Perspectives on Map Cataloging and Classification

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Map Cataloging in the United States: Current Status

DESPITE A RAPID INCREASE in the level of automated bibliographic control of the map during the past ten years, the current level and extent of control for cartographic materials in the United States is *not* adequate in providing access to the nation's resources in this area. This assessment is based on the following premises:

1. The retrospective collections of the major U.S. government map libraries, including those in the Library of Congress (LC), the National Archives and the U.S. Geological Survey, have not been cataloged. Although the contents of these collections have been partially covered by bibliographies and other finding aids, the lack of cataloging means that most of the maps in these collections are, in effect, "lost" to all users who do not have direct access to the respective collections.
2. Although some small, specialized map libraries have cataloged their collections, e.g., the University of Illinois Geology Library,[1] the cataloging information is not directly available to reference librarians or researchers in other institutions.
3. Except for a brief period from 1953 to 1955, maps have never been included, on a systematic basis, in the LC-produced *National Union Catalog*.

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4. The coverage of the automated systems active in controlling biblio-
graphic information for cartographic materials is not comprehensive
for either current or retrospective maps. Also, the automated systems
are not designed to include "union catalog" information indicating
alternative locations or availability.
5. Maps published in, or collected with, monographs and journals
remain an underused, often unavailable resource in the map library
environment. Maps in journals are often completely inaccessible,
while maps in monographs are usually available only in an indirect
manner through the collation of a monograph record.

The primary reason the map format has received inadequate and
unequal levels of bibliographic control in both general and specialized
library environments seems to have been "that librarians have...too
little understanding of maps to give them the attention they deserve as
sources of information...."[2] Because librarians have not recognized the
research value of the map, they have not owned up to their "responsibil-
ity to acquire, control and provide access" to information, regardless of
format.[3]

Libraries are service institutions which throughout their history
have had problems in obtaining adequate funding. As book-oriented
institutions, libraries naturally enough have given the book priority in
the allocation of their financial resources. In addition, the map has
inherent physical and bibliographic characteristics which have made it
a long-standing problem for book-oriented librarians. Maps are diffi-
cult to acquire, as they are frequently printed in limited quantities for a
specific purpose, are usually not well publicized, and may be available
only for a relatively short period of time. Maps are expensive to store,
maintain and preserve, and because of their size and fragility, require
special storage facilities. Maps are also cumbersome to retrieve, circulate
and refile.[4]

The map format is somewhat more difficult to catalog than books,
partly because of problems intrinsic to the process of describing a
graphic format in words, but also because of a lack of a supportive
bibliographic system for use during cataloging. In the United States
there is no National Union Catalog for maps, no Publishers Weekly for
maps, no comprehensive, current Maps in Print, etc. Until recently the
rules and guidelines for cataloging maps were inadequate and did not
permit precise, accurate and consistent cataloging. All this has meant
that there has been a lack of uniformity in the way major research
libraries have treated maps. Many of these have chosen not to acquire

maps on a large scale, or have decided not to provide formal biblio-
graphic control for maps in their collection.

Because librarians have not provided general library users with
access to cartographic information on an equal basis with books, many
users have been unable to obtain information relevant to their needs.
Other potential library users have resorted to other channels and sources
to obtain cartographic information, and a few have even gone to the
expense of creating their own maps.[5]

Although the map presents librarians with unique problems in
acquisition, storage, bibliographic organization, etc., it is a basic prem-
ise that the map format is of research value, and that this value is great
enough to warrant full bibliographic control on an equal basis with
other formats. Maps are information display systems which are unique
in their capability for showing locations, spatial distributions, and
correlation between subjects. Even though the direct economic, scien-
tific and historical value of maps is enough to warrant cataloging and
control of the format, their worth for reasons of rarity and aesthetics
should not be underestimated. Unfortunately, the cost of complete,
equal bibliographic control of discrete map-format bibliographic
entries is just as high as the cost for equivalent control of discrete
bibliographic entries in other formats (books, films, etc.). This is true
because the basic elements of description and requirements for author-
ity control are directly comparable between the map and book formats.
If bibliographic control of the map is to be achieved in the library
environment, library management must accept the cost-benefit ratio for
cataloging the map as being positive. If librarians are to provide a level
of bibliographic control for maps equivalent to that provided for books,
they must expect an analogous ratio in the expenditure of fiscal and staff
resources. It is the professional responsibility of all librarians to provide
the best possible service to researchers and other users of their collec-
tions. Map libraries will not reach their full potential for service until
all extant cartographic materials have been cataloged and incorporated
into a library-based, automated, on-line, international information
network. Such a network would make maps available to users through
multiple access points, including author, title, series, topical subjects,
geographic coordinates, and projection.

