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Maps and Spatial Information:
Changes in the Map Library

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I'd like to thank you for inviting me to speak to you this morning. Opening a meeting of this type is a daunting task; one that I take very seriously. An opening talk should stimulate and excite. It should introduce and invite. It should also be provocative and challenge comfortable ideas. I hope to present you with all these, but I will also remember that we are librarians, and presumably we did not become librarians in order to be either stimulating, exciting, provocative or even, perhaps, inviting.

Like many of you, I'm a fairly solitary worker, and as I began preparing for this talk, I wondered what kind of message I could give you that might have some value as we go through this week's exciting schedule. I've decided to talk from my strength; who I am, a librarian, and what I'm doing, dealing with the changes in information technology. So, forgive me if I give a personal understanding of the situation, and suggest that it can be a model for change. We are map librarians, and like it or not, we are in the forefront of library information technology.

This morning I will briefly ground the changes in our discipline, geographic information, to changes in our shared medium, maps, to the history of printing. I will then posit the notion that our shared mission as librarians is to collect, describe and make accessible geographic or spatial information. That mission is the same for digital spatial information as it is for paper geographic information. Finally I will offer some examples of change.

My area of interest is not the history of cartography. The University of Connecticut's Homer Babbidge Library's collection is not rich in that subject. It is not an area of study at that university. Before I came to the University, however, I worked at the United States Library of Congress Geography and Map Division for five years, and while there had plenty of opportunities to study and discuss the evolution of cartography and to handle exemplars of the cartographer's skill.

I continue to be impressed by geographic information's dependence on the medium, and how print technology has advanced to keep pace with information-gathering technology. Hachuring evolved to contour lines. Vegetative symbology

became colour. Difficult and expensive updates on copper plate were performed more quickly with lithographic technology. At the same time, maps have proliferated in libraries as print distribution has increased. Though procuring maps can be difficult, it is possible. Facsimile print technology allows scholars the ability to study good copies of the originals. Opening trade channels have allowed my library to buy current maps of, for example, Poland. Connecticut business men doing business in Poland arrive with a understanding of the geography. This evolution of the expanding map collection has been described as the "greening" of map libraries. Over the past fifty years we have seen map collections grow and mature.

My library, the Map and Geographic Information Center at the University of Connecticut, is an example of the "greening of map libraries in America_. That is Dr. Walter Ristow's label for the growth of map libraries in the United States after the Second World War. It parallels the growth of public higher education in America. My library is a state university library. The University teaches 20,000 students on its campus in the rural community of Storrs. Storrs is about 1½ hours from Boston and 2 hours from New York. The map library is staffed by only one full time professional, ME! I get some help from about 1½ full time equivalent student employees. The map library serves not only the university community, but also the spatial information needs of the people of the state of Connecticut. It can be a busy place. I tell you this so you can see the reality of my library, and not support any fantasies that it is either abundantly funded or staffed.

Right now, while I am here speaking to you, the library is in the hands of the newly trained, "don't-know-much-about-libraries", and "less-about-maps". Poor, poor hands, indeed!

The map library houses more than 150,000 sheets of maps and charts, over 25,000 air photos and 2,000 books and atlases. It is a moderately sized collection for the United States. After World   War II, some 250 libraries were offered extensive collections of topographic maps from the U.S. Army Map Service. These collections seeded the idea of large map collections in libraries. The government's Federal Depository Library Program, a programme to distribute government publications free to the citizenry of the United States, continued the growth of the map collections by depositing an average of 5,000 sheets a year in libraries. Lately, the number of CD-ROMs has been growing. These are the lithographs of the future. The CD-ROM in America is democratising spatial information at the end of the 20th century in the same way offset lithography did at the beginning of the century. As the amount and detail of information has grown, the U.S. Geological Survey is developing technologies of distribution. We have reached the point in spatial information evolution where the amount of spatial information available outstrips the ability to represent it cartographically.

These maps of the Tolland County in Connecticut show a small percentage of the spatial information available for the region in cartographic representation.

