

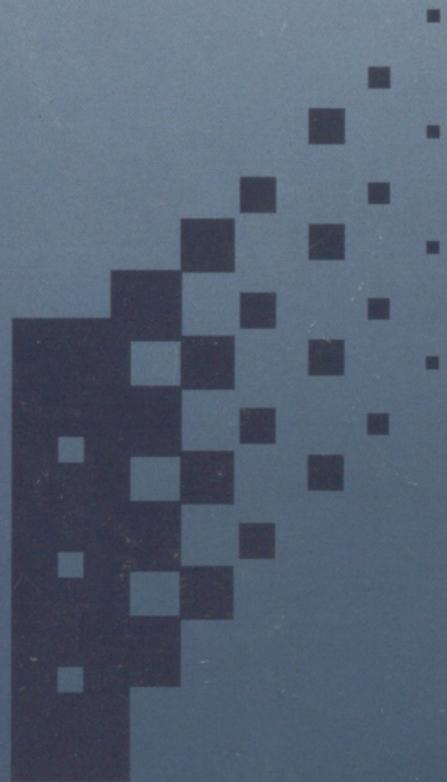
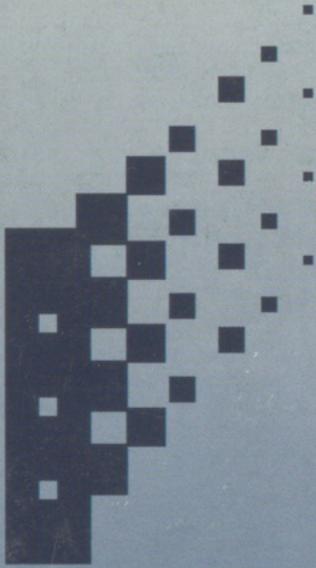
Information Technology and Libraries

Volume 16

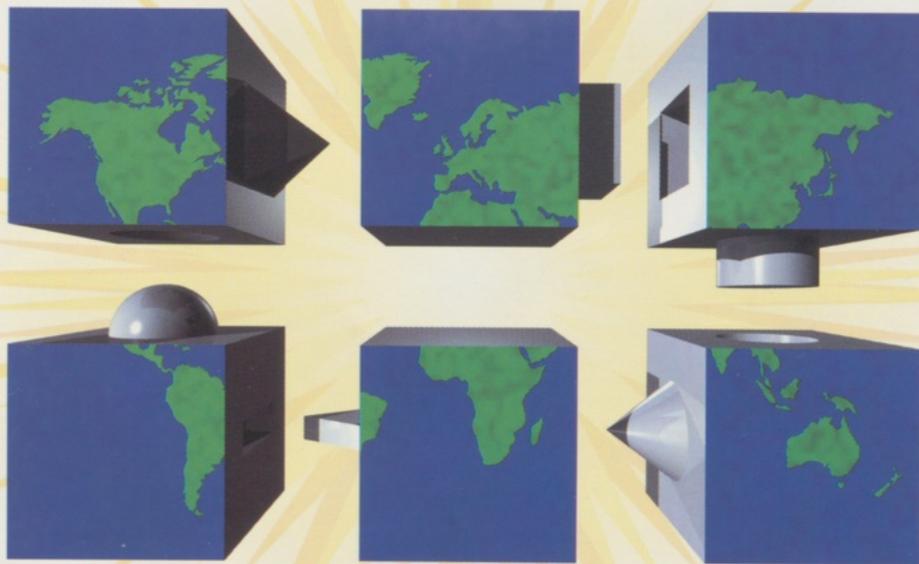
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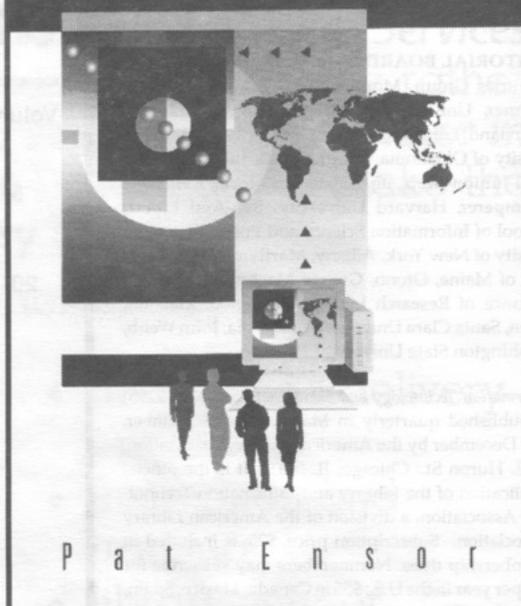
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Mapping the LCSH and MeSH Systems

Tony Olson and Gary Strawn

A number of problems arise when two or more subject systems reside in the same online catalog. One solution to this "multiple vocabulary problem" is to map the systems involved. Since 1990, a project to map the LCSH and MeSH vocabularies has been carried out at Northwestern University. The LCSH/MeSH mapping data are now available for distribution to other libraries and information centers. The data can be used to generate displays in online catalogs that link corresponding LCSH and MeSH headings, thus enhancing retrieval of relevant bibliographic citations.

The Multiple Vocabulary Problem

Many libraries have online public access catalogs that contain two or more subject systems. Some examples of thesauri that may co-exist in the same catalog are: LCSH (Library of Congress Subject Headings), MeSH (Medical Subject Headings from the National Library of Medicine), AAT (Art and Architecture Thesaurus), TLSH (Transportation Library Subject Headings from Northwestern University), as well as other locally developed systems. A number of different methods have been proposed for dealing with multiple vocabularies in the online catalog.¹ The two most commonly used by library management systems (with some systems providing an option to use either) are discussed below.

One option is to segregate the subject systems, so that only one system at a time can be searched. The obvious disadvantage of separating subject systems is that a user may not retrieve all of the materials on a given topic. The following examples (taken from the Northwestern University online catalog which includes LCSH, MeSH, and TLSH) demonstrate the potential for incomplete retrieval from a given subject search in a divided catalog.

1. A search for the LCSH heading **COGNITIVE DISSONANCE** retrieves 19 bibliographic citations, while a search with the identical MeSH heading retrieves only 1 citation. Obviously, a user searching only the MeSH index will miss 18 citations.
2. A search for the LCSH heading **BONE DENSITOMETRY** yields 4 citations, while a search in the MeSH index for the same term yields no citations! This is because there is no heading (or entry term) in MeSH for this concept. A user searching only the MeSH index may come away with the impression

that there are no materials in the library on this topic, while in fact that there are at least 4.

3. A search for the MeSH heading **HISTORY OF MEDICINE 17TH CENTURY** yields 31 citations, while a search for the corresponding LCSH heading **MEDICINE—HISTORY—17TH CENTURY** gives 6 citations. A user searching only LCSH will miss 28 citations, while a user searching only MeSH will miss 3 citations.

The second option is to provide a universal subject search of a "mixed" vocabulary in which terms from all vocabularies in the catalog are retrieved together. This alleviates somewhat the problem of incomplete retrieval (chiefly examples 1 and 2 above) encountered in segregated catalogs. However, a universal subject search of a mixed vocabulary opens up a new set of problems (especially if authority records are involved), and still does not completely resolve the problem of incomplete retrieval of bibliographic citations. Examples of some of the more serious problems that can arise from a universal subject search in an online catalog in which the LCSH and MeSH systems are mixed are given below.

1. Duplicate retrieval of entries from the same bibliographic record when the LCSH and MeSH headings are identical after normalization (e.g., **COGNITIVE DISSONANCE**).
2. Headings in one system may conflict with *search under* references in another system (e.g., **CLINICAL PHARMACOLOGY** is an established heading in LCSH, but a *search under* reference in MeSH; while, on the other hand, **PHARMACOLOGY CLINICAL** is an established heading in MeSH, but a *search under* reference in LCSH.)
3. Even with the implementation of a universal subject search encompassing both systems, there is still potential for incomplete or partial retrieval of citations (example 3 above) because there is still no linking of corresponding headings in the two systems.
4. Headings that appear to be identical may in fact represent different concepts in different systems (e.g., **CROWNS** in MeSH refers to dental crowns, while **CROWNS** in LCSH refers to royal regalia.)

Tony Olson is Head of Technical Services, Galter Health Sciences Library, Northwestern University, Chicago; e-mail: ajolson@nwu.edu. **Gary Strawn** is Authorities Librarian/Systems Analyst, Northwestern University Library, Evanston, Illinois; e-mail: mrsmith@nwu.edu. The authors would like to express their appreciation to Velma Veneziano who was the leader of the original "retrospective" mapping project in 1990–1991.

