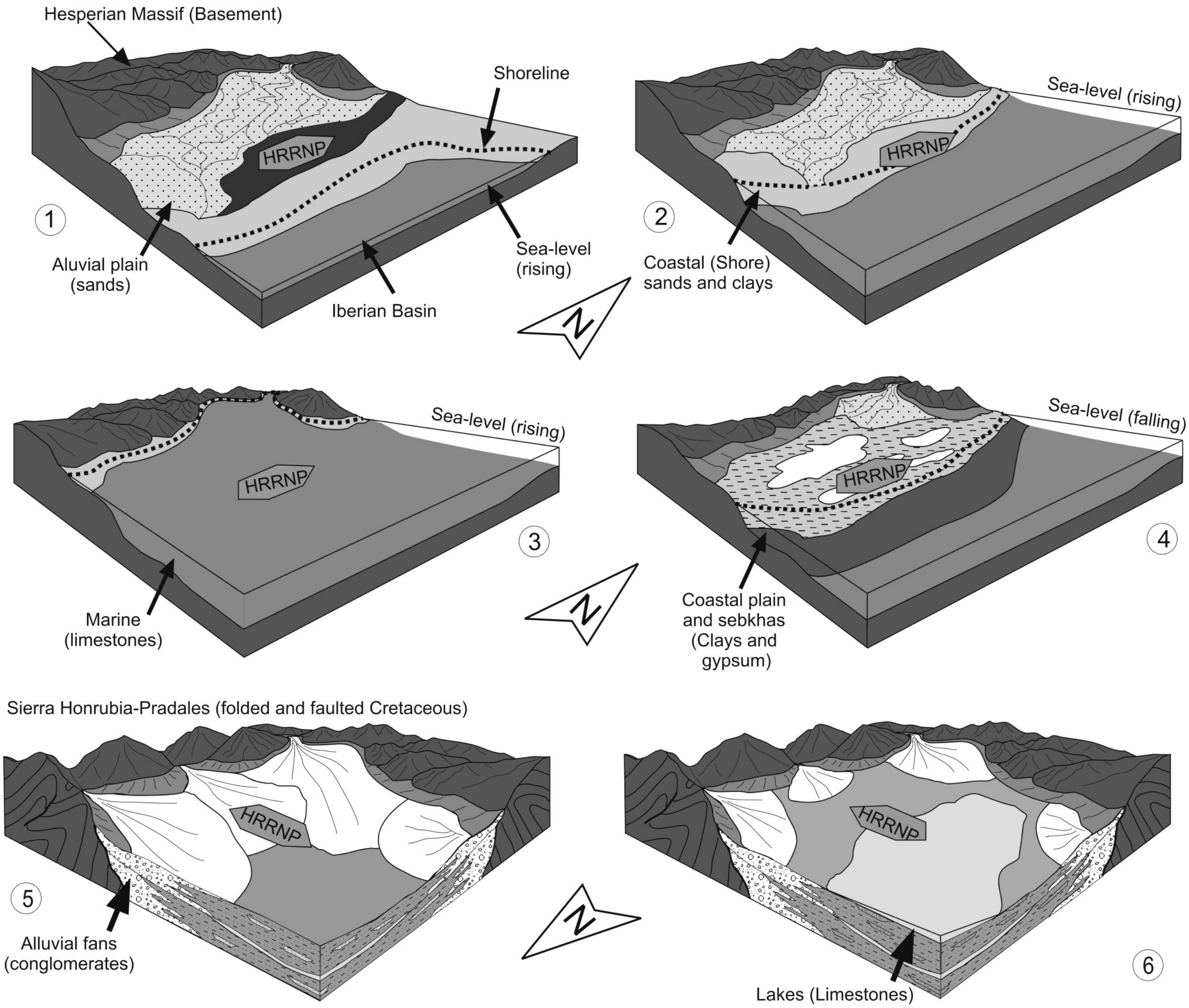


Figure 2 with Callouts 1-6. Figure 2: Block diagrams showing successive sedimentary environments and palaeogeography in the Hoces del Rio Riaza Natural Park (HRRNP) during Cretaceous (1 to 4) and Tertiary (5 and 6). 1) Continental to coastal environments of K1 and K2 units; 2) coastal to marine environments of K3 unit; 3) marine environments of K4 and K5 units; 4) coastal (sebkha) environments of K6 unit; 5) alluvial fans and plains at the onset of T2 unit, the Sierra Honrubia-Pradales is rising related to the Alpine Orogeny being the source area for Tertiary sediments (note the change in north orientation); 6) distal alluvial plains and lakes at the end of the T2 unit.

was a coastal flood plain where the siliceous sands unit was deposited (callout 1 in Fig. 2). Sediment type (sands and quartzite granule lags) and grain size, unidirectional cross-bedding, root traces and palaeosols suggest that these sediments correspond to alluvial deposits of river channels, next to a coastal plain.

Later on, the worldwide rise in sea level during the Late Cretaceous resulted in a marine transgression, originating a displacement of the coastline and the sedimentary environments towards the emerged continent (westwards). Brown and green muds and fine- to coarse-grained sands were deposited in a coastal setting (callout 2 in Fig. 2). Opposite bidirectional cross-bedding is commonly found in the coarser sediments, suggesting that they were originated by coastal tidal currents. The formation of glauconite and the presence of marine organisms and bioturbations also support such interpretation.

The rise in sea level was relatively continuous, so that over time this ascent moved further landwards the coastline and the area became a shallow sea (callout 3 in Fig. 2). The nodular limestones and marls, with abundant marine fossils, are usually interpreted as belonging to a shallow marine environment (Segura et al., 2002); the marine fauna (bivalves, cephalopods, echinoderms, among others) is typical of tropical seas. This condition lasted nearly 15 Ma and led to the accumulation of thick masses of limestones and dolostones with some oysters, rudists, gastropods, ostracods, planktonic and benthic foraminifers and abundant algae.

Towards the end of the Cretaceous, the first movements of the Alpine Orogeny occurred. On this new tectonic setting, the sea became gradually shallower (regression), and gave way to a coastal plain with brackish coastal lagoons; a succession composed of red mudstones, interbedded with fine sands and gypsums was deposited (callout 4 in Fig. 2). The presence of gypsum suggests that these sediments were deposited in hypersaline environments of coastal plains with restricted movement of water in arid regions with high rates of evaporation, similar to the Middle East sebkhas of nowadays.

Alpine Orogeny

At the end of the Cretaceous, the Iberian Microplate was involved in the convergence between two major plates (African and Eurasian plates). As a result of the stresses transmitted to the interior of the microplate, the former Iberian Basin was inverted to an orogenic range (Iberian Ranges) and the Central System was also elevated as a mountainous area.

The Honrubia anticline, and all the minor faults and folds, were formed during the Alpine Orogeny. This folding and shortening is related to the rise of the "Sierra de Honrubia-Pradales". This sierra has suffered since the beginnings of the Alpine Orogeny, a permanent erosive process that continues today. To get a first idea of the volume of eroded rocks is worthy to observe the surroundings of the Valdevacas Hill where the Cretaceous has been almost entirely eroded (its original thickness exceeded 400 m). Nearly all this material has been eroded during the Neogene and carried through large alluvial fans and fluvial systems to the Duero Basin.

Neogene

The Alpine Orogeny originated several mountain ranges in the borders and the interior of the Iberian Microplate; between these ranges there were a few large subsident areas, which were slowly filled along the Tertiary with sediments derived from the erosion of the surrounding mountains. The Duero Basin (Fig. 1A) was one of these basins.

In the Park, there were three successive tectosedimentary cycles throughout the Neogene (T-1 to T-3, Fig. 1B). In each of these cycles the three dominant lithologies were deposited (conglomerates, mudstones with intercalated sandstones and limestones).

The conglomerates, which are locally very thick deposits, correspond to alluvial fans sediments. These fans were several kilometers wide, and they lie at the foots of the surroundings mountainous area. Muddy and sandy sediments are interpreted as originated in a large flood plain developed in the front of the alluvial fans (callout 5 in Fig. 2). Episodes of sub-aerial exposure originated the evaporation of soil waters and favored the development of caliche soils. Finally, the limestones were deposited in shallow lakes (callout 6 in Fig. 2); the presence of freshwater gastropods and the abundance of oncolites (for whose development is needed algae, and thus light, and wave energy capable of rolling them) suggests shallow lakes with well-fed waters, rich in dissolved carbonates.

Each tectosedimentary cycle corresponds to an event of the latter stages of the Alpine Orogeny, which reactivated the sedimentation in the area. This reactivation caused alluvial fan progradation on the margins of the Sierra de Honrubia-Pradales and the establishment of broad flood plains in the Duero Basin. Later, a longer period of geological stability caused the infilling of the flood plains and large lakes were developed, which completed the cycle.

Limestone boulders of the conglomerates were originated from the dismantling of the Cretaceous formations of the anticline, which in turn, was folding and rising in the Sierra de Honrubia-Pradales. First, the Cretaceous formations (K2 to K6), which were higher and dominated by limestone units, were eroded. With time, erosion also reached the K1 unit and so quartz and quartzite clasts are also present in some Neogene conglomerates.

With the T-3 unit finished the Duero Basin filling.