Although the single most important objective of every map librar-
ian shuld be to achieve complete bibliographic control of his or her own
collection, it should also be every map librarian's responsibility to
ensure that bibliographic control of maps be compatible with similar
efforts in other map libraries. Such compatibility would contribute to

progress toward the greater objective of universal bibliographic control of all extant cartographic material. In addition, map librarians should support uniformity of access to information in *all* formats. Information, regardless of the format in which it is presented, should be made as widely available as possible.

Progress Toward Effective Bibliographic Control of the Map

Library Systems Developments

In the not-too-distant past, the objectives cited above could easily have been dismissed as unrealistic. However, general progress in the development of library-based information systems and, more recently, the adaptation and application of such general library systems to the requirements of the map format have made such goals realistic, if not immediately attainable.

The landmark events in progress toward the control of maps in the library environment have been: (1) development and implementation of the MARC Map format at LC and its Geography and Map Division; and (2) the implementation of a MARC Map format-compatible, on-line, automated cooperative map cataloging network by OCLC, Inc. Obviously, these events have been revolutionary in their impact on map libraries in the United States. The first event, the development and implementation of the MARC Map format as an operational system at the LC Geography and Map Division, is significant because it became the basis for later automated MARC format-compatible map cataloging systems. The MARC Map format assured maps of a place in the current trend toward universal access to library information. Authorship of the *Data Preparation Manual for the Conversion of Map Cataloging Records to Machine Readable Form* by David Carrington and Elizabeth Mangan, and its subsequent publication by LC in 1971, is the major turning point in the development of the MARC Map format.

Continued evolution and improvement of the MARC Map format through empirical use by more and more map libraries is inevitable. However, the *Data Prep Manual* is a milestone in that it represents the first published example of the operational compatibility between the basic MARC Monographic format and the other special MARC formats. The trend toward compatibility among MARC communications formats is being continued at the international level through progress toward UNIMARC.[6] Thomas Parr's article "Automation of Cartobibliography" provided a cogent explanation of the significance of the MARC format to automated bibliographic control of cartographic

quantity."[15] Richard Lingeman, a book editor, magazine contributor and assistant managing editor of *The Nation,* says the success of a few best sellers may actually harm the health of the whole industry. "The block-busters siphon money away from the smaller paperback sales," he explains. He also worries about the vertical integration that has combined paperback and hardcover publishing operations and dried up separate bidding for paperback rights.[16]

Nonetheless, not all American writers would be likely supporters of a PLR campaign. PLR has little appeal to writers who aim at the mass market and who enjoy few library sales. The science fiction writers, riding the crest of a sales wave that rises far above the rest of the fiction market, are one such group. Norman Spinrad, president of Science Fiction Writers of America and a successful science fiction novelist who has published with Doubleday, Avon and others, notes with satisfaction that royalties in his field are way up in the past half-dozen years, and that "something like half" of the fiction now published is science fiction. He also notes that the paperback author has a "built-in inflation edge" because royalties rise as book prices rise. Spinrad's blunt assessment is that much of the grumbling about writers' incomes stems from: "all kinds of people writing things that nobody wants to *read*. These are the people who are starving, the kind of people who are forever living off grants. They are all poverty-stricken." Spinrad underscores the kinds of differences among writers that might cripple any authors' campaign for PLR when he wryly adds, "The same people have a snotty attitude toward science fiction."[17]