A third option (which has not yet been widely implemented) for solving the "multiple vocabulary problem" would be to *integrate* vocabularies instead of just mixing them as discussed above. One method of integrating subject systems is to: (a) map terms and headings from one system to corresponding headings in another system; (b) add the mapping data to authority records; and (c) enhance the library management system software so that mapping data in authority records can be used to develop syndetic structures that relate the systems smoothly and consistently, while enhancing subject retrieval. This approach has been the focal point of a project begun at Northwestern University in 1990.² The goal of the project has been to integrate multiple thesauri (specifically LCSH and MeSH) in an online catalog. Work on the project has continued up to the present time.

The project was divided into three parts.

1. Modifications to the library management system software that would solve the first two problems encountered in a mixed vocabulary index, i.e., identical headings and conflicts between references and established headings.³
2. "Retrospective mapping" of the LCSH and MeSH systems. The results can then be used to solve the third problem in a mixed vocabulary index, viz., linking of headings that are neither identical or linked by cross references.
3. Keeping the mapping data current as headings in the two systems are changed, added, or deleted.

The rest of this paper will for the most part be devoted to a description of Part 2 of the project, the retrospective mapping of LCSH and MeSH, since one of the goals of the project was to also develop methods that could be used to map other subject systems. We will conclude the paper with a brief discussion of: how we are keeping the mapping data current; our plans for distributing the mapping data; and finally, some benefits that can be derived from the mapping project.⁴

Retrospective Mapping of LCSH and MeSH

This phase of the project had three goals:

- Develop techniques that can be used to map two or more subject systems.
- Map the LCSH and MeSH systems.
- Develop specifications for a subject mapping field that could be incorporated into the *USMARC Format for Authority Data*.

There were two basic principles that were followed during the project.

- Only topical LCSH and MeSH headings were mapped—*not* geographic, name, or uniform titles used as subject headings.
- Only *existing* established main headings were mapped (i.e., a new main heading was not established in either system in order to complete a mapping.)

The vocabularies selected for retrospective mapping were: LCSH as it existed on April 14, 1990, and the 1989 MeSH. The library management system software used in the project was NOTIS.

Data Collection

The first step of the LCSH/MeSH mapping project was the collection of all available machine-readable data pertaining to equivalent MeSH and LCSH topical subject headings, and its presentation in organized form for use by the subject editors. This work required a suite of sixteen new programs and twelve new jobs. Most of the new programs were small and modular, accomplishing only one limited task. The jobs assembled from these units performed a series of extractions, mergings, manipulations, and comparisons, and produced final printed reports of subject mapping information.⁵

The printed subject mapping reports drew on four complimentary sources of information, the handling of which will be described in turn:

1. Northwestern University's authority file, which includes LCSH and MeSH authority records;
2. Bibliographic records in Northwestern's bibliographic file;
3. Bibliographic records in the LC MARC database; and
4. A tape of correspondences between the LCSH and MeSH systems supplied by the National Library of Medicine.

The basic record unit employed in the collection and display of subject mapping information was called the "heading pair." A heading pair consisted of one heading from each of the two subject systems (see figure 1). This one-to-one record structure is predicated on the assumption that, in the majority of cases, a heading in one subject heading system can be mapped to a single equivalent heading in another system. (Of course we knew at the outset that this assumption did not hold true in every case, and thus attempted to make allowances in the heading pair record structure for the exceptions, viz., the "alternatives" and "coordinates" described below.) In addition to the two subject headings, the record for a

heading pair also contained a variety of control information. The headings in heading pair records were normalized according to NOTIS conventions (i.e., all alphabetic characters were represented in upper case form; a space hyphen (-) preceded each topical subject subdivision; punctuation was either replaced by a space or ignored; and multiple occurrences of a space were replaced by a single space).

In order to collect statistical and control information about both of the headings in a heading pair, two different versions of each pair were maintained throughout the data collection phase. In one version, the "natural" version, the MeSH heading was the first heading in the pair and the LCSH heading the second heading; in the other version, the "reverse" version, the LCSH heading preceded the MeSH heading. The final step before printing the subject mapping report was the merging of all pair records from all sources, natural and reversed, into a single master file.

1. Heading pairs from authority records

Information taken from MeSH and LCSH authority records was scanned for possible points of correspondence between the two systems. This was accomplished by scanning the NOTIS index of headings extracted from authority records, which includes entries for the 1XX, 4XX, and 5XX fields in each authority record, rather than the authority records themselves. Heading pairs were generated from authority records in two cases: (1) when headings in the two systems were the same after normalization (figure 1, top); and (2) when a heading referred from in one system matched an established head-

ing in the other system after normalization (figure 1, bottom). Heading pairs derived from authority records were called authorized pairs.

At the time that the authorized heading pairs were generated, the Northwestern authority file contained 143,169 LCSH established topical headings, 14,885 MeSH established topical headings, 116,806 LCSH topical *see* references, and 65,081 MeSH topical *see* references. There were 4,810 cases detected in which the established headings were the same in both systems. In 1,211 other cases, an LCSH *see* reference matched a MeSH heading; in 1,631 cases a MeSH *see* reference matched an LCSH heading. In 405 of these heading/reference matches, there were MeSH and LCSH headings with mutual *see* references. A total of 7,247 authorized (authority-derived) heading pairs were created.

2. Heading pairs from Northwestern's bibliographic records

At the time the project was begun, a significant number of records in the Northwestern University file contained both LCSH and MeSH headings. The assumption underlying the collection of data from these bibliographic records was that those LCSH and MeSH headings which represented the same concept should occur in bibliographic records more frequently with each other than if they occurred with yet other headings. Stated another way, the more frequently two headings, one from MeSH and one from LCSH, appear together in bibliographic records, the more likely it should be that the headings stand for the same topic. We believed that if we examined a large enough number of bibliographic records, likely matches between the two systems would automatically present themselves because of the greater frequency of their co-occurrence. (The validity of this assumption was later demonstrated by a statistical analysis of the subject mapping data. We will return to a discussion of this analysis later.)

Working under this assumption, heading pairs were generated from those bibliographic records in Northwestern's bibliographic file that contained both LCSH and MeSH topical headings. (This was actually done by scanning a freshly generated copy of the main NOTIS bibliographic index sorted into record number order, rather than by scanning the bibliographic records themselves.) Using a process described below, the programs examined each subdivision in each LCSH or MeSH heading in a bibliographic record and eliminated those subdivisions that had no subject content. They then decomposed multi-element headings into their components and generated all possible matches between the resulting headings. We called heading pairs derived from bibliographic records "potential" pairs.

Figures 2 and 3 illustrate the general procedure for

The following pairs of headings consist of an established MeSH heading and an established LCSH heading which are identical after normalization.

MeSH established heading: Aspirin
LCSH established heading: Aspirin

MeSH established heading: Cognitive Dissonance
LCSH established heading: Cognitive dissonance

MeSH established heading: Liver Function Tests
LCSH established heading: Liver function tests

MeSH established heading: Medication Errors
LCSH established heading: Medication errors

The following pairs of headings consist of an established heading in one subject system which matches (after normalization) a cross reference in the other system.

MeSH established heading and LCSH *see* from reference: Liver Regeneration
LCSH established heading: Liver--Regeneration

MeSH established heading: Management Quality Circles
LCSH established heading and MeSH *see* from reference: Quality circles

MeSH established heading and LCSH *see* from reference: Pharmacology, Clinical
LCSH established heading and MeSH *see* from reference: Clinical pharmacology

MeSH established heading and LCSH *see* from reference: Neoplasms
LCSH established heading and MeSH *see* from reference: Cancer

Figure 1
Authorized (Authority Derived) Heading Pairs

the extraction of potential heading pairs. As can be seen from these figures, the presence of subject subdivisions dramatically increases the number of output pair records. We thought it would be a good idea to reduce the number of pair records—and thereby the size of the final mapping report as well as the work required of the subject editors—by eliminating subdivisions with no subject content. This was easy to accomplish for MeSH headings for several reasons: because there is a clear distinction in this system between form subdivisions (which with a few exceptions we assumed to have no subject content) and topical subdivisions (which we assumed to have subject content); because the number of subdivisions is in any case extremely limited; and because the subject-laden topical subdivisions are available in a single list. A total of 101 MeSH subdivisions were identified as useful for the purposes of this project.