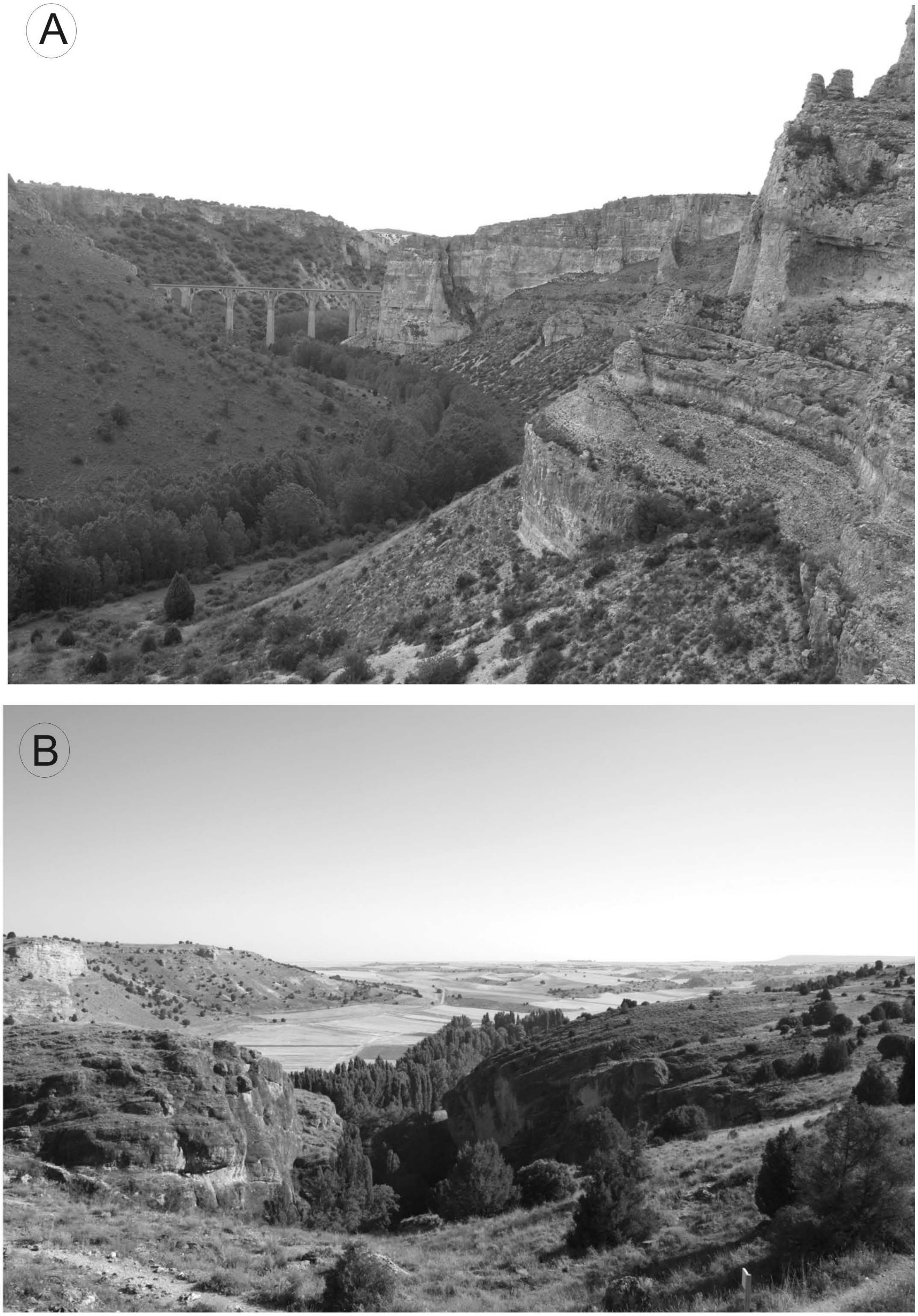


Figure 3. Present landscapes of the "Hoces del Rio Riaza Natural Park". A) Riaza gorge close to the Linares dam. This is the heart of the first protected area, the Rio Riaza has narrow banks with riparian vegetation, the cliffs are composed of Cretaceous dolostones, limestones and marls (units K3 to K5), in the background a railway bridge can be seen; the visits to this area are restricted during part of the year. B) Transition from the Sierra de Honrubia-Pradales (foreground) to the Duero Basin (background). The Sierra area is composed of folded Cretaceous limestones and dolostones (units K2 to K4), this is a hilly area with forest and stock raising uses. The Basin area is composed of sub-horizontal conglomerates (background left) with a lateral facies change to claystones, sandstones and limestones (units T1 to T3); this is a classical agricultural landscape (rolling plains) with cereal cropping uses. In the far background (right) a flat-topped hill can be seen, this hill is capped by horizontal Tertiary limestones (unit T3).

At this time the landscape of the area was a vast plain at approximately 1,020 m in height, on which the reliefs of the Sierra de Honrubia-Pradales that in the area of the Park did not exceed 200 m on that plain, stood out as a relatively prominent areas. This landscape remained unchanged until about 5 or 6 Ma ago, when the draining of the lakes coincided with a change to dryer climate.

Quaternary

Until about 2 Ma ago the Duero Basin was a closed, endorrheic system. It was about this time when the entire fluvial style changed from an endorrheic to an open to the Atlantic system. From this moment, regional rivers began to be affected by the general entrenchment due to the lower base level. This general entrenchment originated, firstly, fluvial terraces at different height, which can be seen in some parts of the park; and, secondly, different landscapes depending on the area. In the sierra area, where Mesozoic rocks crops out, fluvial entrenchment originated gorges and canyons in the Cretaceous limestones (Fig. 3A). In these cliffs some cavities and conduits of karstic origin were also exposed. Nevertheless, they were not very large or abundant, so it does not appear that the karstic processes had great importance in the formation of the gorges. In the basin area, however, the Tertiary sediments were softer and, fluvial entrenchment and valley widening originate broad, open fluvial valleys filled with fluvial sediments within a rolling plain area (Fig. 3B).

Today the area is relatively stable, although a variety of geological processes are still active. Some of them are barely visible, such as gully erosion. Others are more obvious, such as falls of blocks from the escarpments and their accumulation on the slopes, the sporadic activity of alluvial fans and flood plains of some streams, possible landslide on the clay slopes next to the Linares Dam, or erosion in some areas of the Riaza River.

REFERENCES

Buckley, R., 2006, Geotourism: Annals of Tourism Research, 33 (2): 581-583.

Domingo, M.S., Alberdi, M.T. and Azanza, B., 2007, A new quantitative biochronological ordination for the Upper Neogene mammalian localities of Spain: Palaeogeography, Palaeoclimatology, Palaeoecology, 255 (3-4): 361-376.

Durán Valsero, J.J., Carcavilla Urquí, L. and López-Martínez, J., 1997, Patrimonio Geológico: Una panorámica de los últimos 30 años en España: Boletín de la Real Sociedad Española de Historia Natural, 100: 277-287.

Eder, W. and Patzak, M., 2004, Geoparks -geological attractions: A tool for public education, recreation and sustainable economic development: Episodes, 27 (3): 162-164.

Gallego, E. and García Cortés, A., 1992, El Patrimonio Geológico: Un patrimonio cultural en peligro:Tecnoambiente, 13: 37-42.

Mazo, A.V., Van der Made, J., Jordá, J.F., Herráez, E. and Armenteros, I., 1998, Fauna y bioestratigrafía del yacimiento Aragoniense de Montejo de la Vega de la Serrezuela (Segovia): Estudios Geológicos, 54: 231-248.

Patzak, M., 2000, Tourism and Geodiversity. The Case of Geoparks: Division of Earth Sciences. UNESCO, Paris, p. 1-8.

Rigol, J.P. and Chica-Olmo, M., 1998, Merging remote -sensing images for geological-environmental mapping: application to the Cabo de Gata-Níjar Natural Park, Spain: Environmental Geology 34 (2/3): 194-202.

Segura, M., García, A., Carenas, B., García-Hidalgo, J.F., Gil, J., 2002, Upper Cretaceous of the Iberian Basin *in* Gibbons, W. and Moreno, T., eds., The Geology of Spain: Geological Society, London. p. 288-292.

THE US POLAR ROCK REPOSITORY: A TOOL FOR ANTARCTIC PENINSULA RESEARCH

Anne Grunow, Julie Codispoti*, David Elliot
Byrd Polar Research Center
Ohio State University
codispoti.8@osu.edu

Abstract — The United States Polar Rock Repository houses terrestrial rock samples, unconsolidated material, dredges and terrestrial cores primarily from Antarctica and the Arctic and makes them available for research, museum and educational use. More than 500 samples are available from the Antarctic Peninsula. All rock samples are relabeled with a USPRR number, weighed, photographed and measured for magnetic susceptibility. Information about the samples is available in the online database and sample requests can be made online by using the 'sample bag' feature. Metadata associated with the samples include geographical location, rock description, sample age, location maps, logistics used, rock surface observations, location features, and structural measurements.

INTRODUCTION

The National Science Foundation (NSF) and the US polar earth science community recognized the need for, and value of, preserving rock samples from polar regions and hence created the United States Polar Rock Repository (USPRR) (Askin and Grunow, 2003). Rock samples from the few terrestrial outcrops in Antarctica are invaluable because of the extensive ice cover (up to 98% in Antarctica is covered by ice) and these samples provide clues to the geologic evolution of the continent. The extreme cold and hazardous field conditions make field-work costly and difficult in Antarctica as well as leaving a large carbon footprint. The USPRR was established at Ohio State University by the National Science Foundation in October 2003 to minimize redundant sample collecting, improve field work efficiency and lessen the environmental impact of doing research in sensitive Polar Regions. The USPRR provides samples for research, museum and educational use. In addition, the USPRR provides educational outreach activities and a 'Rock Box' for educators to use in the classroom.

The USPRR sample collection includes donated terrestrial rock samples, unconsolidated material, dredges and terrestrial cores from polar regions. In addition to the samples, associated materials such as field notes, annotated air photos and maps, raw analytic data, paleomagnetic cores, ground rock and mineral residues, thin sections, and microfossil mounts, microslides and residues are cataloged and entered into the online database. The advanced search engine allows anyone to search the database through many fields.