One answer to Spinrad is that PLR could free writers from dependence on government grants as a source of alternative financial support. Simpson, the Australian PLR activist, endorses the scheme precisely because of its foundation in the public's reading tastes, determined by what is checked out of libraries. In his crusty fashion, Simpson uses that rationale to dismiss the argument presented by librarians opposed to the Australian PLR plan, i.e., "that governments should give authors more literary grants; then they wouldn't need PLR." He says: "Do I have to spell out...how dim-witted and short-sighted that 'alternative' is? Most books don't and are not intended to qualify as 'literature.' Grants are payments that have no long-term effect in making authorship a way of earning a living."[18]

Several American authors agree that government grants have not been effective in supporting the literary arts and look to PLR as a more effective alternative. Cather says writers have gotten a fair shake from neither government nor the private foundations: "There just isn't any

access for the user to more maps in more places;

7. specialized user services (such as on-demand bibliographies, auto-
   mated subject searches, etc.); and
8. the provision of statistics at the local level to aid map collection
   management and planning.[11]

In the same article, Mr. Daehn also emphasized the importance of
standardization of cataloging rules, classification, area-subject access,
and machine communications format to the success and workability of
cooperative cataloging systems.

Map Classification
   OCLC's Map Cataloging Sub-System allows each participating
library unlimited freedom in the selection of a classification system for
its collection. This flexibility ensures that each library is able to use the
classification system that is most responsive to its specific functional
requirements. However, because of the cost effectiveness and other
advantages of standardized classification, map libraries participating in
OCLC, RLIN or analogous systems should view map classification as
an area in which special cooperation could promote effective, efficient
use of the general systems.
   Every librarian should use the classification system that best meets
his or her total classification requirements. However, map librarians
participating in or changing to automated cooperative map cataloging
programs should consciously reevaluate the effectiveness of their classi-
fication system, taking into account two major criteria: (1) cost effective-
ness and other advantages of classification standardization, and (2) their
own specific functional classification requirements. Aspects of stan-
dardization include:

1. *Lower processing costs.* Acceptance of a standardized classification
   system saves the repetitive costs of reclassifying each record. In the
   interest of cost savings, the Ontario Universities Library Cooperative
   System Map Project requires all participating map collections to use
   the same classification system.[12]
2. *Potential for cooperative collection and acquisitions management.*
   Uniform, common classification in support of consistent access to a
   union shelflist[13] is essential to cooperative collection and acquisi-
   tions management and to almost any other resource-sharing
   program.
3. *Improved efficiency in administering interlibrary loans.* Uniform
   classification provides improved accuracy and efficiency in the iden-

tification and retrieval of maps requested on interlibrary loan.
4. *Automated subject search capabilities.* Standardized classification facilitates automated subject access through the classification number with consequent improvement in reference efficiency.

Points to consider in specific functional classification requirements include:

1. The physical arrangement of the collections and its subsidiary effect on:
   a. retrieval of maps;
   b. general collection maintenance and map preservation;
   c. collection accessibility (open access versus closed); and
   d. space, equipment, or other limitations
2. User familiarity with an existing system
3. Compatibility of subject and area elements between the library's book classification system and its map classification system: this factor should not be overemphasized. Maps and books have different classification requirements. All major map classification schemes emphasize the area covered by the map, while all major book classification schemes emphasize the subject of the work. This difference in emphasis segregates maps and books in most libraries. Also, as maps require special filing equipment, a device for differentiating between bookshelves and map drawers would segregate maps and books even if both classification systems emphasized an areal approach through compatible numbers.
4. Cost of conversion from an existing map classification system to a standardized system. Even if an existing map classification system has to be converted, the long-term benefits of automated, compatible access to a predominate, standardized classification would, in the cooperative environment, outweigh the immediate cost of conversion. In any event, to attain full reference value, any records cataloged under a previous manual system would have to be input into the cooperative system.

As the final part of the reevaluation process, each librarian should assess applicability of potential standardized classification systems to specific functional requirements.

As a result of their analysis and reevaluation, some map librarians may choose to be completely independent in their selection and use of a classification system. For those librarians choosing to cooperate in the standardization of map classification, the options for cooperation range from de facto, informal standardization (resulting from unplanned use

of the same map classification system by two or more map librarians participating in a common on-line network) to formal adoption of a single standard map classification system at a national or international level. Formal cooperation and the designation of a single preferred map classification system have greater potential for increasing the extent of standardization, with a corresponding increase in benefits for those who adhere to the standard.