By the same tokens, the elimination of subdivisions with no subject content was difficult to accomplish in LCSH. This was because the subdivisions relevant to health sciences topics are scattered in at least sixteen different sections of the *Subject Cataloging Manual: Subject Headings* (SCM:SH), and because not all such subdivisions are even printed in SCM:SH. A total of 1,006 LCSH subdivisions were identified as useful for the

```

010 : : ja 73077107 //rB4
020/1 : : ja 0803656408
040 : : d IEN-M
050/1 : : ja RC681.A1 |b C27 vol. 5, no. 2 |a RC685.V2
082/1 : : ja 616.1/008 |a 616.1/25
100/10 : ja Likoff, William.
245/10 : ja Valvular heart disease / |c William Likoff, guest editor.
260 : 0 : ja Philadelphia : |b F. A. Davis Co., |c c1973.
300 : : |a xv, 454 p. : |b ill. : |c 27 cm.
440/1 : 0 : ja Cardiovascular clinics : |v v. 5, no. 2
504 : : ja Includes bibliographic records and index.
650/1 : 0 : ja Heart |x Valves |x Diseases.
650/2 : 2 : ja Heart Valve Diseases.

Raw LCSH heading:
Heart-Valves-Diseases

Raw MeSH heading:
Heart Valve Diseases

Extracted LCSH stems:
HEART
HEART -VALVES
HEART -VALVES -DISEASES

Extracted MeSH heading:
HEART VALVE DISEASES

Heading pairs generated from the subject headings in this bibliographic record (MeSH / LCSH)
HEART VALVE DISEASES / HEART
HEART VALVE DISEASES / HEART -VALVES
HEART VALVE DISEASES / HEART -VALVES -DISEASES

```

Figure 2
Bibliographic-Derived Heading Pairs

This figure shows a bibliographic record that contains one three-element LCSH heading and one single-element MeSH heading. Three different heading stems are generated from the raw LCSH heading. From these LCSH heading stems and the single MeSH heading stem, the program produced three output pairs showing three potential points of correspondence between MeSH and LCSH.

purposes of the project (i.e., about 10 times more subject-related subdivisions in LCSH than in MeSH).

When decomposing a heading containing subdivisions into its constituent stems, each subdivision was checked against the appropriate list of subdivisions. If the subdivision was not found, the program stopped consideration of the heading at that point. As a side effect, the mechanism for the elimination of subdivisions with no subject content also eliminated subdivisions that contained typographical errors and all geographic subdivisions. Figures 4 and 5 show the effect produced by the elimination of subdivisions with no subject content.

After all bibliographic records had been examined, the resulting heading pair records were sorted alphabetically and multiple occurrences of the same pair were consolidated into a single record showing the total number of times the pair occurred in Northwestern's bibliographic records. Of the 1,131,742 bibliographic records in our local bibliographic file at the time the heading pair records were generated, 42,086 contained both LCSH

```

100/10 : ja Beck, Donald F.
245/10 : ja Basic hospital financial management / |c Donald F. Beck.
260/0 : ja Rockville, Md. : |b Aspen Systems Corp., |c 1980.
650/1 : 0 : ja Hospitals |x Business management.
650/2 : 0 : ja Hospitals |x Finance.
650/3 : 2 : ja Economics, Hospital
650/4 : 2 : ja Hospital Administration |x economics.

Raw LCSH headings:
Hospitals--Business management
Hospitals--Finance

Raw MeSH headings:
Economics, Hospital
Hospital Administration--economics

Extracted LCSH stems:
HOSPITALS
HOSPITALS -BUSINESS MANAGEMENT
HOSPITALS -FINANCE

Extracted MeSH stems:
ECONOMICS HOSPITAL
HOSPITAL ADMINISTRATION
HOSPITAL ADMINISTRATION -ECONOMICS

Heading pairs generated from subject headings in this bibliographic record (MeSH / LCSH):
ECONOMICS HOSPITAL / HOSPITALS
ECONOMICS HOSPITAL / HOSPITALS -BUSINESS MANAGEMENT
ECONOMICS HOSPITAL / HOSPITALS -FINANCE
HOSPITAL ADMINISTRATION / HOSPITALS
HOSPITAL ADMINISTRATION / HOSPITALS -BUSINESS MANAGEMENT
HOSPITAL ADMINISTRATION / HOSPITALS -FINANCE
HOSPITAL ADMINISTRATION -ECONOMICS / HOSPITALS
HOSPITAL ADMINISTRATION -ECONOMICS / HOSPITALS -BUSINESS MANAGEMENT
HOSPITAL ADMINISTRATION -ECONOMICS / HOSPITALS -FINANCE

```

Figure 3
Bibliographic-Derived Heading Pairs

This figure shows a bibliographic record that contains two two-element LCSH headings, one single-element MeSH heading, and one two-element MeSH heading. Three different heading stems are generated from the raw LCSH headings. Three stems are generated from the raw MeSH headings. From these three LCSH heading stems and three MeSH heading stems, the program produced nine output pairs showing nine potential points of correspondence between MeSH and LCSH.

and MeSH topical headings. (Figure 6 shows the distribution of Northwestern's bibliographic records which contained both MeSH and LCSH headings.) These bibliographic records represented 182,224 raw subject headings before decomposition and caused the generation of 400,732 heading pairs. Once duplicates were merged, there were 212,284 different potential heading pairs.

Raw MeSH heading:

Kidney Diseases—physiopathology—congresses

Portions of MeSH recognized subdivision list:

-
- CLASSIFICATION
- COMPLICATIONS
- CONGENITAL
- CYTOLOGY
-
- PHARMACOLOGY
- PHYSIOLOGY
- PHYSIOPATHOLOGY
- POISONING
-
-

Extracted MeSH heading stems:

KIDNEY DISEASES
KIDNEY DISEASES -PHYSIOPATHOLOGY

Figure 4

Consideration of Subdivisions

In this example the MeSH heading "Kidney Diseases—Physiopathology—Congresses" is under examination. The subdivision "Physiopathology" is present in the list of recognized subdivisions, but the subdivision "Congresses" is not. From this three-element heading the program generates two heading stems for matching against LCSH headings.

245.00: |a Genetic engineering.
260.00: |a London : |a New York : |b Academic Press, |c 1981-
300/1: |a v. : |b ill. : |c 23 cm.
362/1.0 : |a Vol. 1 (1981)-
650/1: 0: |a Genetic engineering.
650/2: 0: |a Recombinant DNA.
650/3: 2: |a Genetic Engineering |x periodicals
650/4: 2: |a DNA, Recombinant |x periodicals.

LCSH stems:

GENETIC ENGINEERING
RECOMBINANT DNA

MeSH stems:

GENETIC ENGINEERING
DNA RECOMBINANT

Headings pairs generated from subject headings in this bibliographic record (MeSH / LCSH)

GENETIC ENGINEERING / GENETIC ENGINEERING
GENETIC ENGINEERING / RECOMBINANT DNA
DNA RECOMBINANT / GENETIC ENGINEERING
DNA RECOMBINANT / RECOMBINANT DNA

Figure 5

Consideration of Subdivisions

This figure shows the consequences of the elimination of subdivisions with no subject content. The bibliographic record contains two single-element LCSH headings and two two-element MeSH headings. Two MeSH stems (instead of four) are generated from the two MeSH headings, because the subdivision "Periodicals" is discarded; four (instead of eight) potential pairs are generated from this bibliographic record.

3. Heading pairs from LC MARC bibliographic records

The MARC bibliographic file produced by the Library of Congress was known to contain bibliographic records with both LCSH and MeSH headings. Under the same assumption that guided our extraction of heading pair records from Northwestern's bibliographic records—that the frequency of co-occurrence of LCSH and MeSH headings indicated the probability of their representing the same topic—we felt that heading pairs taken from these bibliographic records could be an important addition to the information available to the subject editors.

We processed records in the LC MARC bibliographic file in a manner quite similar to that used for records in Northwestern's bibliographic file. Bibliographic records were selected if they contained both LCSH and MeSH headings; those headings were decomposed into their constituents; subdivisions with no subject content were excluded; all possible heading pairs were generated; the resulting heading pair records were sorted; and multiple occurrences of the same heading pair were merged into a single record showing the number of times the pair occurred in the LC MARC file.

Since LC MARC bibliographic records were not under local subject authority control, an extra step was added to the processing of LC MARC-derived potential heading pairs: the main term in each heading pair was

Distribution of Northwestern's Bibliographic Records (April 1990)

	Number of LCSH headings										
	1	2	3	4	5	6	7	8	9	+	
#	1	5481	2605	1256	459	178	104	39	22	9	8
2	3170	4272	2051	1098	411	202	75	41	20	7	
o	3	1107	2383	2147	1200	543	316	132	70	23	20
f	4	587	1351	1416	1204	538	313	134	75	44	25
5	220	555	687	681	459	276	132	69	24	26	
M	6	119	325	424	395	251	236	115	61	18	30
c	7	28	105	145	189	117	120	61	44	28	16
S	8	23	60	98	84	85	66	40	24	12	19
H	9	7	18	42	39	35	39	19	12	11	6
+	10	20	29	31	42	37	33	16	15	22	

Distribution of LC MARC Bibliographic Records (April 1990)

	Number of LCSH headings										
	1	2	3	4	5	6	7	8	9	+	
#	1	3685	1488	588	216	66	40	15	6	8	2
2	2025	4842	1023	1496	153	543	20	199	11	145	
o	3	681	1363	1749	607	219	520	47	44	129	113
f	4	338	2265	605	2594	205	881	63	547	19	356
5	130	328	293	397	321	212	37	58	18	144	
M	6	67	721	627	1104	106	1568	45	451	221	737
c	7	13	95	72	158	50	136	86	80	35	101
S	8	16	327	51	801	25	650	16	675	21	588
H	9	3	30	185	50	26	371	8	42	295	340
+	5	220	253	661	144	1061	84	835	495	4075	

Figure 6

The column labels show the number of LCSH headings per record; the row labels show the number of MeSH headings per record. For example, in the Northwestern file 2,605 records contained two LCSH headings and one MeSH heading, while in the LC MARC file 1,488 records contained two LCSH headings and one MeSH heading.

compared against the appropriate authority file. If the heading was not found at all, the whole pair was discarded; if the heading matched a cross-reference, the heading was flipped to the current form. If the heading was a miscoded geographic heading, the pair was discarded. Pairs containing 452 different MeSH headings were changed to the current form; pairs containing 7 miscoded geographic headings were deleted; pairs containing 4,925 unrecognized MeSH headings were deleted. Pairs containing 302 different LCSH headings were changed to the current form; pairs containing 64 miscoded geographic headings were deleted; pairs containing 2,930 unrecognized LCSH headings were deleted.