ANTARCTIC PENINSULA AND SOUTH AMERICAN COLLECTIONS

Currently, more than 16,000 rock samples are available at the rock repository (Figure 1) including ~500 outcrop samples from the Antarctic Peninsula (from the collections of Grunow, Macellari, LeMasurier) and 84 dredge samples from the Scotia Sea, Weddell Sea and Pacific Ocean (Figure 2). The cataloged outcrop samples come from Seymour Island, the South Shetland Islands and Graham Land. Formations and groups represented by these samples include the Antarctic Peninsula Volcanic Group, the Trinity Peninsula Group, the Scotia Metamorphic Complex, the Nordenskjold Formation, and the Lopez de Bertodano Formation. The USPRR also houses ~2000 samples from Ellsworth Land at the base of the Antarctic Peninsula (the Laudon collection) and samples from Chile and Argentina (from the collections of

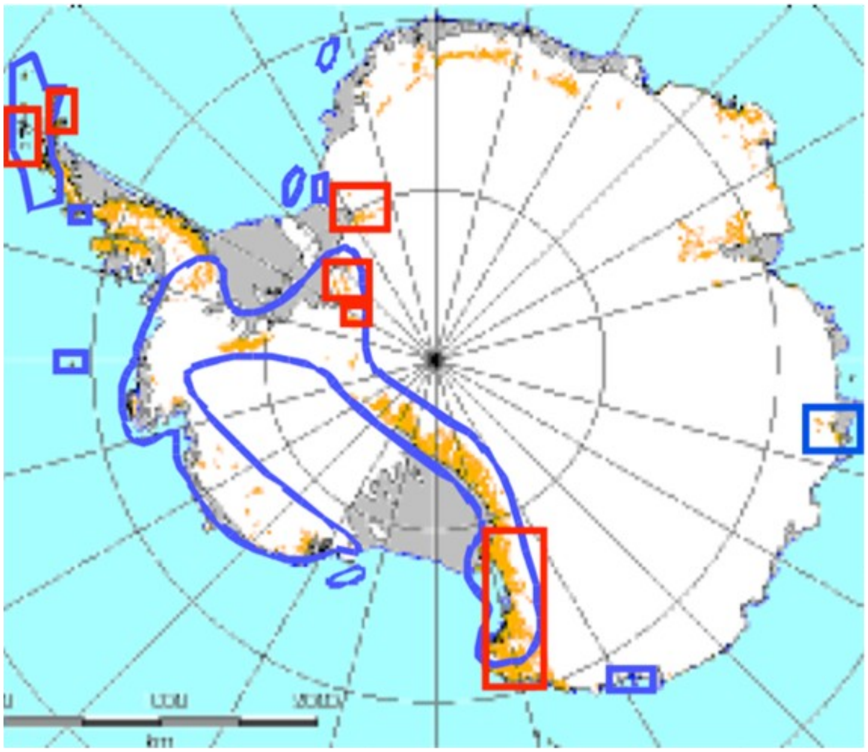


Figure 1. Location of cataloged Antarctic samples in blue (~16,000). Red locations are samples not yet cataloged.

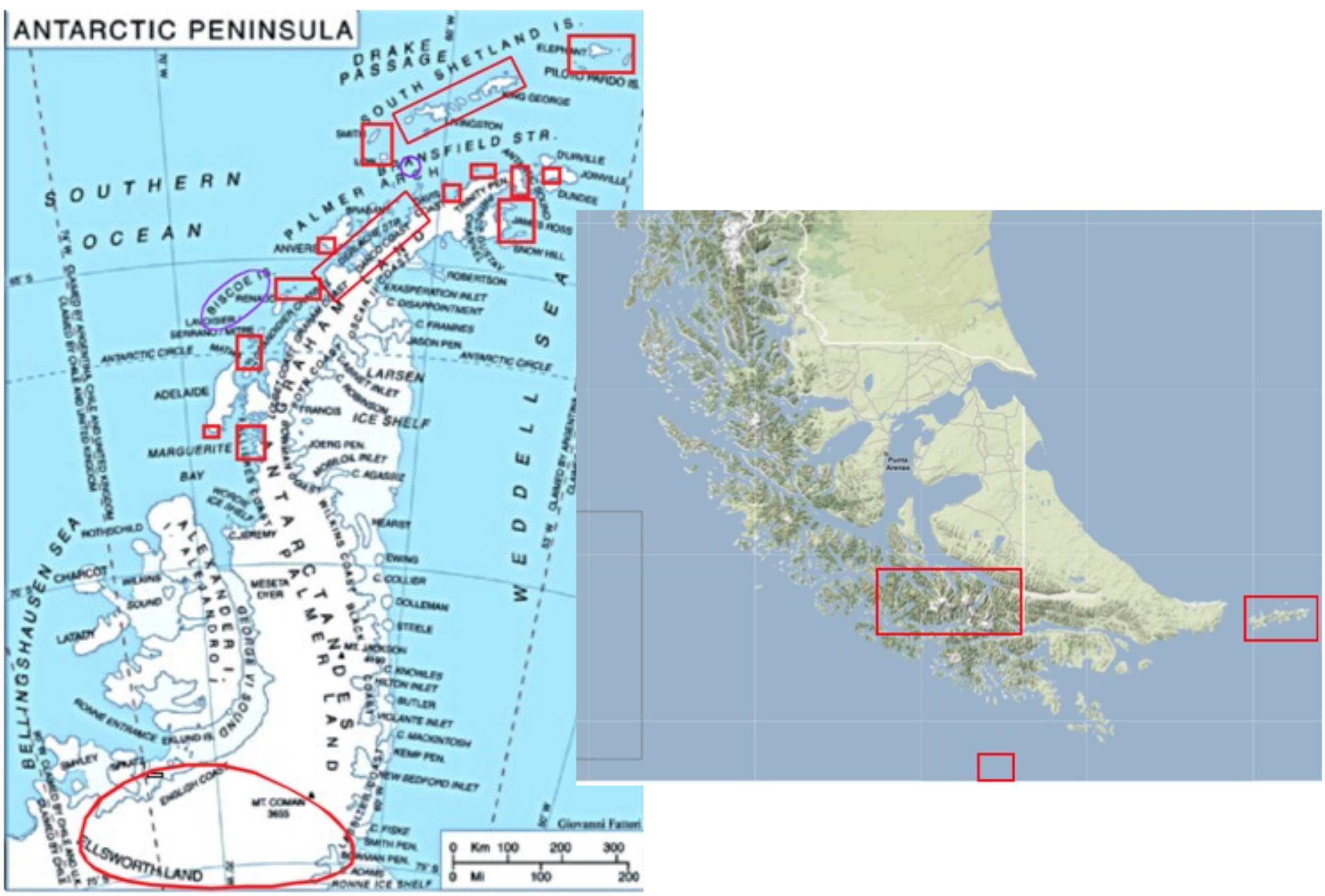


Figure 2. Antarctic Peninsula *(left)* and South American cataloged samples (red boxes) and dredges (purple ovals).

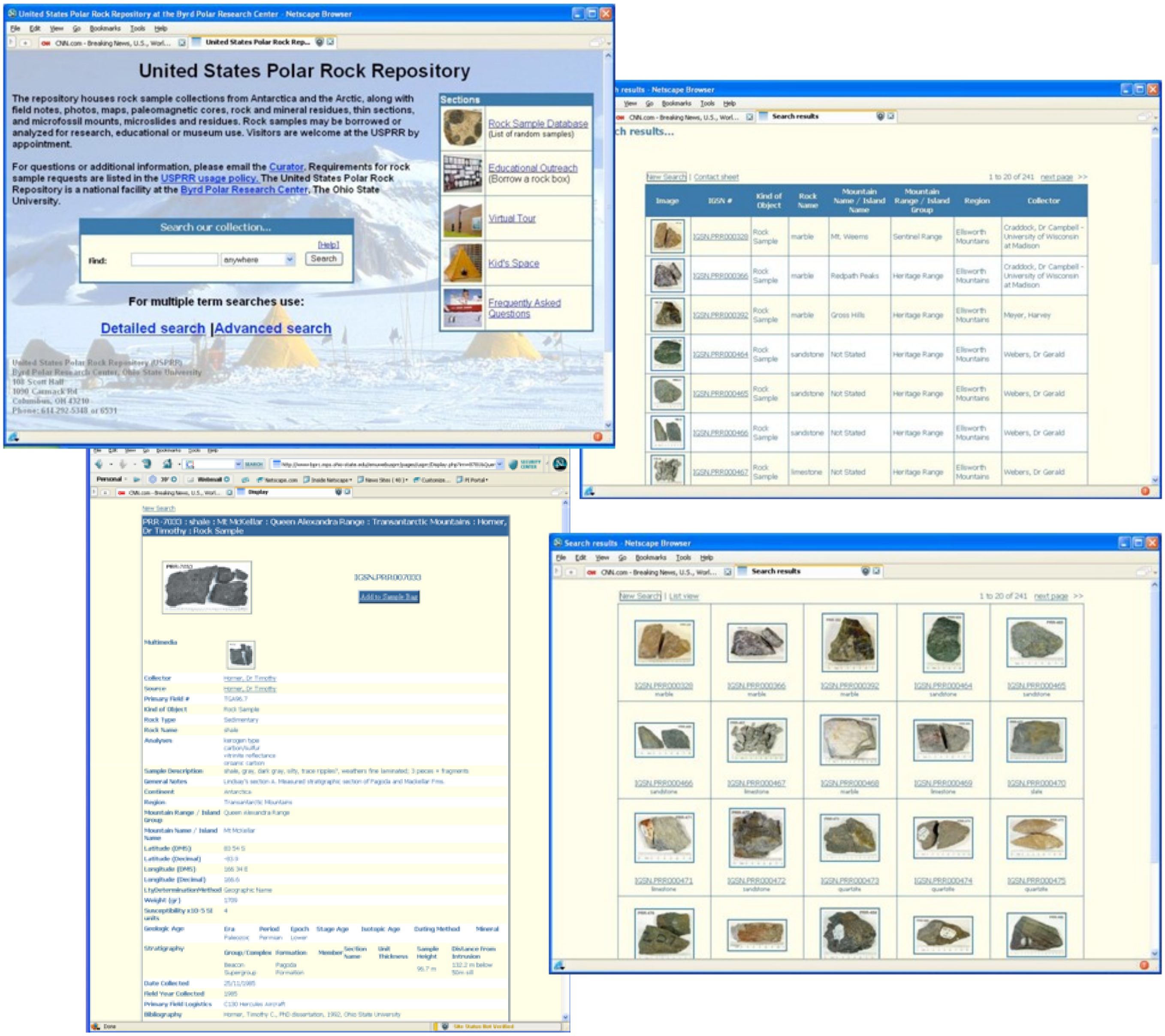


Figure 3. (*clockwise*) Online USPRR database home page, search results, search results contact sheet, and sample page.

Grunow and Hanson) (Figure 2). Many more samples remain to be cataloged from the Antarctic Peninsula and include: sedimentary rocks from Seymour Island; igneous and sedimentary rocks from the South Shetland Islands; igneous, sedimentary and metamorphic rocks from Graham Land. The uncataloged collections include samples from many researchers, including: Askin, Dalziel, Dupre, Elliot, Gracanin, Hoffman, Huber, and Pezetti .