It has been recommended that the LC "G" classification system be used as the standard classification system for map records input into MARC format-compatible systems.[14] In North America, it is almost certain the LC map classification system will become the predominant map classification system for automated programs. There is an excellent chance that it will become the standard classification system for the continent. There are many reasons for this, including: LC's book classification predominates at research libraries in the United States and Canada; the LC "G" Schedule for maps is the system most frequently associated with the MARC Map format; the LC MARC Map data base contains over 60,000 records; and, the LC "G" Schedule is by far the most widely used classification system in map libraries in the United States and Canada.

The LC "G" Schedule has many intrinsic advantages. The first of these is its suitability for automation. The LC "G" Schedule has a proven capability for area-subject automated searches through the call number and in the form of the map classification code. The LC classification system has been cited as "the strongest and most modern general library classification in existence today, with the greatest long-range potential for automation."[15] It is also easy to use; and it has recently been revised and updated. Furthermore, publication of a separate microform edition of the official LC "G" shelflist by University Microfilms International can be viewed as a de facto expansion of the map and atlas portions of the "G" Schedule (as routine expansions of map and atlas portions of the "G" Schedule are incorporated into the respective official shelflists). Future publication of LC Geography and Map Division cutter lists for American cities and towns will enable cooperating map libraries to improve the compatibility of locally produced classification numbers with those assigned by the LC Geography and Map Division. And finally, the area and subject access points of the "G" Schedule are detailed, precise, and complete enough to meet the requirements of any large general map collecion; yet the basic system is flexible enough to accommodate change or expansion if required by specialized libraries.

The LC "G" Schedule is essentially strong in its capability for serving subject-oriented users. The major disadvantage for open access map libraries is that its inherent emphasis on subarea over subject has the net effect of scattering subject maps within each of four separate files under each numbered base area. This affects the physical accessibility of the collection for purposes of subject-oriented "browsing." However, browsing is much less important in a cataloged, controlled collection which has subject and area access by computer. As single copies of maps can only be filed in one place under a given classification system, emphasis of one theoretical aspect is perforce at the expense of another theoretical aspect. If the LC map classificaton system emphasized subject under base areas, it would scatter subareas—to the detriment of researchers interested in all thematic aspects of a given subarea.

Descriptive Cataloging

Daehn's article emphasized the importance of descriptive cataloging standards to the efficient use of cooperative map cataloging systems.[16] He recommended that *Anglo-American Cataloguing Rules* (AACR) be used as the basis for standardized cataloging rules on the grounds of user familiarity, widespread use in the library environment, and compatibility with catalog records for other types of material.

Although examination of the content of MARC Map format reveals a basic similarity to MARC Monograph format records, and although direct analogies can frequently be made between techniques used in the cataloging of maps and monographs, maps do in fact have unique bibliographic characteristics which often present unique cataloging problems or unique combinations of traditional cataloging techniques. These must be accommodated in the standardization of cataloging and bibliographic control of the format. Among these characteristics are: (1) maps are a graphic format, while cataloging records are restricted to a written description; (2) the arrangement of bibliographic information on maps is frequently inconsistent; and (3) concepts and terms used by cartographers on maps are sometimes different from those used by catalogers.

The map cataloging rules in AACR-1 were essentially inadequate in accommodating unique characteristics of the format.[17] AACR-2 (as interpreted by the Anglo-American Cataloguing Committee for Cartograhic Materials[18]) will be much more effective in standardizing the description of cartographic material. AACR-2 contains several general features which will improve the bibliographic description of cartographic material, improve access to cartographic information, and

facilitate cooperative cataloging. With the specific intent of supporting cooperative cataloging, the national libraries of Australia, Canada and Great Britain and the Library of Congress have agreed to a common policy for adoption and application of AACR-2.[19] Other general advantages or strengths of AACR-2 include: (1) compatibility with the International Federation of Library Associations' international standards for bibliographic description, (2) compatibility with developments in the machine processing of bibliographic records, (3) expansion of coverage of nonbook material, (4) internal consistency of rules for different formats with mnemonic rule numbering, (5) improved capabilities for analytical and multilevel description, and (6) greater emphasis on access points to "increase retrievability in the catalog."[20] Although the concept, general principles, and much of the specific content of AACR-2 are advantageous for cataloging cartographic materials, chapter 3 of AACR-2 was inadequate and unworkable for cataloging maps.