There were 50,680 different bibliographic records in the LC MARC file that contained both MeSH and LCSH topical headings, which caused the generation of 433,625 raw heading pair records. (Figure 6 also shows the distribution of LC MARC bibliographic records that contained both MeSH and LCSH headings.) After processing for unestablished headings, there were 425,699 LC MARC-derived potential pairs. Once duplicates were merged, there were 234,120 different potential heading pairs.

4. Heading pairs from the NLM tape

The fourth and final source of subject mapping information used in this project was a tape of records that identified correspondences between MeSH and LCSH headings, supplied to us by the National Library of Medicine (the NLM "tape"). A version of the data on this tape now forms part of NLM's ongoing Unified Medical Language System Project.

(a) NLM tape record for LIVER EXTRACTS

HM = Liver Extracts
OV = Liver extract

Heading pair generated from this NLM tape record (MeSH / LCSH)

LIVER EXTRACTS / LIVER EXTRACT

(b) NLM tape record for MENTAL HEALTH—IN OLD AGE

HM = Mental Health / in old age
OV = Aged / Mental health

Heading pair generated from this NLM tape record (MeSH / LCSH)

MENTAL HEALTH -IN OLD AGE / AGED -MENTAL HEALTH

Figure 7

Single Equivalences from the NLM Tape
In this (and the following figures 8–10) showing tape records from the NLM tape, the label "HM=" identifies MeSH headings (the "Heading Being Mapped"); the label "OV=" identifies LCSH headings (the "Heading in the Other Vocabulary"). A virgule (/) precedes subdivisions. The tape record in (a) is interpreted in this manner: the topic conveyed by the MeSH heading "Liver Extracts" is represented in the LCSH system by the heading "Liver Extract." The tape record in (b) is interpreted in this manner: the topic conveyed by the MeSH heading "Mental Health—in Old Age" is represented in the LCSH system by "Aged—Mental Health."

The most common type of record on the NLM tape is that which indicates a one-for-one correspondence (equivalence) between headings in the two subject systems (figure 7). From such NLM tape records, a single output pair record was generated. Another type of record identified cases in which there are two or more different ways to express a concept in a subject heading system; we called these alternatives (figure 8). From such NLM tape records, an output heading pair record for each alternative was generated. A third type of record on the NLM tape shows cases in which two or more headings in one subject system must be used together to form an equivalent for the heading in the other system; we called these coordinate headings (figure 9). From such records an output heading pair record for each heading in the coordinate group was generated. Finally there were some "alternative" records on the NLM tape in which one or more of the alternatives were themselves coordinates (figure 10). The program that examined the NLM tape also generated a set of codes to identify heading pairs derived from records that contained equivalences, alternatives, or coordinates. These codes were translated into printed labels on the final subject mapping reports (see below for a discussion of the subject mapping reports).

The heading pairs extracted from the NLM tape were also matched against established headings and *see* references in LCSH and MeSH authority records and "flipped" to the current form when necessary, as described above for heading pairs derived from biblio-

(a) NLM tape record for BONE AND BONES

HM = Bone and Bones
OV = Bone
OV = Bones

Heading pairs generated from this NLM tape record (MeSH / LCSH)

BONE AND BONES / BONE
BONE AND BONES / BONES

(b) NLM tape record for HISTOCYTOCHEMISTRY

HM = Histochemistry
OV = Cytochemistry
OV = Histochemistry

Heading pairs generated from this NLM tape record (MeSH / LCSH)

HISTOCYTOCHEMISTRY / CYTOCHEMISTRY
HISTOCYTOCHEMISTRY / HISTOCHEMISTRY

Figure 8

Alternates from the NLM Tape

An NLM tape record for an "alternative" describes cases in which two or more headings in one subject system could each be considered an equivalent for a heading in the other subject system. The NLM tape record in (a) is interpreted in this manner: the topic conveyed by the MeSH heading "Bone and Bones" is represented in the LCSH system with by the heading "Bone" or by the heading "Bones." The NLM tape record in (b) is interpreted in this manner: the topic conveyed by the MeSH heading "Histochemistry" is represented in the LCSH system by either the heading "Cytochemistry" or by the heading "Histochemistry."

(a) NLM tape record for BONE AND BONES + DENSITOMETRY X RAY

HM = Bone and Bones + Densitometry, X-Ray
OV = Bone densitometry

Heading pairs generated from this NLM tape record (MeSH / LCSH)

BONE AND BONES / BONE DENSITOMETRY
DENSITOMETRY X RAY / BONE DENSITOMETRY

(b) NLM tape record for HOSPITALS PSYCHIATRIC + OUTPATIENT CLINICS HOSPITAL

HM = Hospitals, Psychiatric + Outpatient Clinics, Hospital
OV = Psychiatric hospitals / Outpatient services

Heading pairs generated from this NLM tape record (MeSH / LCSH)

HOSPITALS PSYCHIATRIC / PSYCHIATRIC HOSPITALS -OUTPATIENT SERVICES
OUTPATIENT CLINICS HOSPITAL / PSYCHIATRIC HOSPITALS -OUTPATIENT SERVICES

Figure 9

Coordinates from the NLM Tape

An NLM tape record for "coordinates" describes cases in which two or more headings in one subject system must be used together in the same bibliographic record to form an equivalent from a heading in the other subject system. The NLM tape record in (a) is interpreted in this manner: the topic conveyed by the MeSH headings "Bone and Bones" and "Densitometry X Ray" when those headings are used together in one bibliographic record, is represented in the LCSH system by the single heading "Bone Densitometry." The NLM tape record in (b) is interpreted in this manner: the topic conveyed by the MeSH headings "Hospitals Psychiatric" and "Outpatient Clinics Hospital" when used together in one bibliographic record is represented in the LCSH system by the single heading "Psychiatric Hospitals—Outpatient Clinics."

graphic records in the LC MARC file. The NLM tape had been prepared several years before it was used in this project, and consequently contained a number of outdated headings.

The 10,997 records on the NLM tape mapped 11,584 MeSH to 12,408 LCSH headings. A total of 17,079 heading pair records were generated from the NLM tape. Pairs containing 6 different MeSH and 151 different LCSH headings were flipped to the current form, and 332 MeSH and 4 LCSH pairs containing geographic headings were removed. This left 16,753 heading pairs derived from the NLM tape.

In addition to the machine-readable heading pair records generated from the NLM tape, we also printed a copy of the 4,368 records on the tape that contained alternates or coordinates, and generated an alphabetic index to each heading in these records. This separate register and index made it possible for the subject editors to move from a pair extracted from the NLM tape printed in the final subject mapping report to the original complex record when necessary.

Subject mapping reports

In an elaborate series of merging operations, potential heading pairs from Northwestern's bibliographic file and the LC MARC file, heading pairs extracted from the NLM tape, and authority-derived authorized pairs, were combined into a master tape file of 310,507 different heading pair records. This master tape was sorted as needed, and used to generate two different final subject

HM = Brain / blood supply + Brain / surgery
HM = Cerebral Arteries / surgery
HM = Cerebral Veins / surgery
OV = Brain / Blood vessels / Surgery

Heading pairs generated from this NLM tape record (MeSH / LCSH):

BRAIN -BLOOD SUPPLY / BRAIN -BLOOD VESSELS -SURGERY
BRAIN -SURGERY / BRAIN -BLOOD VESSELS -SURGERY
CEREBRAL ARTERIES -SURGERY / BRAIN -BLOOD VESSELS -SURGERY
CEREBRAL VEINS -SURGERY / BRAIN -BLOOD VESSELS -SURGERY

Figure 10

NLM Tape Record with both Alternatives and Coordinates

This record is interpreted in this manner: The topic conveyed by any of the following MeSH headings: "Brain—Blood Supply" and "Brain—Surgery" when those headings appear together in one bibliographic record; or "Cerebral Arteries—Surgery"; or "Cerebral Veins—Surgery," is represented in the LCSH system by the single heading "Brain—Blood Vessels—Surgery."

mapping reports for use by the subject editors. One of these reports lists, under each MeSH heading, most (but in some cases not necessarily all) of the LCSH headings defined as potential equivalents for it. The editors called this the MeSH printout. The other report lists, under each LCSH heading, most (but not necessarily all) MeSH headings identified as potential equivalents. The editors called this the LCSH printout.