Difficult and expensive updates on lithography are performed more quickly computer screen redraw rates and plotters and printers. At the same time, digital spatial information has NOT proliferated in libraries because libraries have not been ready for the transfer in technology and the print distribution has decreased because printing multiple copies is costlier than plotting a few copies for elite decision makers. Though procuring print maps can be difficult, it is possible; procuring print files, or image files can be next to impossible.

I have really just skimmed the surface of the impact of print technology on cartographic representation; and data collection technology on innovations in map printing technology and map collections in libraries. It is only important, aside from my scholarly interests, because libraries are the depositories for print information. As librarians it behoves us to keep an eye on the publishing community as much as we do the user community. I see the publishing community limiting map output, and, in the United States, increasing the digital output. I see a user sector hungry for spatial data, both digital and paper, as conventional map, of course; but also as tables, and computer reports.

So, how do we deal with these map *things*? These map *wanna-bes*? These map *gonna-bes*? I maintain that as librarians we do three things.... just three.

We collect information for use by a community, we describe that information in a catalogue and we make that information accessible. That's it. Let me speak from my experience at the Map and Geographic Information Center on these three areas.

At the map library I have written a collection development policy which reflects the research and teaching interests of the faculty, staff and students at the University of Connecticut. The collection development policy helps me prioritise my spending strategy. Obviously, Connecticut is a first priority.

For paper maps I collect maps through my federal and state depository programmes. I get maps of towns and local areas by asking, or by picking them up. I buy maps, such as the maps of Poland at 1:100,000. I store them, index them and circulate them.

For digital material it is not as straight forward. The distribution facilities in my state and country for paper maps have been developed over decades of discussion, legislation, co-operation and coercion. Digital material is only just beginning to find its way into the distribution process. From the federal government is a steady flow of data on CD-ROM and more recently on the Internet. These data follow very clearly defined federal mandates for the democratisation of information. From the states the situation is not as clearly defined. Only recently has the Department of Environmental Protection, the most data-rich state agency, deposited data in the map library. That deposit was a tentative one of 150 megabytes. There are several hundred megabytes waiting to be uploaded on the map library's fileserver.

It really is the FILESERVER which makes storing the data in the map library so attractive. The fact that it is a library doesn't really matter. As interest in spatial data has grown, users have pressed the data producers for access. The data producers' main mission is to produce, not to collect, or catalogue or make accessible. The agency has become a bottle-neck and that is a bad thing for a bureaucracy to be in America. In the United States, the people own the information: it is in the public domain. Free access to information is seen as a fundamental freedom. So the agency shifted the responsibility of distributing the information to the library. It becomes an economic imperative.

In many ways what comes into the library drives collection development, but I have to say that with digital material I have been actively pursuing the state agencies, as I will pursue the local governments as they begin to produce spatial data. Building collections is a key component of library services and without clear guidelines and goals it is up to the librarian to develop them.

What is a fileserver and why is it in the map library? The fileserver looks like a relatively passive computer. It is a big box that sits in an out-of-the-way-corner of the map collection room. In fact, it sits between the horizontal atlas shelving and hydrographic chart cases. But looks are deceiving. It hides 1.2 gigabytes of storage and serves up to ten users at a time. Our server is called MAGIC, for Map and Geographic Information Center. It can be accessed from all over the campus as an interactive reference tool and as a research collection of spatial data of Connecticut. It can be accessed using a software programme, called FTP, from Zürich. It is a virtual map shelf, and the data is arranged on that shelf using a modified Library of Congress schedule G classification scheme. Later in the week I hope to have a chance to welcome you to MAGIC.

The mission of the library is to create sophisticated and standardised catalogues or finding aids. We in the States use USMARC to catalogue. The catalogue record is entered into OCLC and our on-line public access catalogue, HOMER. Cataloguing maps has been a controversial issue for too long. The Map and Geography Roundtable of the American Association spends a lot of time teaching non-map librarians how to catalogue maps. Perhaps UNIMARC will resolve some of these issues. In any event, map librarians are not generally happy with text-based catalogues of maps, but it has been the only game in town.

Data is handled in the same way that maps, or books or journals or sound recordings are at my library. The clear attempt is to normalise this oddball. I am using the USMARC computer files format with Library of Congress schedule G scheme for classification.