In response to this situation, an international meeting called by Canada's National Map Collection was held in Ottawa in October 1979. At the meeting, representatives of the Public Archives of Canada, the Library of Congress, the British Library, and the map library associations of the respective countries formed the Anglo-American Cataloguing Committee for Cartographic Materials (AACCCM).[21] Formation of this committee, and its subsequent activities in the production of a map cataloging manual to interpret and explain AACR-2 as it pertains to the cataloging of cartographic material, represents an important step toward practical, effective international cooperation. In producing its map cataloging manual, the committee will attempt to adhere to the following objectives and guidelines:

1. the general principle of maximum uniformity of description and access to information, regardless of format;
2. maximum compatibility of bibliographic description between cartographic and other materials;
3. support for the concepts, general principles and much of the specific content of AACR-2;
4. maximum conformity with AACR-2, while at the same time ensuring responsiveness to the unique physical and bibliographic requirements of cartographic materials;
5. the expansion and interpretation of AACR-2, particularly chapter 3, in order to achieve standardization, consistency and precision in cataloging cartographic materials; and
6. the resolution of some basic problems in cataloging cartographic

materials, particularly main entry, title, collation, and collective treatment and multilevel cataloging.

Authority control for access points (main and added entries) is essential for improving access to cartographic information and facilitating standardization of the bibliographic description of maps. In early 1980, the major networks loaded LC's Automated Names Authority File (ANAF) records on their data bases. This extension of on-line access to LC's authority control system will be a major factor in improving the uniformity and consistency of authority systems used by cooperating libraries.

Subject Access

Almost all users and map librarians are aware of the inherent area focus of the map format. Every thematic map of a place is a graphic portrayal of the subject as it applies to that place. Such maps have an automatic and definite connotation of both place and subject, and contribute to the body of knowledge on a given subject, but do not constitute a purely theoretical contribution to the subject discipline. Nevertheless, the importance of area and subject as "distinct yet inseparable concepts"[22] has not been widely accepted by map librarians. As users of a library catalog, geologists and geographers are often interested in specific subjects on a worldwide basis. The primary LC subject pattern (subject-area) accommodates this interest. However, geoscientists also employ an areal and regionally-oriented methodology concerned with multiple subject aspects of a specific area or region. Additional subject access under area-subject is needed to accommodate this approach.[23] If both subject access requirements are to be accommodated within a formalized map cataloging program, it follows that both approaches must be emphasized within the system. A double-entry concept for resolving the dichotomy between two necessary approaches to area-oriented thematic material is not really new. Double entries under subject and area were used in general research libraries before 1900,[24] and are currently being used in a few special, area-oriented libraries.[25]

Although the concept of double entry was, and is, valid for all place-oriented materials, research libraries in the United States, including LC, discontinued or did not adopt the double-entry concept for economic reasons (at that time, unit card sets had to be typed or set in type for printing). This meant that the standard LC subject cataloging practices as described in the LC "Red Book" (*Library of Congress Subject Headings*) have been inadequate and inconsistent in terms of

providing access to area-oriented material, including maps. Until recently, all LC subjects were treated in one of the following patterns: (1) subject (undivided), (2) subject—base area—subarea (indirect), (3) subject—local area (direct), (4) subject—subarea—subject subdivision, (5) local area—subject (applied to local history material and recently to maps), or (6) area—certain specified subjects. Although the prevalent LC Subject Cataloging Division pattern for the division of area-oriented subject headings ("indirect," subject—base area—subarea) is basically responsive to researcher needs, fragmentation within the total system and inconsistencies in the application of place to subject headings meant that neither area nor topical subjects were accessible uniformly or consistently. The LC treatment of subject headings for area-oriented material simply has not met the information retrieval requirements of geoscience researchers.