As noted above, not all of the potential heading pairs were printed on the reports. The following restriction was applied to the printing of the MeSH report. Under all MeSH headings that were paired at least 80 times with LCSH headings in Northwestern and LC MARC bibliographic records, those LCSH headings that were paired 4 or fewer times were excluded from the report, unless the heading pair had been identified on the NLM tape or through authority records. A similar restriction was applied to the LCSH report. We assumed that heading pairs that occurred so infrequently were of doubtful interest or utility to the subject editors. These restrictions reduced considerably the size of the reports (which were still quite large, the MeSH printout containing 3,770 pages and the LCSH printout containing 5,070 pages).

Figures 11–13 show typical record groups taken from the MeSH printout. The MeSH headings are listed in alphabetical order. Each different MeSH heading (or heading-subdivision combination) is followed on the same line by two numbers in parentheses, showing the number of times the heading was found paired with any LCSH heading in (1) Northwestern's bibliographic records and (2) LC MARC bibliographic records. On the lines following each MeSH heading, the LCSH headings paired with the MeSH heading appear in descending order of frequency of occurrence. The numbers at the left of each LCSH heading are the number of times that heading was paired with the MeSH heading in (1) Northwestern's bibliographic records and (2) LC MARC bibliographic records. The numbers in the parentheses at the

right of each LCSH heading are the number of times the LCSH heading was paired with *different* MeSH headings in (1) Northwestern's bibliographic records and (2) LC MARC bibliographic records. The area to the left of the LCSH and MeSH headings and their accompanying numbers is reserved for codes representing information discovered on the NLM tape and in LCSH and MeSH authority records. Some of the more frequently used codes are: "N" which indicates that the pair was ex-

HEARING (166/162 TOTAL PR.)		
N	A	E
		33/ 25 HEARING (+120/96)
		8/ 12 AUDIOLOGY (+164/113)
		8/ 9 HEARING DISORDERS (+150/141)
		6/ 9 SPEECH (+97/119)
		8/ 5 AUDITORY PATHWAYS (+106/70)
		5/ 5 AUDITORY PERCEPTION (+37/21)
		2/ 6 SPEECH DISORDERS (+238/214)
		5/ 2 NEUROPHYSIOLOGY (+462/409)
		3/ 3 NOISE (+20/15)
		3/ 2 AUDIOMETRY (+71/78)
		3/ 2 COCHLEA (+28/22)
		2/ 3 DEAFNESS (+91/83)
		3/ 2 EAR (+199/217)
		3/ 2 PSYCHOACOUSTICS (+23/17)

Figure 11

Final Subject Mapping Report

Portion of the MeSH subject mapping report for the MeSH main heading "Hearing." This MeSH heading appeared in 166 heading pairs derived from bibliographic records in Northwestern's file, and in 162 heading pairs derived from bibliographic records in the LC MARC file. The LCSH heading "Hearing" was paired more often with this MeSH heading (33 times in Northwestern's bibliographic records, 25 in LC MARC bibliographic records) than with any other LCSH heading. The LCSH heading "Hearing" appears in 120 other heading pairs derived from Northwestern's bibliographic records, and 96 from LC MARC bibliographic records. The LCSH heading listed second, "Audiology," appears with the MeSH heading "Hearing" only one-third as often as the LCSH heading "Hearing." The codes to the left of the LCSH heading "Hearing" are interpreted as follows: "N" indicates that this pair was identified as an equivalent on the NLM tape; "A" indicates that this is an authority-derived pair; and "E" indicates that the two headings are one-for-one equivalents, identical after normalization.

HYPERSENSITIVITY (204/217 TOTAL PR.)		
Ax1x2		60/ 65 ALLERGY (+127/141)
		11/ 10 ALLERGY IN CHILDREN (+14/9)
		8/ 7 IMMUNOLOGY (+442/470)
		8/ 6 IMMUNOLOGIC DISEASES (+160/139)
		4/ 2 ASTHMA (+123/127)
		2/ 4 INSECTS -VENOM (+5/10)
		3/ 2 ALLERGY -PATHOGENESIS (+12/10)
		3/ 2 CHILDREN (+1383/1324)
		3/ 2 CHILDREN -DISEASES (+303/307)
		2/ 3 RESPIRATORY ALLERGY (+12/13)

Figure 12

Final Subject Mapping Report

Portion of the MeSH subject mapping report for the MeSH main heading "Hypersensitivity." This MeSH heading appeared more often in Northwestern's bibliographic records and the LC MARC database with the LCSH heading "Allergy" than it occurred with any other LCSH heading. (The LCSH heading listed next, "Allergy in Children," appears in only one-sixth as many pairs as does "Allergy.") This pair was not identified on the NLM tape. (There is no "N" code.) The code "Ax1x2" means that there are mutual *see* references between these two headings (i.e., the MeSH authority record for "Hypersensitivity" contains a 450 field for "Allergy"; and the LCSH record for "Allergy" contains a 450 field for "Hypersensitivity.")

tracted from the NLM tape; "A" which indicates that the pair was an authorized (authority-derived) heading pair; and "E" which indicates that the headings in the pair are equivalent after normalization. More complex relationships such as cross-references for authorized heading pairs or coordinates from the NLM tape are shown in figures 12 and 13.

Editorial Work

The subject editors examined each record group in the MeSH subject mapping report, from first page to last, and made a decision regarding the equivalence of each MeSH heading with one or more of the LCSH headings listed on the report with it. As they proceeded, the editors marked points of equivalence between the two systems with a series of predefined codes. (These codes

GENETIC ENGINEERING (269/233 total pr.)		
A	E	50/ 45 GENETIC ENGINEERING (+139/135)
		11/ 8 RECOMBINANT DNA (+98/94)
		2/ 14 BIOTECHNOLOGY (+54/167)
		7/ 6 GENETIC ENGINEERING -SOCIAL ASPECTS (+13/13)
		7/ 5 HUMAN GENETICS (+193/122)
		6/ 4 MEDICAL GENETICS (+433/320)
		6/ 3 MOLECULAR CLONING (+34/24)
		6/ 2 GENE EXPRESSION (+376/239)
		3/ 4 HUMAN GENETICS -SOCIAL ASPECTS (+9/19)
		3/ 2 GENE THERAPY (+6/7)
		4/ 2 MICROBIAL GENETICS (+74/21)
		2/ 4 PROTEIN ENGINEERING (+12/19)
		5/ 1 SEX PRESELECTION (+6/3)
		2/ 3 GENE AMPLIFICATION (+9/10)
		4/ 1 GENETIC REGULATION (195/127)
		3/ 2 HUMAN REPRODUCTION (+24/32)
		3/ 2 PROTEINS (+638/467)
Ne1		2/ 1 GENETIC ENGINEERING -GOVERNMENT POLICY (+3/2)

Figure 13

Final Subject Mapping Report

Portion of the MeSH subject mapping report for the MeSH main heading "Genetic Engineering." This MeSH heading appeared five times more often in Northwestern's bibliographic records and the LC MARC database with the LCSH heading "Genetic Engineering" than it occurred with any other LCSH heading. The code "Ne1" at the start of the last line indicates that the MeSH heading "Genetic Engineering" when used in the same bibliographic record with some other MeSH heading (identified in the register of complex NLM tape records as "Public Policy"), forms an equivalent for the LCSH heading "Genetic Engineering—Government Policy."

MeSH:	Cognitive Dissonance
LCSH:	Cognitive dissonance
MeSH:	Aspirin
LCSH:	Aspirin
MeSH:	Pharmacology, Clinical
LCSH:	Clinical pharmacology
MeSH:	Management Quality Circles
LCSH:	Quality circles
MeSH:	Drug Hypersensitivity
LCSH:	Drug allergy
MeSH:	Mammary Tumor Viruses, Mouse
LCSH:	Mouse mammary tumor virus

Figure 14

Examples of one-to-one correspondences between MeSH and LCSH headings that were mapped.

were used at a later stage to guide the modification of authority records by a library assistant.)

As stated above, the general principle followed was to identify and map one-to-one correspondences between LCSH and MeSH *main* headings (figure 14). That is, for the editors to map an LCSH and MeSH heading onto each other, the headings had to be co-extensive; one could not be broader or narrower than the other. The existing *see also* reference structure was relied on to direct a user from a known heading to a broader or narrower heading (figure 15).