SAMPLE SEARCH AND LOAN REQUEST

The USPRR maintains a database about the rock samples, as well as a magnetic property database assembled from published and unpublished paleomagnetic data. The USPRR uses commercial software called EMu (by KE Software) as the in-house and online database for the repository http://www-bprc.mps.ohio-state.edu/emuwebusprr.

The online sample database is one of the most comprehensive geological databases available to researchers, educators and museums worldwide. The database provides a fast way to search the collection using multiple terms (Figure 3). The database includes very basic geological information about samples but also other information about the location that may be of value to researchers. Requests for sample loans can be emailed to the Curator from the USPRR website. Scientists from other countries can request samples. United States educators and museums may also request samples.

CONCLUSION

The rock samples at the USPRR can provide provenance information for sediment cores taken in the Pacific Ocean, Scotia, Bellingshausen and Weddell seas. The USPRR is a valuable resource to the scientific community because it advances knowledge about polar geology in regions that are often not well known because of logistical and ice-cover constraints. By encouraging researchers to access samples in the USPRR collection first, the facility lessens the environmental impact of research in Polar regions. The online database facilitates planning for field-work, improving the science, efficiency, and safety of field operations. The USPRR provides a way for teachers and children to learn about Antarctica via the website.

EARTH SCIENCE IN PRINT MEDIA, INSIGHTS FROM A MID-SIZED NEWSPAPER

Stephen Mattox
Department of Geology
Grand Valley State University
mattoxs@gvsu.edu

Abstract — Research was conducted to determine the amount of science presented in a mid-sized newspaper, The Grand Rapids Press, a daily paper with circulation of about 350,000. It is proposed that the science articles a person is likely to encounter in a newspaper is a proxy of the science a person needs to know to be a literate citizen. More than three hundred issues of the Grand Rapids Press from the year 2007 were examined for scientific articles. Quantitative data was collected on number of articles, article length, number and size of pictures and graphs, and location of articles within the paper. Source of the article and general content were also noted. Each scientific article was grouped into one broad area of science and one of nine scientific disciplines: Earth science: (geology, weather, climate, environment, astronomy), life sciences: (biology, bio-medical), and physical sciences: (chemistry and physics). Results indicate that Earth science articles (53 %) occur more frequently than life science (45 %) and physical science (2 %) articles. The most common Earth science topics are: weather, natural disasters, climate change, and the environment. The length of articles and the number of pictures follow a similar pattern. Most graphs are associated with weather. The findings suggest that Earth science should be on equal status as life and physical science in preparing literate citizens. Extrapolating the data to an entire year, this mid-sized newspaper published nearly 318 full pages of science text, with over 2,120 articles, 1,300 pictures, and 3,380 graphs. Although we lack a standard in print media, this effort and content seems like a substantial and appropriate step towards creating or keeping a citizen literate in science.

PART 3:

GEOSCIENCE INFORMATION SOCIETY FORUMS

2008 Annual Meeting, Houston, Texas
October 4th-8th

GEOSCIENCE INFORMATION SOCIETY
SCHEDULE OF EVENTS

Note: GSIS Committees met separately as arranged by committee chairs

Saturday, October 4		*Location*
9:00 a.m. - 4:30 p.m.	Geoscience Librarianship 101	MD Anderson Library, University of Houston
6:00 p.m. - 9:00 p.m.	GSIS Executive Board Meeting	Hilton, 335C
Sunday, October 5		
9:30 a.m. - 12:30 p.m.	GSIS Business Meeting	George R. Brown Conv Ctr , Room 371E
2:00 p.m. - 5:00 p.m.	GSIS Collection Development Forum	Hilton, Lanier Grand Ballroom B
5:30 p.m. - 7:30 p.m.	Exhibits Opening & Welcome Reception	GRB Conv Ctr
Monday, October 6		
TBA (Morning)	Field Trip	Houston Museum of Natural Science
Tuesday, October 7		
9:00 a.m - 12:00 p.m.	GSIS E-Resources Forum	Hilton, Lanier Grand Ballroom D
12:00 p.m. - 1:30 p.m.	GSIS Luncheon	Hilton, 337AB
6:00 p.m. - 9:00 p.m.	GSIS Reception, Awards and Silent Auction	Hilton, Lanier Grand Ballroom J
Wednesday, October 8		
10:00-11:00	GSIS Executive Board Meeting	Informal TBA -convenient area in GRB Conv Ctr
1:30 p.m. - 5:30 p.m.	Technical Session	GRB Conv Ctr , Room 351BE
4:00 p.m. - 6:00 p.m.	Posters Session (with presenters on hand)	GRB Conv Ctr , Room Exhibit Hall E
	(Posters will be up all day this year, from 8am-6pm)	

"GEOSCIENCE LIBRARIANSHIP 101"
A SEMINAR PRESENTED BY THE GEOSCIENCE INFORMATION SOCIETY

Saturday, October 4, 2008
MD Anderson Library (Room 306)
University of Houston
Houston, TX

Workshop overview

9:15-9:30 AM	Check In	
9:30-9:40 AM	Welcome and introductions	Andrea Twiss-Brooks, University of Chicago
9:40-11:00 AM	Reference and Instruction • Overview of reference in geosciences, including instruction • Demos of selected resources	Adonna Fleming, University of Nebraska
11:00-11:10	Break	
11:10 AM - 12:30 PM	Collection Development • Overview of collection development • Managing electronic resources in the geosciences	Lisa Dunn, Colorado School of Mines
12:30-2:00 PM	Lunch and networking	(Lunch provided by the University of Houston Libraries)
2:00-4:00 PM	Maps and geographic information systems (GIS) • Introduction to maps • Overview of spatial geoscience information and GIS • GIS data sources and applications	Linda Zellmer, Western Illinois University
4:00-4:30 PM	Feedback and wrap up	Andrea Twiss-Brooks

***All participants in GL101 will also receive a USB thumb/flash drive with all workshop materials pre-loaded.

Thanks for their support of ***Geoscience Librarianship 101*** to:
the University of Houston Libraries
ESRI – GIS and Mapping Software
John Wiley and Sons, Inc.

GEOSCIENCE INFORMATION SOCIETY
BUISINESS MEETING 2008

Sunday October 5, 2008, 9:30 am -12:30 pm
Houston, TX

Respectfully submitted by Elaine Adams, Secretary

President Suzanne Larsen called the meeting to order at 9:40am with a new gavel courtesy of Lura Joseph. The agenda was approved. Copies of the minutes from the Denver Business meeting were distributed for review and two corrections noted. The Minutes were approved as corrected. Introductions of both incumbent and entering officers (Vice President/ President Elect Jan Heagy and Secretary Elaine Adams) were made. There were no new members or first time attendees at the meeting.

Financial report: The Treasurer's report will be published in the Newsletter as Renee Davis was not present to give the report.

Houston conference reports and announcements (Kimball): Due to the unusual schedule brought about by the joint meeting of the larger societies, the GSIS field trip is happening in the middle of the meeting.

-Heagy announced trip details for those attending the field trip.

-GSIS will implement at this meeting presentation of the awards at the reception and silent auction. The Reception begins at 6pm on Tuesday evening. Award presentations will begin about 7:15pm. -Also, this will be the first luncheon featuring a speaker (Sharon Mosher from the University of Texas, Austin).

-We have a number of sponsors for our various events:

- Gemological Society of America – business meeting refreshments and the GSIS booth
- Geological Society of London is sponsoring the Collection Development Forum
- Knovel and ESRI are sponsoring the E-Resources Forum
- Wiley and ProQuest are sponsoring the reception and silent auction
- University of Houston Library not only provided space for GeoScience 101 but also sponsored lunch for attendees Kimball will be sending special thank you letters to all our sponsors and asked that members thank the representatives at the various vendor booths in the Exhibit Hall.

-Technical Sessions: Lisa Johnson, our technical program chair, noted that due to the schedule assigned by GSA, our Technical Session will be Wednesday afternoon from 1:30- 5:30. The Technical Session topic is "Libraries in Transformation: Exploring Topics of Changing Practices and New Technologies". Lisa noted that the Posters will be up all day this year with the authors available from 4-6pm, overlapping somewhat with the technical session.

-Geoscience 101: Linda Zellmer read an email report from Geoscience 101 organizing chair Andrea Twiss-Brooks. The report noted that there were 22 participants. Presentations included strategy for reference services, collection development best practices, maps and GIS, with an ARC GIS demonstration. The University of Houston provided a computer equipped classroom and lunch for attendees. Wiley provided flash drives loaded with samples and information.

-GSIS Exhibit Booth**:** Our booth number this year is 350 and is located between the Internet Café and the GSA booth. The theme is guidebooks and will have information on the various 2008 GSIS awards on display. The booth is sponsored by the Gemological Institute of America whose booth is adjacent. Dona Dirlam noted that this is the first year that GSA has charged associated societies for booth space, and believes GSA will continue the practice in future years.

GSIS BUISINESS MEETING MINUETS 2008, CONT.

Committee Updates:

Suzanne Larson reported on the **Executive Board** meeting October 4, 2008 from 6-9pm. Most of the items under discussion form the agenda for this meeting.

Sarah Ziegler Hodkinson, chair of the **Membership Committee**, reported that the five members of the committee sent out a lot of emails focused on recruiting from academic, corporate and state survey libraries. Other emails promoted membership to library students, non- renewing members, and foreign librarians. As a result, we have eight new embers, including one from yesterday's Geoscience 101 session and one international librarian.

Adonna Fleming, **Newsletter Editor**, reminded members about submission guidelines for type face and size (Word 2003, Times New Roman 12, borders 1" all around). Tables cannot be more than 6.5 inches by 9 inches. If a table is not in Word and the proper type face, it will be returned to the author for formatting. Also, contribution deadlines are firm so that the newsletter can be produced on schedule. The deadline for the next issue is October 17. She also reminded committee chairs that Annual Reports are published in the newsletters in the middle and end of the year.