The LC Subject Cataloging Division is well aware of the inadequacies of its subject treatment as it pertains to place-oriented material, and has previously proposed changes in the system.[26] Unfortunately, the internal expense of changing existing cards in LC catalogs has prevented changes which would have made their subject heading system more responsive to map users. Recently, the Subject Cataloging Division has made several innovations, such as dividing previously-undivided subject headings "indirect" and converting headings which were divided "direct" to "indirect." These changes were made in preparation for implementation of fully automated, on-line access to subject headings at LC. LC's automated, on-line "component word" searching capability provides an inherent capability for area-subject permutation (or rotation).

Through its catalog card sales and distribution system, and through publication of Library of Congress Subject Headings (the "Red Book"), LC has been a major force in determining the style and content of subject card catalogs in the research libraries of the United States. In the interest of uniform access to information, the style, form, arrangement, and content of subject headings assigned to MARC Map records produced in the LC Geography and Map Division have been compatible with the standard LC subject heading system.

RLIN, OCLC and analogous systems provide participating map libraries with options and alternatives for improving the subject control of their collections. Although OCLC currently does not have an on-line subject search subroutine, they are cooperating with Battelle Institute in the evaluation and testing of a subject search capability through the use of minicomputers.[27] OCLC's Map Cataloging Sub-System allows input

of two elements which provides a direct potential for automated, on-line searching of data bases by area and subject. Entry of geographic coordinates in MARC Map format records provides positive identification of the area covered on the map; but more importantly, it offers the potential for retrieving map coverage by area and scale parameters. Geographic coordinate retrieval techniques for searching on automated systems are already being used in the United States and the Netherlands.[28] Entry of the LC "G" Schedule derived map classification codes in MARC Map format Field 052 provides OCLC with the immediate potential for area-subject retrieval from map records. Although not yet activated by OCLC and RLIN, this capability has been used extensively by LC for searching its MARC Map data base. In serving the more traditional subject catalogs, the OCLC Map Cataloging Sub-System provides options for the entry and production of either: (1) subject headings completely compatible with LC practice; or (2) local subject heading options, either free text or modified LC subject headings. Cooperating map libraries have the option of manipulating and partially permutating standard LC subject headings, thereby providing comprehensive, uniform access to both area and topical subject, and improving the effectiveness of traditional subject card catalogs, bibliographies, etc.

At present, such permutations can be made by explicit entry of each form of the heading on the OCLC work screen. However, LC's increased use of the indirect approach to subject headings and the MARC format's requirement for machine-identifiable x,y,z delimitation of area, time, and topical elements create the potential for automated manipulation of the subject heading from a single explicit form of the subject heading entry. In order to permutate from a single form for specific applications, networks would have to develop the programming for manipulation of subject heading elements within their system, or, alternatively, individual institutions could use their archival tapes on minicomputers to produce catalog cards, book catalogs, or COM display systems emphasizing uniform, comprehensive access to both area and topical subjects.

The following "semi-permutative" system of rotating subject headings is proposed as a subject heading option for cooperating map libraries:

1. General maps of base areas would receive:
$$\text{Base areas—Maps}$$

2. Thematic maps of entire base areas would receive, for each subject:
$$\text{Base area—Subject—Maps}$$
$$\text{Subject—Base area—Maps}$$

3. Thematic maps of portions of the base area would receive for each
   subject:

   > Base area—Subject—Subarea—Maps
   > Base area—Subarea—Subject—Maps
   > Subject—Base area—Subarea—Maps

4. General maps of portions of the base area would receive:

   > Base area—Subarea—Maps

5. Unlocalized maps or schematics would receive:

   > Subject—Maps

In order for the permutative system to be effective in providing asso-
ciated access in all area-subject related subject headings, such headings
would have to be rotated comprehensively and completely in accor-
dance with pre-established guidelines.

   The permutated subject headings could be arranged in discrete files
or categories, as shown in the following patterns:

1. Base area—Subject—Subarea—Maps
   Example: California—Geology—Imperial Co.—Maps. This pattern
   of subject heading elements would answer the associative question:
   What geological maps covering California (or any other area prese-
   lected as a base area) do you have in your library? If the pattern were
   applied consistently to all subjects reflected by maps contained in a
   map collection, a broader associative question could be answered,
   i.e., What is your thematic map coverage of California (or any other
   base area)?