The first important exception to this general principle was made when one system used a single broad term for a concept and the other system used a very limited number of headings for various aspects of the broader concept, *and* there were no *see also* references linking the broader and narrower terms. Examples are shown in figure 16. This situation is parallel to the "alternative" headings identified on the NLM tape.

The second important exception to the general editorial principle was made when two headings in one subject system, each representing an independent con-

(a)	MeSH: Chromosomes, Human, 1-3 xr Chromosomes, Human	(narrower heading)
	LCSH: Human Chromosomes	(broader heading)
	MeSH: Ganglia, Sympathetic xr Ganglia, Autonomic	(narrower heading)
	LCSH: Autonomic ganglia	(broader heading)
(b)	MeSH: Surgery	
	LCSH: Chemosurgery xr Surgery	(narrower heading)
		(broader heading)
	MeSH: Natural Disasters	
	LCSH: Earthquakes xr Natural disasters	(narrower heading)
		(broader heading)

Figure 15

(a) Examples of narrower MeSH headings (for which there were no corresponding LCSH headings) that were not mapped to a broader LCSH heading, because the narrower MeSH headings were linked to the broader MeSH and LCSH headings by *see also* references. In these cases only the broader MeSH and LCSH headings were mapped. (b) Examples of narrower LCSH headings (for which there were not mapped to a broader LCSH heading. In these cases too only the broader MeSH and LCSH headings were mapped.

MeSH: Neoplasms
LCSH: Cancer Tumors
MeSH: Surgery
LCSH: Surgery Surgeons Surgery, Experimental
MeSH: Allergy and Immunology
LCSH: Allergy Allergists Immunology Immunologists

Figure 16

Examples of correspondences that were not one-to-one. In each case the multiple LCSH headings were mapped to the single MeSH heading.

cept, would, if used together in a single bibliographic record, form an exact equivalent for a heading in the other subject system (figure 17). This situation is parallel to the "coordinate" headings identified on the NLM tape.

Another exception was made in about 20 cases in which a MeSH main heading corresponded to an LCSH subheading and there was no corresponding LCSH main heading. For example, **FOREIGN BODIES** is a main heading in MeSH, but there is no corresponding main heading in LCSH. Instead, this concept is represented by a subdivision in LCSH, which was mapped to the MeSH main heading.

The principle of mapping only main headings was expanded to include cases in which a main heading in one system was expressed as a main heading/subheading combination in the other system (figure 18). On the other hand, correspondences between MeSH and LCSH headings were not mapped when *both* headings consisted of a main heading/subheading combination (figure 19). There were three reasons for this latter policy: the main headings in the two systems were normally already mapped; the correspondences between subdivisions in the two systems are often not precise enough to allow for reliable mapping; and the number of correspondences to be identified and recorded if each possible main heading and subheading combination were to

(a)	MeSH: Bone and Bones + Densitometry, X-ray
	LCSH: Bone densitometry
	MeSH: Endocrinology + Gynecology
	LCSH: Endocrine gynecology
(b)	MeSH: Obesity in Diabetes
	LCSH: Obesity + Diabetes
	MeSH: Synaptic Membranes
	LCSH: Synapses + Membranes (Biology)

Figure 17

Coordinates Mapped by the Project

(a) Examples of two MeSH headings used together in the same record that correspond to a single LCSH heading. (b) Examples of two LCSH headings used together in the same re-

MeSH: Liver Regeneration
LCSH: Liver--Regeneration
MeSH: History of Medicine, 17th Cent.
LCSH: Medicine--History--17th century
MeSH: Cholangiography
LCSH: Bile ducts--radiography
MeSH: Art Therapy--in old age
LCSH: Art therapy for the aged
MeSH: Skin Diseases--in infancy & childhood
LCSH: Pediatric dermatology

Figure 18

Examples in which a simple main heading in one system was mapped to a main heading/subheading combination in the other system.

MeSH: Biliary Tract--radiography
 LCSH: Biliary tract--Radiography

MeSH: Nursing--standards
 LCSH: Nursing--standards

MeSH: Neoplasms--therapy
 LCSH: Cancer--treatment

MeSH: Mental Health--in old age
 LCSH: Aged--Mental health

Figure 19
 Examples of headings not mapped, because each consisted of a main heading/subheading combination.

be examined would require much more work than was possible, given the limits of the project.

As may be expected, given the vagaries of the English language, not all mapping decisions were straightforward. A recurring problem that had to be guarded against consistently was that of the "false match." False matches were cases in which established headings in the two systems, or a see reference in one system and an established heading in the other system, were identical (after normalization) yet represented different concepts (figure 20 shows some examples of false matches). False matches that involved pairs

Crowns	MeSH: dental crowns	LCSH: royal regalia
Compliance	MeSH: a yielding of materials to stress	LCSH: a behavior related to "conformity"
Drainage	MeSH: a surgical technique	LCSH: an agricultural technique
Labor	MeSH: physiological process of giving birth	LCSH: human activity that produces goods and services in an economy
Microspheres	MeSH: a small particle of a mixture	LCSH: a shell of a certain Foraminifera

Figure 20
 Examples of False Matches between Main Headings

(a) MeSH record before modification: 150: 0: ja Chronology 450: 0: ja Date	(b) MeSH record before modification: 150: 0: ja Dissociative Disorders 450: 0: ja Fugue
LCSH record: 150: 0: ja Date	LCSH record: 150: 0: ja Fugue
MeSH record after modification: 150: 0: ja Chronology 450: 0: ja Dates	MeSH record after modification: 150: 0: ja Dissociative Disorders 450: 0: ja Fugue (Psychology)

Figure 21
 Modifications to Authority Records to Resolve "False Matches" between Cross References and Established Headings.
 (a) The LCSH heading represents the fruit of the date plan. Making the MeSH reference plural eliminates the false match.
 (b) The LCSH heading represents a musical form. Adding a qualifier to the MeSH reference eliminates the false match.

of main headings were not resolved by the editors. This problem could only be solved by changing one or both of the headings, which would require the cooperation of the Library of Congress and the National Library of Medicine.

By contrast, a "false match" between a *see* reference and a heading could usually be resolved by the editors. The conflicting reference was simply modified in some manner so that it would no longer match the heading. (Commonly a "qualifier" was added to the reference as shown.)

In a number of cases, MeSH and LCSH use the same noun, but one system uses the singular form while the other uses the plural. The plural form might represent a class of objects (e.g., a class of chemical compounds) and the singular form the most common or best-known member of that class. Unfortunately, it often seems that the heading in the singular form may also be used to represent the entire class of objects (figure 22). The editors generally mapped singular and plural headings unless evidence in the authority records indicated that no mapping should be made.

Several other areas also presented challenges to the subject editors. The ones most frequently encountered are listed below.

- Significant problems involving biological classifications were encountered. Uncertain clashes in the two systems between popular and scientific names and between different scientific or popular names made this part of the editorial work especially burdensome.
- Both systems used enzyme nomenclature inconsistently—not always following the standards for naming enzymes. At times this made it difficult to decide if two headings that appeared to represent the same enzyme should in fact be mapped.

MeSH: Acetamides	LCSH: Acetamide
MeSH: Acetic Acids	LCSH: Acetic acid
MeSH: Benzofurans	LCSH: Benzofuran
MeSH: Bicuspids	LCSH: Bicuspids
MeSH: Fibroma	LCSH: Fibromas

Figure 22
 Singular/Plural Problems
 Typical examples in which one subject system uses a noun in the singular form, and the other uses the noun in the plural form. In a large number of cases (including those shown above, the headings were mapped.)

Examples of MeSH headings not mapped because no corresponding established LCSH heading could be found:

Mucociliary Clearance
 Night Blindness
 Propranolol
 Streptirhini
 Tumor Viruses, Murine

Examples of LCSH headings not mapped because no corresponding established MeSH heading could be found:

Chemotherapy
 Correlation (Statistics)
 Lemurs
 Medicine, Chronothermal
 PONS test

Figure 23
 Typical Headings Not Mapped

- Particularly frustrating was an old LC practice of not establishing a heading for some chemicals, drugs, and taxonomic names for biological species and genera, even though LC used them as subject headings in bibliographic records. Consequently, we were unable to map these LCSH headings to their corresponding MeSH headings, because in order to do so we would have had to contravene one of the basic principles that we were following, viz., not establishing new main headings.

In making their mapping decisions, the editors routinely consulted the subject mapping print-outs, the report and index of NLM tape records showing coordinates and alternatives, the authority and bibliographic records in Northwestern's online NOTIS file, the *MeSH Tree Structures*, and several standard medical dictionaries. However, not all decisions could be made by the editors based solely on these materials. Some decisions had to be deferred until research at Northwestern's Health Sciences Library or Science and Engineering Library could be conducted to determine where the proper mapping should be made.