Ellie Clement, **Publications**, announced that v.36 of the society's proceedings was printed and distributed in spring, 2008. Ellie has a printer's quote for the next volume (v.37 from the Philadelphia meeting), and those copies should come out next month. Ellie is organizing the standing orders and members lists and dealing with subscriber claims. As a special project, she is reconciling the publication's ISBN numbers with our list of registered numbers. Shaun Hardy noted that ProQuest has phased out their books on demand publishing, so how might we handle requests for back numbers not in stock? Discussion ensued about alternate "on demand" publishing sources (University of Michigan) and mounting our proceedings on the GSIS website. There is some question about copyright issues. Suzanne suggested a task group explore the issues and prepare a proposal to the membership in general. Ellie will chair the task group, and the Webmaster and Suzanne, as past chair, will complete the group. Lisa Dunn noted that the society has permission to distribute, duplicate stuff starting four years ago. Dunn proposes that we go ahead with posting the proceedings papers to the website and take down any papers if there is an objection. Lisa Johnston suggests we make sure we're compiling electronic files. Ellie says that the task group will contact former editors to see who still has e files and then work forward. Although no deadline was suggested, the task group will come back with proposal for membership at large.

Larsen noted that the various society **Awards** have all been publicized. This year Jim O'Donnell produced all the award certificates so that they shared the same format and framing. Each award has a box and bubble wrap for safe shipping.

Lura Joseph updated the membership on the status of the **Archives**. We have 17 boxes taking up 13.6 cubic feet of space. There is a finding aid at the University of Illinois Archives website (http://www.library.uiuc.edu/archives/ and type in "geoscience information society.) Only a minor amount of material was submitted during last year, so officers and chairs are reminded to forward materials to Lura when cleaning out files. Lura noted that we haven't paid anything to University of Illinois at Urbana-Champaign Archives for storing our archives as we set up a deposit account. However, the deposit account is depleted and she is expecting to receive a request for additional funding. Lura is also asking for a cost estimate to reorganize our entire archives to make them more efficient for retrieval, and will submit a proposal to the executive board. Lura feels that we are losing a lot of our history, especially about members. She would like the Nominating Committee to submit copies of the candidate bios and ballots to Newsletter so this information will make it into archives. And she would like each previous officer to submit their current vita for archives. These could be sent to Lura or Ann either in paper or as an email attachment. These are voluntary submissions – the length is up to the individual. There were no objections to this proposal voiced from floor. This information will be very helpful in providing background for the distinguished service award.

Lura next reported on the **Guidebooks Committee**: There are 5 members on the committee, but some are not able to be active. There is also a need for more people to be on best guidebook committee. Louise Zipp has put together a spreadsheet of societies in her area for sending out the guidebook guidelines. Given the number of societies in all areas, the committee needs more people to help with this. Lura is working to reduce gaps between databases. Lura also noted that our own society is one of the worst for having a record of society field trips. She suggests a copy of all leaflets, flyers, and guidebooks (if any) be submitted to archives each year. She has developed a template for a field trip report to be included in proceedings so the event becomes part of our history. Suzanne, picking up on the template suggestion, recommended that we set up a forms section on GSIS website. The field trip report, reimbursement request forms, and other society business templates and forms would be readily available for member use.

Linda Zellmer reports that she and Andrea Twiss-Brooks are still working on the Earth Sciences section of Resources for College Libraries. The publisher wants annual updates for the publication and Linda and Andrea have found many changes, especially in the NOAA websites. The updates are reflected only in online version. Linda and Andrea will continue to collect new titles and incorporate them for the online file. If you see anything new or reviews for outstanding stuff, please forward the information on to either Linda or Andrea.

Linda reported that not much changed since her mid-year report on **CUAC** (Cartographic Users Advisory Council). She participated in a webinar on June 10th concerning spatial data and capturing it for preservation. (See CUAC website http://cuac.wustl.edu for presentation slides.) CUAC is working on guidelines and will include their findings in a final report. NACIS (North American Cartographic Information Society) looks like they will be out of CUAC as they are not replacing retiring members

Marie Dvorzak urged members to look at the **AGI Government Affairs Program** (GAP) report on C*ritical Needs for the 21st Century: The Role of the Geosciences* at http://www.agiweb.org/gap/trans08.html. Open access is a major issue for the GAP committee as are data archiving and institutional repositories.

OLD BUSINESS:

Technical Program Chair – Jody Bales Foote has volunteered to serve as Technical Program Chair for the 2009 conference. Suzanne distributed the draft of a charge to formalize the position of Technical Program Chair. Having the technical programs arrangements split out from the vice presidency has worked out great as it allows the vice president to focus on fundraising. Lisa Johnson, 2008 Technical Program Chair, recommends that the incoming and outgoing technical program chairs meet in person at the conference, and Lura echoed the value of tagging along with the current technical chair to learn first hand. That being the case, the President should send out a call for volunteers well in advance of the annual meeting, and the position filled before the current meeting. After a brief discussion the Charge for Technical Program Chair was adopted by a vote of the membership. The charge reads: The Technical Program Chair is a 2 year appointment. The first year will be as Chair for the annual GSIS technical program at the Geological Society of America. The Chair will identify the theme for the program in the light of the overall theme for the conference as set by GSA. The Chair will invite speakers and recruit speakers for the technical session and posters for the poster session. The Chair will moderate the technical session at the annual meeting. The second year of the appointment will be Proceedings Editor. The Proceedings Editor will also serve as mentor to the current Technical Program Chair. Previous organizers of the technical program, which was a responsibility of the Vice President prior to 2007, should also be considered as mentors.

Newsletter Co-editor: The job of producing the GSIS Newsletter can be overwhelming for one person. There is precedent for having co-editors, e.g. a managing editor and a copy editor. The co-editor position is appointed, not elected. The President will put out a call in the newsletter and on the geonetl discussion list to recruit interested volunteers.

NEW BUSINESS:

Committee structure: Our membership is shrinking but our current committee structure means we are requiring a larger percentage of members than is really feasible to serve on committees. Suzanne proposed that committee size be limited to 2-3 members maximum with exceptions to this limit being made on the basis of work to be done. For instance, the Archives Committee is fine with two members, but the Guidebook Committee needs a larger membership due to the breadth and ongoing nature of its work. General consensus from the meeting floor agreed with limiting most committees to 2-3 members. Further discussion about committee structure focused on collapsing some committees. For instance, there was general agreement that the subjects covered by the Collection Development and the EResources committees were becoming more similar. It was suggested that these committees be combined into one committee, and could possibly need more than three members. Linda Zellmer, as chair of the E-Resources Committee commented that this year's collection development and e-resources fora have very different suites of speakers. In the proposed merged committee would there still be two sessions or just one longer session? Suzanne suggested leaving that decision (one versus two sessions) up to the committee members who will determine the content of the program. However, the committee will need to coordinate closely with the conference planner (vice president) to make sure rooms are reserved and other appropriate arrangements are made. Communication is essential. A proposal from the floor suggested that the new merged committee be tried for one year, be named the Information Resources Committee, and have three committee members. The proposal was agreed upon confirming that the committee would determine the number and content of sessions to be presented at the annual conference. Suzanne will check the President's Handbook for committee descriptions and write up a committee description for the new merged structure. There was a brief discussion about committee chairs being required to attend the annual meeting. It was generally agreed that attendance at the annual meeting is not really a requirement. Linda Musser voiced the group consensus that the work of the committees is more than attending conference and that there is extra value in committee service even if one can't attend annual conference. If a chair is required as a moderator or presenter (e.g. at a session or for an award), however, and is not able to attend the conference, it is their responsibility to designate someone to perform these duties.

Subsidizing cost of abstract submissions: Patricia Yocum proposed that we subsidize the cost of submitting abstracts for GSIS members. GSA requires a fee when an author submits an abstract for a paper to be presented at one of the annual conference technical sessions. Patricia proposes that if a GSIS member submits an abstract to GSA, they could request reimbursement from GSIS. Some see this as a gesture of support for members who contribute presentations. Others thought it might be additional incentive to younger/newer members to become presenters. Discussion of the proposal included cost projections and funding sources, infrastructure for administering the reimbursements, and parameters (e.g. would this apply to invited speakers?). Patricia made the following formal motion: That for GSIS members and invited speakers, GSIS reimburses the charge GSA levies on submitting abstracts for the oral and poster sessions GSIS organizes for GSA effective for the 2009 annual meeting. The motion was amended: This is a pilot program for two years and will be re-evaluated for continuance. The amended motion was put to a vote and passed unanimously. Although not part of the formal motion, it was agreed that it is up to the individuals submitting abstracts to request the reimbursement, and a form will be put on the GSIS website for that purpose.

Newsletter distribution: A proposal to convert the Newsletter to electronic distribution only, with the exception of standing orders for paper copies and any members who do not have email addresses, was discussed and adopted at the Executive Board Meeting, October 4, 2008. By moving to e-only we can do color, more bells and whistles, and get it out faster. This is an Executive Board decision and will not be voted on by membership. The GSIS archivist will need to print out a copy for the historical files. And the membership form will need to be revised to remove the print copy option. The next question is whether or not to make the issues available on the GSIS website as they become available. We currently have a three issue embargo period. Many felt that we would not lose membership if we lifted the embargo and put up issues as published. In fact, some saw it as a recruitment tool. Of the two options proposed – 1) send out email on geonet-l that the latest issues is available, or 2) send out notification to members only – most preferred option 2). Therefore, starting with the 2009 newsletters, the Newsletter Editor will send the issue's PDF file to Jim for mounting on the GSIS website, and then email an announcement to membership. Since the notification goes out to members only, there will still be incentive for members to renew.

Auditor: Suzanne asked for a volunteer to audit our financial records. (See Bylaws, Article IX, Section 5.)

Geoscience 101 Coordinator and Task Force Members: Andrea Twiss-Brooks is resigning as coordinator of this annual pre-conference workshop. Clara McCloud has indicated her willingness to be the coordinator (but not a presenter) with Andrea's mentoring. Anyone wishing to participate in the task force is encouraged to volunteer.