2. Subject—Base area—Subarea—Maps
   Example: Geology—California—Imperial Co.—Maps. Although
   this approach has been the predominant LC pattern for map mate-
   rials, it has never been applied consistently and comprehensively to
   all subjects. The associative value of this file is that it would provide
   the researcher with ready-made comprehensive subject bibliogra-
   phies for the content of the map collections.

3. Base area—Subarea—Subject—Maps
   Example: California—Imperial Co.—Geology—Maps. This asso-
   ciative pattern collects subareas under major base areas. It provides a
   focused approach for those who are interested in the thematic map
   coverage of a specific subarea. If the user needed to know the com-
   plete library coverage for a local area such as Imperial County, the
   file would immediately reveal all thematic maps of the county as a
   whole and would provide a relatively focused approach for locating
   regional maps encompassing the county, as well as part or quadran-

gle maps included within the county boundaries.
4. Specific area—Subject—Maps
   If desired, the subject headings could be rotated to provide direct access to specific places of interest. Alternatively, local areas could be brought out through consistent tracing of specific areas in map titles.

The map format can usually be served by the same topical subject headings that are applied to books. However, as the map format provides a graphic representation, generalization, or interpretation of reality in the form of geographic distributions or subject correlations, some LC subject headings (those reflecting theory or methodology) may be insufficient or inapplicable for use as subject headings for maps. Cooperating map libraries in the United States should forward requests for LC subject heading modifications to the LC Subject Cataloging Division if they feel pertinent subject headings do not meet the requirements of the map format or its users. The concept of "cartographic material scope notes" to explain and elaborate on the usage of subject headings for cartographic material may be useful in resolving this problem. The area or geographic name element of subject headings should, if at all possible, be compatible with LC subject heading usage. If this is not possible, geographic names should be verified in standard reference sources and established in the LC subject heading style.

Even though automated access to map records through "component word" or other on-line machine search techniques provides excellent service to users, the concept of direct display of the written form of subject elements in discrete hierarchical files is valid for display in computer-output microform (COM) subject catalogs, book catalogs, current-awareness printouts, bibliographies, or even in card form for distribution to researchers or small branch libraries which do not have ready access to computer search systems.

The permutative subject heading approach is more feasible economically on COM or other computer-access systems than in the traditional library card catalog. However, as each of the superficially repetitive subject heading patterns contributes a unique reference function or associative capability, the additional access provided by the system should be useful enough to make it cost effective for display on catalog cards, especially if the catalog cards are produced by a computer on an automated system. The approach will not reach its full potential for service until all maps (or other place-oriented material) in the library's collection have been cataloged in accordance with the permutative system.

Subject cataloging is the key element in developing a service-oriented, user-responsive map collection. Trained, alert, professionally involved reference librarians are, in the final analysis, the single most important element in providing excellent library service, but such people need the working tools of excellent cataloging and strong collection development programs to be able to provide optimal reference service. If a reference staff is to reach its full potential for service, processing units must offer improved levels of service in terms of "associative"- or "bibliography"-oriented information and reference capabilities, whether through terminal searches or separate visual display systems.

Communication and Coordination

Although the current capabilities of the general library cooperative systems, such as OCLC and RLIN, are relevant to the map cataloging requirements of individual participating libraries, development and support of formal channels of communication and coordination within the map library community could be used by map librarians participating in OCLC and other similar networks to maximize the efficiency and utility of such networks for the cataloging and bibliographic control of cartographic materials. Once the basic standards of the general system are met, multiple levels of additional cooperation among specialized users with common interests become possible. Options for special cooperation range from informal communication between two specialized users of the same system to membership in formally organized cooperative groups such as the Map On-line Users Group (formed in June 1980 by the merger of the OCLC and RLIN map user groups). Obviously, the latter option would be preferable, as it has the potential of maximizing the cost effectiveness of the cooperative approach for all participants. However, any level of extra cooperation would be beneficial to the individual participants in such an effort.