Finally, there were many headings that simply could not be mapped. Failure to map commonly occurred either because no equivalent existed at all in one system for a heading in the other system, or because the closest equivalent was actually a broader or narrower term for a concept already mapped and connected to the related term with a *see also* reference. Figure 23 gives examples of headings from both systems that were not mapped.

Modifications to Authority Records

In 1990 and 1991, when the mapping of the 1990 LCSH

```
HS# CAZ9480 FMT A RT z DT 06/11/89 R/DT 06/01/95 STAT la E/L n
SRC b ROM n MOD ? UNIQUE n GOVT.? S/SYS c DI/ SUBD n NUM n S/TYP n
NAME b SUBJ c SER b KIND a H/ESTAB a T/EVAL b IP a RULES n
```

```
035/1: : ja (DNLM)D006309
040: : ja DNLM jc DNLM
072/1: : ja F2 .x 830 .x 816 .x 263
072/2: : ja G11 .ja 561 .x 796 .x 263
150: 0: ja Hearing
360/1: : |i consider also terms at ja ACOUSTIC ja AUDIO-
550/1: 0: |w g ja Sensation |5 IEN-M
550/2: 0: |w h ja Auditory Perception |5 IEN-M
550/3: 0: |w h ja Bone Conduction |5 IEN-M
667/1: : ja differentiate from AUDITORY PERCEPTION: aud percept takes place in the
brain; hearing takes place in the ear. TN 98. PSYCHOACOUSTICS is also available; AMERICAN
SPEECH-LANGUAGE-HEARING ASSOCIATION is available; CATALOG: form qualif
permitted
680/1: : |i The sensation of sound
750/1: 0: ja Hearing |5 IEN-M
```

```
NU# BZQ9518 FMT A RT z DT 05/30/86 R/DT 10/21/93 STAT gc E/L n
SRC ROM ? MOD UNIQUE n GOVT ? S/SYS a DI ? SUBD n NUM n S/TYP n
NAME b SUBJ c SER b KIND a H/ESTAB a T/EVAL b IP a RULES n
```

```
010: : ja sh 85059612
040: : ja DLC jc DLC
053/1: : ja BF251 jc Psychology
053/2: : ja GN275 jc Anthropology
053/3: : ja QP460 |b QP469.3 jc Physiology
150: 0: ja Hearing
450/1: 0: ja Acoustics
450/2: 0: ja Audition (Physiology)
450/3: 0: ja Physiological acoustics
550/1: 0: |w g ja Bioacoustics
550/2: 0: |w g ja Senses and sensation
550/3: 0: ja Audiology
550/4: 0: ja Auditory pathways
550/5: 0: ja Deafness
550/6: 0: ja Ear
550/7: 0: ja Listening
750/1: 2: ja Hearing |5 IEN
```

Figure 24
 Examples of Modified Authority Records
 Top: MeSH authority record with a linking entry (750) field containing the corresponding LCSH heading.
 Bottom: LCSH authority record with a linking entry (750) field containing the corresponding MeSH heading.

and 1989 MeSH was carried out, there were no "Subject Mapping" fields or "Linking Entry" fields defined for the *USMARC Authority Format*. Consequently, we locally defined a new field in the MARC authorities format (which we called the "subject mapping field," and to which we assigned the tag 695). This field contained the equivalent in another subject heading system for the term in the 150 field of the authority record. (We later generalized the definition of the subject mapping field, and sent a proposal to MARBI that it be added to the *USMARC Authorities Format*. The field was eventually added as one of the 7XX linking entry fields.)

A library assistant reviewed the subject mapping report marked by the editors and made the appropriate modifications to the indicated LCSH and MeSH authority records. In general for each point of correspondence between LCSH and MeSH identified by the editors, the library assistant added at least one subject mapping field to authority records for each involved heading. The library assistant also added *see from* tracings to authority records or modified *see from* tracings (usually to resolve false matches) in authority records, when so directed by

the subject editors. Finally, in order to record mapping data, the library assistant created authority records for main heading/subheading combinations if there was no existing authority record. For example, in order to record

```
HS# CBA0153 FMT A RT z DT 06/11/89 R/DT 06/01/95 STAT la E/L n
SRC b ROM n MOD ? UNIQUE n GOVT ? S/SYS a D/I ? SUBD n NUM n S/TYP n
NAME b SUBJ c SER b KIND a H/ESTAB a T/EVAL b IP a RULES n
```

```
035/1: : ja (DNLM)D006967
040: : ja DNLM jc DNLM
072/1: : ja C20 .x 543
150: 0: ja Hypersensitivity
450/1: 0: iw nna ja Allergies
450/2: 0: ja Allergy
550/1: 0: iw g ja Immunologic Diseases [5 IEN-M
550/2: 0: iw h ja Drug Hypersensitivity [5 IEN-M
550/3: 0: iw h ja Food Hypersensitivity [5 IEN-M
550/4: 0: iw h ja Hypersensitivity, Delayed [5 IEN-M
550/5: 0: iw h ja Hypersensitivity, Immediate [5 IEN-M
550/6: 0: iw h ja Photosensitivity Disorders [5 IEN-M
667/1: : ja IM; use qualif with caution; atopic = HYPERSENSITIVITY, IMMEDIATE;
to food = FOOD HYPERSENSITIVITY, to light = PHOTSENSITIVITY DISORDERS;
RESPIRATORY HYPERSENSITIVITY is also available; CATALOG: form qualif permitted
680/1: : |j Altered reaction to an antigen, which can result in pathologic reactions upon
subsequent exposure to that particular antigen.
688/1: : ja 66; was ALLERGY 1963-65
750/1: 0: ja Allergy [5 IEN-M
```

```
NU# BZK3568 FMT A RT z DT 05/30/86 R/DT 01/07/93 STAT gc E/L n
SRC ROM ? MOD UNIQUE n GOVT ? S/SYS a D/I ? SUBD n NUM n S/TYP n
NAME b SUBJ c SER b KIND a H/ESTAB a T/EVAL b IP a RULES n
```

```
010: : ja sh 85003662
040: : ja DLC jc DLC
150: 0: ja Allergy
450/1: 0: ja Allergic diseases
450/2: 0: ja Allergies
450/3: 0: ja Hypersensitivity
450/4: 0: ja Hypersensitivity, Immediate
450/5: 0: ja Immediate allergy
450/6: 0: ja Immediate hypersensitivity
550/1: 0: iw g ja Immunologic diseases
550/2: 0: ja Immunoglobulin E
670/1: : ja MeSH [b (Hypersensitivity x Allergy)
670/2: : ja LC data base, 10/2/92 [b (allergic diseases)
750/1: 2: ja Hypersensitivity [5 IEN
750/2: 2: ja Allergy and Immunology [5 IEN
```

Figure 25

Examples of Modified Authority Records

Top. MeSH authority record with a linking entry (750) field containing the corresponding LCSH heading.

Bottom: LCSH authority record with two linking entry (750) fields

```
NU# BZL5426 FMT A RT z DT 05/30/86 R/DT 07/14/95 STAT ma E/L n
SRC ROM ? MOD UNIQUE n GOVT ? S/SYS a D/I ? SUBD n NUM n S/TYP n
NAME b SUBJ c SER b KIND a H/ESTAB a T/EVAL b IP a RULES n
```

```
010: : ja sh 85015520
040: : ja DLC jc DLC
150: 0: ja Bone densitometry
450/1: 0: ja Densitometry, Bone
550/1: 0: iw g ja Body composition
550/2: 0: iw g ja Bones [x Radiography
550/3: 0: iw g ja Calcium in the body
750/1: 2: [8 1 [w b ja Bone and Bones [5 IEN
750/2: 2: [8 1 [w b ja Densitometry, X-Ray [5 IEN
788/3: 2: |j Search also under the following headings used together in the same
record ja Bone and Bones [j and ja Densitometry, X-Ray [5 IEN
```

Figure 26

Example of Modified Authority Record

In this case two MeSH headings have to be used together in the same record in order to form an equivalent to the LCSH heading in the 150 field. The MeSH headings are entered into 750 linking entry fields, but the display of these fields in the OPAC will be suppressed by the coding in the /w subfields. Instead the complex linking entry (788) field will be displayed. Also note that the LCSH heading will not be entered into 750 linking entry fields in the corresponding MeSH authority records.

the mapping of the MeSH heading EYELID NEOPLASMS to the LCSH heading EYELIDS—CANCER, an LCSH authority record had to be created. (Note that this was not contrary to the general principle in that we were not establishing a new main heading, but were using an existing main heading to establish a main heading/subheading combination.)

When the 7XX "Linking Entry" fields were defined for the *USMARC Authority Format*, a batch program was run to convert the locally defined 695 "subject mapping fields" to the appropriate "Linking Entry" fields. Figures 24-26 show linking entry fields added to authority records. Figure 27 contains a summary of the modifications made to authority records.