OTHER COMMENTS, SUGGESTIONS, OR QUESTIONS:

AGU Publications Liaisons: Michael Noga and Patricia Yocum have advised the AGU Publications Committee for years. There will be a committee meeting later this fall which Patricia will be attending. Please contact her if you have concerns you would like her to raise at the meeting. Anyone with simultaneous user problems should also contact Patricia. AGU has launched their new Digital Library archive and institutions wishing access will need to subscribe beginning with 2009. Mary Scott mentioned that she had talked with AGU and was informed that the charge would automatically be on the bill.

When are membership fees due? By the end of March. The Secretary will be sending out renewal notices in December or January.

Is GSA going to post slides as well as abstracts for conference presentations? Suzanne and Rusty will take the question forward to GSA if an appropriate opportunity presents itself. Marie suggests we encourage GSA to go beyond simply posting slides. They should be pod casting and using other media for some presentations. Linda suggests adding this as a note to session evaluations. [Secretary's note: some sessions are available as Live Web casts at https://www.acsmeetings.org/programs/events/webcasts/]

Do we want to host slides on the GSIS website if speakers are willing to post? It was agreed that, yes, we could link session slides in the post conference portion of the website. Jim will put up presentation materials and links if you send him the files. Linda suggested making digital recordings of presentations at the collection development and e-resources fora (with presenters' permission) and posting these to the GSIS website for added value as well.

Meeting was adjourned at 12:25 PM.

Respectfully submitted, Elaine Adams, Secretary

COLLECTION DEVELOPMENT FORUM

Sunday, October 5, 2008, 2:00-5:00 pm
Hilton, Lanier Grand Ballroom B
Houston, TX

Agenda

Welcome and Introductions	Name, Chair Information Resources Committee

1. Collection Development Panel Discussion: Structure and Decision-making in Collection Development — Process, who decides on what, why, pros, cons, & recommendations.

(8-10 min presentation by each panel member followed by 30 min Q&A)	Panel Members: **John Hunter**, Science & Engineering Librarian, Fondren Library, Rice University **Lisa Dunn**, Head of Reference, Authur Lakes Library, Colorado School of Mines **Doug Jones**, Science & Engineering Librarian, Information Resources Macro-Management Team Leader, University of Arizona

2. Legacy Print and Hidden Collections: Graveyards or Gold Mines?

(15-20 min talk followed by Q&A)	**Michael Noga**, Collection Manager, Science Library, Massachusetts Institute of Technology

3. Publisher Updates: news from AAPG, GSA, and AGU — Representatives of three major geosciences publishers talk about what's new and their focus for the future

(8-10 min presentation by each followed by 10-12 min Q&A each)	**Michael Noga** will present for Geological Society of America **Beverly Molyneux,** Technical Publications Managing Editor, American Association of Petroleum Geologists **Judy Holoviak**, Deputy Executive Director and Director of Publications, American Geophysical Union

GEOSCIENCE INFORMATION SOCIETY AWARD WINNERS 2008

Presented at the GSIS Reception, Awards, and Silent Auction
Tuesday, October 7, 2008, 6-9 pm
Hilton, Lanier Grand Ballroom J
Houston, TX

Summary report by Shaun Hardy
Originally Published in *GSIS Newsletter No. 234,* October 2008

Mary B. Ansari Distinguished Service Award

Connie J. Manson
American Geological Institute, Alexandria, VA
cjm@scattercreek.com

Geology librarian Connie J. Manson of Olympia, Washington was honored by GSIS on October 7 for her service to the profession. At a ceremony held at the Geological Society of America's annual meeting in Houston, Manson was presented with the GSIS Mary B. Ansari Distinguished Service Award.

For many years Manson served as Geology Librarian at the Washington Division of Natural Resources, where she published more than one hundred bibliographies on the geology, mineral resources, urban planning, and natural hazards of the state. She also compiled several volumes of Index to Geologic and Geophysical Mapping of Washington. "Improving access to geoscience information from government agencies has been a hallmark of Connie's career," according to Patricia B. Yocum (University of Michigan), chair of the selection committee. "Connecting information with people is a core value which Connie exemplifies in her approach to her work." Prior to her work in Washington Manson worked at the Wyoming Department of Economic Planning and Development, where she published several books.

Manson served as editor of the *GSIS Newsletter* from 1986 to 2007, taking only one respite while serving as the Society's vice-president/president/past-president in 1997-1999. While in office she edited *The Costs and Values of Geoscience Information,* co-edited *Accreting the Continent's Collections,* and participated in organizing the Sixth International Conference on Geoscience Information, held in Washington, D.C. in 1998. She subsequently edited the conference proceedings, *Science Editing and Information Management,* published in 1999. In the 1990s she compiled two editions of the Society's widely-used *Directory of Geoscience Libraries, United States and Canada.* She served as the GSIS representative to the Geological Society of America's Publications Committee, among other appointments.

Commenting on Manson's award, longtime colleague Jim O'Donnell (Caltech) summarized: "Connie has always been willing to mentor and encourage new members to the profession. She is noted for the extraordinary efforts she will make to help a patron or a fellow librarian find the information they're seeking. She's been an enthusiastic and productive member of both GSIS and the profession."

Manson is currently working with the American Geological Institute on special bibliographic projects for GeoRef, the world's leading database of geoscience literature. GSIS Newsletter No. 234 October 2008

Connie J. Mason's Acceptance Speech of the 2008
Mary B. Ansair Distinguished Service Award

In 2003, in recognition of my 25th anniversary as Senior Librarian at the Washington state geological survey library, a lot of people made a big fuss. Some of my buddies at the survey conspired about me. They arranged to get plaques of appreciation from the USGS and from a group *of local researchers praising the help I'd given them over the years. (Heck, Lee Walkling even arranged to get me a congratulatory note from the current librarian at the Ballard Branch Public Library, where I started as a page in 1967.) It was all very gratifying.*

But their plotting hadn't stopped there. At the January meeting of the Northwest Geological Society, the chair of the University of Washington's Department of Earth and Space Sciences, presented me with an honorary degree! I was flabbergasted, but just kept saying, "I accept! I accept!"

But that "honorary degree" is a total fake.

You see, there was one teeny, tiny, little problem: Historically, the University of Washington did not bestow honorary degrees. From 1894 to 2002, the UW bestowed exactly 1 honorary degree (to a WWI general). Then in 2002, the state legislature had a change of heart and decided the UW should give honorary degrees. So, the UW does now, but only to very very accomplished and important people. In 2002, the UW gave honorary degrees to Desmond Tutu and to Madeleine Albright. In 2008, they gave one to the Dalai Lama– You get the picture.

As I later learned, for my honorary degree, the chair of the Dept of Earth and Space Sciences had to get special permission from the Dean of the College of Arts and Sciences. And my honorary degree is not a Bachelors, Masters, nor PhD. It is simply an "honorary degree in geology" and it's signed only by the chair of the Dept of Earth and Space Sciences. But on the drive home, I was just bouncing– They gave me an honorary degree! They gave me an honorary degree! The degree is a total fake. I've always known that, and I've never cared. It was given in good faith as an honor in appreciation of the work I'd done for all the folks in Washington over the years and I gladly accepted it as such. It was the highest honor I thought I'd ever receive, that anyone ever could... And then you folks go and play "Can You Top This?

The Mary B. Ansari Distinguished Service Award recognizes and honors "significant contributions to the geoscience information profession" The previous honorees are all giants in our profession – Charlotte

Derksen, the legendary emeritus head of Stanford's Branner Library; Dedy Ward, a founding father of

GSIS, and John Mulvihill, the guiding force behind GeoRef. I honestly don't believe I'm in their league. But if you think I am, I can't stop you. And so, I humbly and happily accept this award. But, unlike my honorary "degree in geology", this one isn't a fake. But I'm not giving either one of them back! And now, for all time Charlotte, Dedy, John, and I will always be "Ansarians."

GEOSCIENCE INFORMATION SOCIETY AWARD WINNERS 2008, CONT.

Mary B. Ansari Reference Work Award

Lucy-Ann McFadden
University of Maryland
mcfadden@umd.edu

Paul R. Weissman, Torrence V. Johnson
Jet Propulsion Laboratory, California Institute of Technology
paul.r.weissman@jpl.nasa.gov, torrence.v.johnson@jpl.nasa.gov

Editors, for their book *Encyclopedia of the Solar System,* 2nd edition, Elsevier/Academic Press, 2007.

Published by Elsevier/Academic Press in 2007, the *Encyclopedia* is "probably the definitive single-volume work on the solar system," according to Angelique Jenks-Brown, who chaired the selection committee. "The illustrations and overall quality are outstanding. With few books like this available, this text is essential to an academic collection." Torrence Johnson accepted the prize on behalf of the 56 specialists who contributed to the *Encyclopedia*. The Ansari Award has been presented by GSIS annually since 1988 and honors an outstanding reference work in the field of geoscience information published during the previous three years.

Best Website Award

Environmental Information Coalition of the National Council for Science and the Environment (NCSE)
Maggy Surface, Earth Portal Program Coordinator
msurface@ncseonline.org

For their website: "*Encyclopedia of Earth (EoE)*"
http://www.eoearth.org

Encyclopedia of Earth (EoE) is an open-access electronic resource with thousands of authoritative, objective articles on environment, climate, and general earth sciences. The *Encyclopedia* is a project of the Environmental Information Coalition of the National Council for Science and the Environment (NCSE), a non-profit organization based in Washington, D.C. NCSE's executive director, Peter Saundry, accepted the award at the Geological Society of America annual meeting in Houston on October 7. Saundry stated that "our goal is to make the *Encyclopedia of Earth* the largest reliable information resource on the environment in history."

EoE consists of original contributions by individuals who are expert in their fields as evidenced by their research, teaching, publishing, and public outreach, and of content derived from partner organizations and 0other open content sources. Articles are written in non-technical language and stress the interaction between society and the Earth's physical and biological systems. Quality is maintained through a strict editorial process. The Best Website Award has been presented by GSIS annually since 2002 to a site which exemplifies outstanding standards of content, design, organization, and overall site effectiveness.

In selecting *EoE*, the award committee noted the *Encyclopedia* "offers the educated lay person so much that they can miss by trying to wade through mountains of important but dry [and] confusing journal articles." They praised its design concept, which strikes a balance between predetermined editorial content and a free-lance Wikipedia style. *EoE* is accessible online at www.eoearth.org.