Development of a map library parastructure for coordinating or assigning cataloging priorities to individual institutions on the basis of the strengths of respective cataloging staff, acquisitions, or collections could be used as a technique for increasing efficient use of the existing cooperative system. This approach would result in higher-quality, more consistent cataloging, as well as making specific categories of map records available more quickly. Priority assignments could be made on the basis of strengths in areal coverage, subject coverage, language expertise of cataloging staff, or even on the basis of a library's relationship with a map-producing agency. A library which is part of a map-producing agency could catalog maps produced by the parent agency

more easily, quickly and accurately than an outside library, as it would have earlier access to the maps and increased availability of cataloging information on authors, intent, etc.

Improvement of Network Capabilities
    The most effective approach which cooperating map libraries could take to improving the technical capabilities of networks would be advising or lobbying the individual networks and the national bibliographic agencies to accelerate implementation of those specific planned or projected technical capabilities which would be most responsive to the map cataloging requirements of the cartographic community. Implementation of a geographic coordinate search capability would be extremely valuable for accessing cartographic information contained in map records. This is a proven technique which could be implemented by networks with relatively little software modification. All that stands in the way of networks' implementation of such a capability is the lack of a user mandate. The reasoning is also applicable to implementation of a map classification code area-subject search capability. This technique is already operational at LC for information retrieval from the MARC Map data base.
    Development and implementation of MARC format analytical and multilevel capabilities, including activation of the linking numbers concept for tying records together, would improve map librarians' capabilities for cataloging related texts and maps, sheets of multisheet works, maps in monographs or journals, etc. These capabilities are highly important, if not essential, in improving user access to cartographic information.[29] Full implementation of the multilevel cataloging provisions of AACR-2 depends on development and implementation of analytical and multilevel capabilities of the MARC format. The lack of these capabilities has been a serious deterrent to the timely development of bibliographic control of the map format.[30] In supporting cooperative cataloging and standardization of bibliographic description, classification, subject headings, etc., participants should encourage network flexibility in allowing local deviations from standards. This will enable catalogers in individual libraries to meet specific institutional reference and service requirements.

Conclusion

    Several major factors are contributing to increased demand for maps, information about maps, and improved bibliographic control of

maps. As the world grows smaller and international concerns over political, social and economic problems intensify, the importance and direct economic value of maps to planning, legislation, and so on is increasingly evident to persons who are not map librarians or earth scientists.

The increased automation of cartographic information by map libraries and other information specialists is reinforcing the demands for access to maps. The demand for automated information of practical value grows as the information is supplied.[31] Concurrent with the increased demand for maps is a trend toward increased production of maps. This trend is reinforced by growing demand for geoscience information and by increased automation within the field of cartography. The net result is a potential flood of cartographic information, which will in turn generate demand for the genre.

The challenge to map librarians is clear. They must implement a system of comprehensive, automated bibliographic control of maps and other cartographic material, or be overwhelmed by requests for maps. Increased demand for and increased production of maps can only serve to create greater pressures for increased map library services by map users. Such pressures will be intolerable for those map librarians who are unprepared or isolated from cooperative automated programs for attaining bibliographic control.

Map librarians now have access to cost-effective, on-line, cooperative cataloging systems, which have the potential for meeting the challenge through their "union catalog" content, acquisitions information content, interlibrary loan communications capability,[32] and automated area and subject access capabilities. However, to assure the success of the cooperative automated programs for bibliographic control of maps, librarians must:

1. Be more aggressive in obtaining financial support for cooperative efforts. Given the traditional low levels of financial support received by map libraries, even an efficient cooperative approach can not be truly successful in meeting the evolving requirements for cartographic information;
2. Offer improved library service through imaginative use of automated access to map records. Libraries must emphasize "associative" and "bibliography-oriented" information display systems to reach general users and to attain the widest possible dissemination of their services;
3. Extend the cooperative approach for exchanging cartographic information to an international level as rapidly as possible, to ensure that

universal bibliographic control of current and retrospective thematic mapping becomes an attainable objective; and

4. View other automated systems for retrieval of cartographic informa- tion as complementary to map library efforts. If at all possible, map librarians should gain access to such systems in order to improve their own reference and acquisitions capabilities. However, because of the increased demands on library resources created by such sys- tems, libraries must also use the existence of these systems to justify improvement of library information and bibliographic control capabilities.

As information is a form of power, map librarians must learn to accept and even seek out the responsibility for controlling information about the maps in their care, as well as preserving and maintaining the maps as physical items.

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