I suspect that over time GIS and other spatial data handling techniques will allow us to run parallel catalogues that provide for graphical spatial queries. I expect that in time we will be working with spatial metadata, an emerging technique for describing large numeric databases which, when sorted, annotated and printed, become maps, images or reports. I also anticipate a time when

librarians will be providing the spatial metadata for the data producer. Nobody, but nobody describes material as well as libraries. In any event, the catalogue description that will evolve will have the same Janus-like quality as conventional bibliographic control/bibliographic access, that is, the descriptive record will provide control of the spatial data and access to the spatial data. We need to keep a sharp eye out for developments in database management systems.

All this work to collect and describe, and finally provide access to the material. Most users see this as the only component in our mission, overlooking the getting and describing. A research library should be able to answer any question, at any time. Ironically, good libraries are rarely noticed, it is only the bad ones, when the user has to work very hard to get the material. Is the map in the library, or checked out; when are the hours, how can copies be made? These are all problems of the paper map library. Access to paper material is limited by space and time. Only one person, at one place at one time can use the map.

The digital collection in the virtual map library is not limited by those constraints. It has its own constraints, of course, but several users can share material, from several places simultaneously. We can log on from Zürich while the data is being used in Storrs. The Virtual Map Library, housed on the MAGIC Fileserver, is accessible from ten places at once, a limitation applied by the network software. It exists in the virtual or cyber space of the Network. The Network is a series of collections connected by various telecommunications devices. The InterNet is part of the Network.

There are several constraints of the Virtual Map Library. As we gain experience and study the phenomena, librarians will be able to develop strategies for dealing with these constraints. As I see them now they are user abilities, network abilities and fiscal abilities.

User ability, or literacy, is dependent on not only the knowledge and intelligence of the user, but their hardware and software. Without a computer, the user cannot "get at" the data. Without software, the user cannot "do anything" with the data. So, with digital data, where does the access start? Many of my colleagues believe that we should simply supply the data, and the user is responsible for the software. I feel there is a role for the library to supply the software as well, at least for the emerging user. MAGIC supplies a number of GIS and computer aided programmes. There are two licensed seats of MapInfo for Windows, five seats of MapInfo for DOS and two seats of IDRISI. In addition, there are ten seats of ArcView to provide 1990 cencus data for Connecticut. I expcect that as the user community develops, they will begin to purchase their own copies of the programmes rather than compete for the limited seats on MAGIC... I hope. Programme support is difficult and uses a lot of network resources.

Access to the data and programmes is dependent on the network's ability to readily transfer large datasets. Because the University's network does not

support graphic file transfer particularly well, MAGIC relies on batch transfer rather than real time. So I have zipped the files and expect the user to down load the data onto their machine. This accomplishes a few things. Zipping files is a term which means to compress the data into a smaller packet. In this case it is compressing a number of files into one very dense file. It conserves space on my storage drive, by about 50%. It allows for more effective use of a network that is still emerging on our campus. Perhaps the most subtle accomplishment, however, is that it forces the user to take ownership and responsibility of the data. One of my issues is that I want to build an independent client group. I really want them to use the data on their own scholar's workstations. I want them to buy and maintain their own machines. I don't want to turn into a computer lab manager. This seems like a good strategy for now, but I will monitor it carefully as the network capabilities develop.

Here's the rub. How do we pay for all this? Well, not easily. Here are some of my strategies. Limit the cost to the library missions, collection, description and access. I put the data on a fileserver, transferring the burden of manipulating the data to the user. Work with software companies. I have attained a lot of software by selling the influential role of libraries as information distributors. ArcInfo has donated hundreds of copies of ArcView and ArcData to American research libraries. Canadian research libraries are getting theirs this year. Develop a similar programme in Europe. ESRI is a champion of spatial information sharing.

I hope I have given you a foundation, a framework, for this conference. Later I hope I can sit down at a terminal and show you some of this; take you to my virtual map library. If the technology co-operates. I look forward to joining with you this week; the papers sound stimulating, the company looks gemülich (my daughter says "angenehm"); and the planning has been good. We have a rare opportunity here, we are map librarians, leaders of technology in the library community.