GEOSCIENCE INFORMATION SOCIETY AWARD WINNERS 2008, CONT.

Best Paper Award

Lura E. Joseph
University of Illinois at Urbana-Champaign
luraj@uiuc.edu

For her paper "Comparison of Retrieval Performance of Eleven Online Indexes Containing Information Related to Quaternary Research, an Interdisciplinary Science" published in *Reference & User Services Quarterly,* vol. 47, no. 1, pp. 56- 75, 2007.

Lura E. Joseph is the university's Geology and Digital Projects Librarian and Associate Professor of Library Administration. In presenting the award, selection committee chair Carol La Russa stated "The Committee was impressed with the way Joseph demonstrated the benefits of searching multiple databases to achieve comprehensive results for this multi-disciplinary topic." While a small number of databases provide most of the retrievals for quaternary science, Joseph's research showed that access to other databases is necessary for their unique content. "Having such evidence is very useful in this time of budget cuts and pressures to limit library subscriptions to databases," La Russa added.

Best Guidebook Award

Jon D. Inners, Robert C. Smith II
Pennsylvania Geological Survey, retired

Roger J. Cuffey
Pennsylvania State University
rjc7@psu.edu

And others for their guidebook *Rifts, Diabase, and the Topographic "Fishhook": Terrain and Military Geology of the Battle of Gettysburg—July 1-2, 1863,* Pennsylvania Geological Survey Open-File Report 06-02.

The work was revised and expanded from a 2004 guidebook of the same title and authorship by Jon D. Inners, Roger J. Cuffey, Robert C. Smith, II, John C. Neubaum, Richard C. Keen, Gary M. Fleeger, Lewis Butts, Helen L. Delano, Victor A. Newbaum, and Richard H. Howe. The guidebook examines the geology and geography of the Gettysburg region and the role they played in the military aspects of the battle. In announcing the selection, Guidebook Committee awards chair Jody Bales Foote cited the publication's blending of history with geology. "It's an example of how a geological publication can be used to promote an interest in the geosciences for the general public," Foote observed. The Committee commended the work's color photographs, detailed road load, and online format. They noted it conformed to all the requirements established in the GSIS *Guidelines for Authors, Editors, and Publishers of Geologic Field Trip Guidebooks.*

GEOSCIENCE INFORMATION SOCIETY KEYNOTE ADDRESS 2008

Keynote speaker at the GSIS Luncheon
Tuesday, October 7, 2008, 12-1:30 pm
Hilton, 337AB
Houston, TX

Summary report by Adonna Fleming
Originally Published in *GSIS Newsletter No. 234,* October 2008

Dr. Sharon Mosher
Chair of the Department of Geological Sciences
University of Texas at Austin

GSIS keynote speaker Dr. Sharon Mosher gave her perspective on where information behaviors are headed, during her talk at the GSIS annual luncheon in Houston, October 7th. Mosher is Chair of the Department of Geological Sciences, University of Texas at Austin. Her perspectives on the information gathering behavior of students and researchers comes from her experience as a department head, GSA president, one of the founders of GeoScience World, and as a working researcher herself. Discussing science journals, Mosher said the trend to publish in electronic format will grow, and that the printed journal would continue to diminish. She listed the cost of maintaining a paper journal as one of the factors for their loss in popularity, as well as the inability to provide interactive components such as linking, animations, and 3D slicing. It is essential for electronic journals to have reference linking, the ability to provide a copy of an article in text-like form, color, online archives, and accessibility from outside the library. In addition, they should link to animations; movies etc., Mosher continued. Mosher stated the first books to go to electronic format will be monographic serials; those that are a collection of articles. Then ‘real books’ such as the Lyell collection will follow. She stated that maps will need to be interactive, and have the ability to download and print either all or a section of the map. New journals will be published in specialty areas as science changes, and the current trend is towards interdisciplinary journals such as *Lithosphere*. Publishers like to introduce new journals in aggregate databases because they insure an instant audience, and are less of a risk to the publisher and author, she stated. Over time, all journal archives will need to be accessible electronically, otherwise the archives will not be used, Mosher continued. Aggregates will continue to be the best packaging of electronic journals, Mosher stated. As budgets continue to shrink, small or specialty libraries want the inexpensive all-in-one package, such as GeoScience World, she continued. The most successful aggregates will offer different types of materials and formats. For example, field guides, maps, books, and regional/ second tier journals, she concluded. Open access will continue to be an important issue, Mosher stated. The popularity of personalized home pages will grow she said. The pages will provide the scientist with access to selected journal articles, the capability to browse the table-of-contents of favorite journals, and reviews of specific articles, in addition to the weather and news, Mosher said. The future will see the development of personal databases of articles with linking and simplified searching, text alerts on handhelds, less browsing of individual journals and a decrease in journal identity. The subject of the article will be the focus, not the journal it is published in, Mosher said. Wikis will continue to grow as well as, online science chats and ‘most read’ indexing, she concluded. In conclusion, Mosher stated, libraries will become a quiet place to study, help centers where librarians teach users how to access information, social gathering places, and specialty libraries will have close associations with museums.

GEOSCIENCE JOURNAL PRICES – compiled by Michael M. Noga

Journal	2002	2003	2004	2005	2006	2007	2008	2009	2006/2007	2007/2008	2008/2009
AAPG Bulletin	280	280	290	305	320	320	354	350	0%	11%	-1%
AAPG Explorer	63	63	63	63	63	63	69	63	0%	10%	-9%
Acta Oceanologica Sinica	420	420	420	420	420	420	425	420	0%	1%	-1%
Alcheringa	70	76	98	99	112	134	165	173	20%	23%	5%
American Journal of Science	175	175	175	175	185	185	187	185	0%	1%	-1%
American Mineralogist	530	580	625	650	675	725	775	825	7%	7%	6%
Annales de Paleontologie	485	519	553	641	595	634	672	726	7%	6%	8%
Annales Geophysicae	990	1187	2282	2474	2458	2704	2926	2893	10%	8%	-1%
Annual Review of Earth Planetary Sci	165	180	189	200	205	216	225	234	5%	4%	4%
Applied Geochemistry	877	942	1083	1140	1200	1263	1348	1439	5%	7%	7%
Arctic Antarctic and Alpine Research	125	140	140	149	149	195	197	230	31%	1%	17%
Atlantic Geology	60	60	70	75	75	75	75	75	0%	0%	0%
Australian Journal of Earth Sci	690	760	836	965	1032	1238	1330	1449	20%	7%	9%
Basin Research	575	719	889	1037	1109	1181	1264	1287	6%	7%	2%
Biogeochemistry	1427	1539	1654	1818	1918	2138	2320	2524	11%	9%	9%
Bulletin of Canadian Petroleum Geol	88	140	140	140	140	127	140	140	-9%	10%	0%
Bulletin of Eng Geol & the Envt	289	329	368	408	448	478	605	647	7%	27%	7%
Bulletin of the Seismol Soc of Am	350	360	390	420	450	500	540	565	11%	8%	5%
Bulletin of Volcanology	786	829	1107	1245	1358	1555	1774	1873	15%	14%	6%
Canadian Journal of Earth Sciences	701	773	846	909	936	1022	1115	1215	9%	9%	9%
CATENA	1043	1121	1289	1357	1428	1503	1604	1712	5%	7%	7%
Chemical Geology	3168	3406	3627	3817	4017	4228	4482	4751	5%	6%	6%
Chemie der Erde	244	313	344	353	372	392	451	480	5%	15%	6%
Clays and Clay Minerals	220	235	235	250	265	275	278	330	4%	1%	19%
Computers & Geosciences	1777	1910	2034	2141	2253	2371	2531	2702	5%	7%	7%
Continental Shelf Research	1751	1882	2004	2109	2220	2337	2495	2663	5%	7%	7%
Contrib of Mineral & Petrology	3017	3279	3453	3828	3949	4262	4624	4810	8%	8%	4%
Coral Reefs	475	515	750	958	1038	1122	1217	1324	8%	8%	9%
Cretaceous Research	774	825	879	925	974	1025	1094	1168	5%	7%	7%

GEOSCIENCE JOURNAL PRICES 2008, CONT

Deep Sea Research Pts. I & II	4068	4373	4657	4901	5158	5429	5772	6137	5%	6%	6%
Doklady Earth Science Sections	3455	3766	4652	4331	4588	4932	5302	5939	7%	8%	12%
Earth & Planetary Science Letters	3043	3367	3586	3774	3972	4181	4432	4698	5%	6%	6%
Earth Moon and Planets	831	873	938	1015	1068	1100	1121	1194	3%	2%	7%
Earth-Science Reviews	1009	1160	1334	1404	1478	1556	1632	1773	5%	5%	9%
Ecosystems	315	386	481	498	598	643	691	751	8%	7%	9%
Engineering Geology	1298	1493	1717	1807	1902	2002	2137	2281	5%	7%	7%
Environmental & Eng Geoscience	125	125	200	175	200	200	170	170	0%	-15%	0%
Environmental Fluid Mechanics	180	180	198	198	198	228	247	264	15%	8%	7%
Environmental Geology	1297	1509	1849	2029	2149	2482	2826	3449	15%	14%	22%
Eos	440	440	440	450	465	482	513	543	4%	6%	6%
Episodes	24	24	24	24	24	24	24	24	0%	0%	0%
Estuarine Coastal and Shelf Science	1650	1890	2174	2288	2408	2534	2566	2888	5%	1%	13%
Eurasian Soil Science	2605	2839	3052	3266	3476	3996	3997	4477	15%	0%	12%
Facies	71	79	439	438	438	475	516	552	8%	9%	7%
Geochemistry International	2940	3234	3485	3729	3948	4316	4646	5198	9%	8%	12%
Geochimica et Cosmochim Acta	1869	2149	2471	2601	2738	2882	3077	3262	5%	7%	6%
Geoderma	2020	2172	2313	2434	2562	2697	2879	3073	5%	7%	7%
Geodinamica Acta	305	328	349	457	436	550	564	587	26%	3%	4%
Geoforum	816	877	1009	1062	1118	1177	1256	1341	5%	7%	7%
Geology of Ore Deposits	1165	1270	1359	1454	1538	1655	1779	1993	8%	7%	12%
Geology	450	475	525	560	600	650	700	700	8%	8%	0%
Geomagnetism and Aeronomy	910	987	1056	1130	1195	1284	1380	1643	7%	7%	19%
Geo-Marine Letters	539	569	619	938	998	1065	1155	1235	7%	8%	7%
Geomorphology	1666	1791	1907	2007	2112	2223	2373	2533	5%	7%	7%
Geophysical Research Letters	1405	1405	1550	1800	2100	2650	3200	3800	26%	21%	19%
Geotectonics	710	770	824	890	938	1008	1084	1214	7%	8%	12%
Geothermics	981	1055	1124	1183	1245	1310	1398	1432	5%	7%	2%
Global and Planetary Change	1280	1376	1465	1542	1623	1708	1758	1946	5%	3%	11%
Global Biogeochemical Cycles	528	528	580	598	604	604	635	750	0%	5%	18%
Grana	249	270	293	315	420	430	459	489	2%	7%	7%
Ground Water	260	260	280	295	395	435	474	512	10%	9%	8%
Grundwasser	119	139	159	159	175	198	220	235	13%	11%	7%

GSA Abstracts with Programs	120	135	117	132	132	130	150	150	-2%	15%	0%
GSA Bulletin	450	475	525	560	600	650	700	700	8%	8%	0%
Holocene	723	886	961	1105	1326	1500	1637	1784	13%	9%	9%
Hydrogeology Journal	415	444	514	615	778	938	1018	1131	21%	9%	11%
Icarus	2663	2863	3049	3209	3377	3554	3732	3956	5%	5%	6%
International J of Rock Mech/Min Sci	2153	2314	2464	2593	2729	2872	3066	3250	5%	7%	6%
International Journ of Coal Geology	1648	1771	1886	1985	2089	2199	2347	2505	5%	7%	7%
International J of Geosciences	709	769	915	988	1048	1150	1260	1440	10%	10%	14%
Izvestiya Atmos & Oceanic Physics	1155	1247	1247	1347	1425	1532	1647	1845	8%	8%	12%
Izvestiya Physics of Solid Earth	1040	1123	1329	1286	1358	1458	1567	1755	7%	7%	12%
Journal of African Earth Sciences	1926	2070	2205	2321	2443	2571	2700	2882	5%	5%	7%
Journal of Applied Geophysics	949	1020	1086	1143	1143	1203	1284	1371	5%	7%	7%
Journal of Asian Earh Sciences	957	1028	1095	1152	1212	1276	1362	1454	5%	7%	7%
Journal of Atmos and Solar-Terr Phys	2767	2975	3168	3334	3509	3693	3915	4150	5%	6%	6%
Journal of Geochemical Exploration	1192	1281	1364	1436	1436	1511	1613	1722	5%	7%	7%
Journal of Geodesy	823	839	939	1055	1099	1192	1293	1406	8%	8%	9%
Journal of Geology	124	136	149	167	182	175	182	191	-4%	4%	5%
Journal of Geodynamics	1326	1426	1519	1599	1683	1771	1891	2019	5%	7%	7%
Journal of Geophysical Research	6400	6400	6600	6905	7700	8580	9800	10580	11%	14%	8%
Journal of Hydrology	4287	4609	4909	5167	5438	5723	6066	6430	5%	6%	6%
Journal of Micropalaeontology	155	155	185	205	230	243	259	277	6%	7%	7%
Journal of Molluscan Studies	366	392	412	420	454	490	546	620	8%	11%	14%
Journal of Paleontology	128	145	156	165	248	275	300	330	11%	9%	10%
Journal of Petrology	875	965	1052	1148	1278	1341	1433	1672	5%	7%	17%
Journal of South Amer Earth Sci	798	858	914	962	1013	1066	1138	1215	5%	7%	7%
Journal of Structural Geology	1266	1361	1449	1525	1605	1689	1803	1925	5%	7%	7%
Journal of the Geol Soc of London	824	885	985	1089	1195	1322	1458	1570	11%	10%	8%
Journal of Volcanol & Geotherm Res	2400	2580	2748	2892	3044	3204	3396	3600	5%	6%	6%
Lithos	1146	1232	1417	1491	1569	2122	1762	1881	35%	-17%	7%
Marine and Petroleum Geology	1612	1732	1845	1942	2044	2151	2296	2450	5%	7%	7%
Marine Chemistry	1779	1912	2036	2143	2256	2374	2534	2705	5%	7%	7%
Marine Geology	2948	3169	3375	3552	3738	3934	4170	4420	5%	6%	6%
Marine Geophysical Researches	688	500	530	578	578	642	697	745	11%	9%	7%

GEOSCIENCE JOURNAL PRICES 2008, CONT

Marine Micropaleontology	1041	1119	1287	1355	1426	1501	1602	1710	5%	7%	7%
Marine Pollution Bulletin	1003	1079	1149	1321	1390	1463	1562	1667	5%	7%	7%
Mathematical Geosciences	780	819	880	968	1038	1092	1185	1290	5%	9%	9%
Meteoritics and Planetary Science	830	830	830	900	950	950	1100	1100	0%	16%	0%
Mineralium Deposita	1045	1140	1369	1478	1558	1625	1757	1909	4%	8%	9%
Mineralogy and Petrology	955	1022	1109	1225	1325	1455	1556	1693	10%	7%	9%
Minerals Engineering	1094	1176	1252	1318	1387	1460	1559	1664	5%	7%	7%
Natural Hazards	784	847	909	1125	1188	1380	1470	1629	16%	7%	11%
New Zealand J of Geol & Geoph	225	305	305	320	320	340	340	340	6%	0%	0%
New Zealand J of Mar & Freshwater Res	225	305	305	320	320	340	340	340	6%	0%	0%
Nonlinear Processes in Geophysics	220	340	433	360	520	552	596	845	6%	8%	42%
Oceanology of Russian Acad Science	1034	1127	1127	1240	1298	1398	1505	1686	8%	8%	12%
Ore Geology Reviews	768	826	880	926	975	1026	1095	1169	5%	7%	7%
Organic Geochemistry	2513	2701	2877	3028	3187	3354	3555	3768	5%	6%	6%
Origins of Life & Evol of Biosphere	462	498	537	598	648	712	772	826	10%	8%	7%
Palaeo, Palaeo, Palaeo	3120	3353	3571	3758	3955	4163	4413	4678	5%	6%	6%
Palaontologische Zeitschrift	32	38	46	72	63	114	212	447	81%	86%	111%
Paleobiology	80	90	96	100	150	165	180	200	10%	9%	11%
Paleoceanography	358	395	415	458	490	490	530	675	0%	8%	27%
Paleontological Journal	3315	3580	3831	4099	4338	4665	4760	5619	8%	2%	18%
Petroleum Chemistry	3379	3679	3955	4232	4503	5162	5176	5797	15%	0%	12%
Petrology	1165	1270	1365	1474	1558	1675	1800	2016	8%	7%	12%
Physical Geography	339	349	366	385	399	435	465	495	9%	7%	6%
Physics and Chem of the Earth	2000	2150	2290	2410	2537	2670	2850	3042	5%	7%	7%
Physics and Chemistry of Minerals	1679	1797	1920	2065	2242	2445	2653	2797	9%	9%	5%
Physics of the Earth & Planet Inter	2181	2345	2497	2628	2766	2911	3107	3293	5%	7%	6%
Planetary and Space Science	2655	2854	3040	3200	3368	3545	3758	3983	5%	6%	6%
Precambrian Research	2164	2327	2478	2608	2745	2889	3084	3269	5%	7%	6%
Proceedings of Geologists Assoc	230	246	275	309	335	326	350	373	-3%	7%	7%
Proceedings of Yorkshire Geo Soc	147	147	175	194	215	223	223	239	4%	0%	7%
Progress in Oceanography	2090	2246	2392	2518	2650	2789	2977	3178	5%	7%	7%
Progress in Physical Geography	371	403	437	465	581	772	852	917	33%	10%	8%
Pure and Applied Geophysics	2295	2456	2739	2898	2998	3145	3366	3624	5%	7%	8%

Quarterly J of Eng Geo & Hydrogeo	413	412	478	555	600	670	738	796	12%	10%	8%
Quaternary International	844	908	965	1018	1071	1127	1183	1254	5%	5%	6%
Quaternary Research	580	624	665	702	739	778	821	876	5%	6%	7%
Quaternary Science Reviews	1505	1618	1723	1813	1908	2028	2144	2289	6%	6%	7%
Remote Sensing of Environment	2180	2344	2496	2627	2765	2910	3106	3292	5%	7%	6%
Review of Palaeobotany & Palynology	1836	1974	2102	2212	2328	2450	2615	2792	5%	7%	7%
Reviews of Geophysics	300	300	300	309	309	280	300	376	-9%	7%	25%
Rock Mech and Rock Eng	320	395	485	534	525	620	798	877	18%	29%	10%
Scottish Journal of Geology	182	182	215	244	260	272	290	310	5%	7%	7%
Sedimentary Geology	2500	2688	2863	3013	3171	3337	3537	3749	5%	6%	6%
Seismological Research Letters	108	115	125	135	140	145	150	150	4%	3%	0%
Shale Shaker	30	30	30	30	30	30	30	30	0%	0%	0%
Stratigraphy and Geological Correl.	1165	1270	1365	1474	1562	1678	1806	2023	7%	8%	12%
Surveys in Geophysics	557	602	647	708	745	815	884	945	9%	8%	7%
Swiss Journal of Earth Sciences	635	679	761	768	788	838	910	964	6%	9%	6%
Tectonics	528	528	550	620	650	650	684	684	0%	5%	0%
Tectonophysics	4092	4399	4685	4931	5190	5462	5790	6137	5%	6%	6%
Water Research	3963	4260	4537	4775	5026	5290	5528	5777	5%	4%	5%
Water Resources Research	980	980	1090	1200	1300	1300	1450	1580	0%	12%	9%
Average price change (title) =									**8%**	**8%**	**8%**
Average price change (overall pool) =									7%	7%	8%

Note: The average price change of the overall pool of journals measures the increase in funds needed to purchase this particular pool of journals. This measure dampens the effect of a specific journal.

AUTHOR INDEX