As was mentioned above, the editors attempted to consider the existing *see also* reference structures of the two subject heading systems when determining whether a mapping was appropriate, especially when the "broader" term was already mapped. At the time that the mapping was performed, this was made difficult because the *see also* structure in MeSH was implied rather than manifest, being present only in coded form in the 072 fields contained in MeSH authority records. (The 072 field does not form a part of any public catalog display in the NOTIS system.) The editors recognized the value of having the syndetic structure of the MeSH system made apparent to users of the public catalog, as well as to staff. Therefore, in early 1991, a new job translated the 072 fields in MeSH authority records into explicit *see also* references tracings, which in turn were

Authority records with subject mapping fields:

```
LCSH: 9,427
MeSH: 8,799
Total authority records with subject mapping fields: 18,226
```

See from reference tracings (450 fields) added:

```
LCSH: 590
MeSH: 918
Total see from reference tracings added: 1,508
```

Subject mapping fields added:

```
To LCSH records:
1: MeSH matches LCSH 150: 3,192
2: MeSH matches LCSH after normalization: 1,664
3: MeSH matches LCSH 450: 782
4: MeSH matches LCSH 450 after normalization: 924
5: No match between LCSH and MeSH: 3,194
6: LCSH matches multiple MeSH headings: 71
7: LCSH matches MeSH subdivision: 0
Incorrectly coded fields: 6
Total mapping fields added to LCSH records: 9,823
```

To MeSH records:

```
1: LCSH matches MeSH 150: 3,192
2: LCSH matches MeSH after normalization: 1,663
3: LCSH matches MeSH 450: 836
4: LCSH matches MeSH 450 after normalization: 1,273
5: No match between MeSH and LCSH: 2,795
6: MeSH matches multiple LCSH headings: 43
7: MeSH matches LCSH subdivision: 21
Incorrectly coded fields: 1
Total mapping fields added to MeSH records: 9,824
```

Figure 27

Records Modified During Project

This table enumerates changes to MeSH and LCSH authority records.

instantly available to users of the public catalog. Nearly 40,000 new *see also* references were added. Figure 28 shows the process used, along with the resulting OPAC display.

Statistical Analysis of the Subject Mapping Data

We wished to demonstrate the validity of the assumption underlying our use of headings from bibliographic records: that MeSH and LCSH headings that occur together frequently in bibliographic records represent the same concept. Statistical information about the mapping project was collected by a job sequence, which consisted chiefly of programs from the data collection jobs—along with a new program. Two sets of heading pairs were used in this job sequence: one derived from the subject mapping fields in LCSH and MeSH authority records; the other from subject headings found in bibliographic records in Northwestern's bibliographic file. Subdivisions with no subject content were removed from bibliographic-derived headings, as was done when processing headings for the original subject mapping report, but the headings were not decomposed into heading stems.

After the bibliographic-derived pairs were sorted and duplicates counted and merged, they were compared with mapped heading pairs generated from subject mapping fields in authority records. Each authority-derived pair was assigned a score: "1" if the MeSH heading in the mapped pair occurred in bibliographic-derived pairs more frequently with the LCSH heading to which it had been mapped by the subject editors than with other LCSH headings; "0" if the MeSH heading in the mapped pair did not occur in bibliographic-derived pairs more frequently with the LCSH heading to which it was mapped than with other LCSH headings. In other words, a mapped pair was assigned a value "1" if the LCSH heading appeared at the top of the list of LCSH headings under the MeSH heading in the subject mapping report because of its frequency of occurrence, and the value "0" if it did not appear at the top of the list of LCSH headings under the MeSH heading.

This "score" for each pair was combined in a small output record with a count of the number of times the heading occurred in bibliographic records. These output records were sorted by frequency of occurrence and merged. A graph of the analysis of this data (figure 29) plots the probability that a mapped pair will occur at the "top" of a subject mapping report (the y-axis) against the number of bibliographic-derived pairs found (the x-axis). In this graph, the data points are represented by a character that indicates the number of cases reported: 1=1 case; 9=9 cases; A=10 cases; C=12 cases; and so on.

This graph shows a rise in the probability of match between frequency of occurrence and mapping as the

The first authority record fragment below shows a portion of the MeSH authority record for the heading EMPHYSEMA before modification. The 072 fields in the authority records for SYMPTOMS AND GENERAL PATHOLOGY, MEDIASTINAL EMPHYSEMA and SUBCUTANEOUS EMPHYSEMA indicate that they are broader and narrower terms for EMPHYSEMA.

```
072/1: : ja C23. jx 390
150: 0: ja Emphysema

072/1: : ja C23 (broader than EMPHYSEMA)
150: 0: ja Symptoms and General Pathology (Non MeSH)

072/1: : ja C23 jx 390. jx 529 (narrower than EMPHYSEMA)
150: 0: ja Mediastinal Emphysema

072/1: : ja C23 jx 390. jx 880 (narrower than EMPHYSEMA)
150: 0: ja Subcutaneous Emphysema
```

The following is a portion of the MeSH authority record for EMPHYSEMA after "broader" and "narrower" *see also* reference tracings were added by comparing the 072 fields in related authority records. Note the presence of subfield \$ in the 550 fields generated from the 072 fields.

```
072/1: : ja C23. jx 390
150: 0: ja Emphysema
550/1: 0: ja Pulmonary Emphysema
550/2: 0: iw h ja Symptoms and General Pathology (Non MeSH) $ IEN-M
550/3: 0: iw g ja Mediastinal Emphysema $ IEN-M
550/4: 0: iw g ja Subcutaneous Emphysema $ IEN-M
```

Below is a portion of a public catalog display under the MeSH term EMPHYSEMA, showing the *see also* references to narrower terms. (There is no public catalog reference to the "non-MeSH" broader term SYMPTOMS AND GENERAL PATHOLOGY, because that term is in a "node label" record; its heading is not assigned to bibliographic records.)

```
EMPHYSEMA
* Search also under the narrower term:
1 MEDIASTINAL EMPHYSEMA
2 SUBCUTANEOUS EMPHYSEMA

EMPHYSEMA
3 BRONCHITIS ASTHMA EMPHYSEMA <1979> (HS)

EMPHYSEMA—COMPLICATIONS
4 COR PULMONALE IN CHRONIC BRONCHITIS AND EMPHYSEMA <1984> (HS)
```

Figure 28
MeSH See Also Reference Generation

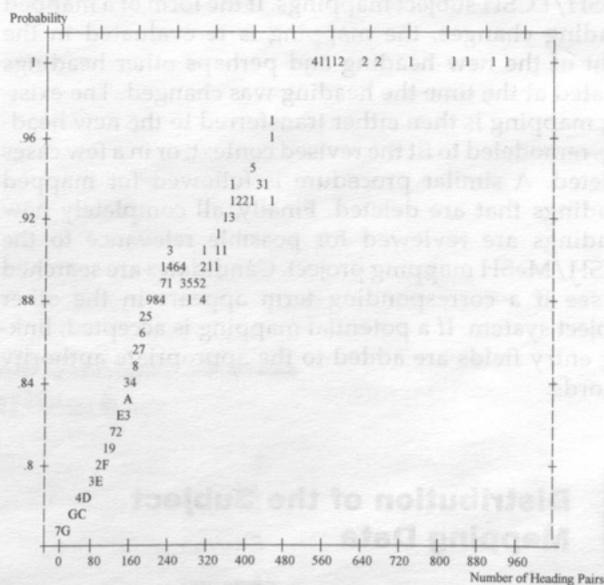


Figure 29
Graph of Mapping Probability

number of bibliographic-derived pairs rises. In other words, the more frequently a MeSH and LCSH heading appear together in bibliographic records, the more likely it is that they represent the same concept. However, except when a pair of headings is represented by an extremely large number of occurrences in bibliographic records, this likelihood never becomes a certainty. We conclude from this that the mutual occurrence of headings in bibliographic records is a valid predictor of subject mapping potential, but it is not so reliable an indicator as to allow subject mapping to take place without editorial intervention.

Maintenance of Subject Mapping Data

The LCSH and MeSH systems are not static entities, but frequently undergo modification: existing headings are changed or deleted and new headings are added. The value of this project would be greatly diminished if the mappings of subject headings were not kept up-to-date. For the time being, the Northwestern University libraries are committed to the ongoing maintenance of subject mapping data.

To this end, the list of new and changed subject headings produced as a routine part of the NOTIS jobs that update the MeSH and LCSH files (from tapes produced by NLM and LC) are scanned by one or the other of the editors for the effect the changes might have on MeSH/LCSH subject mappings. If the form of a mapped heading changes, the mapping is re-evaluated in the light of the new heading and perhaps other headings created at the time the heading was changed. The existing mapping is then either transferred to the new heading, remodeled to fit the revised context, or in a few cases deleted. A similar procedure is followed for mapped headings that are deleted. Finally, all completely new headings are reviewed for possible relevance to the LCSH/MeSH mapping project. Candidates are searched to see if a corresponding term appears in the other subject system. If a potential mapping is accepted, linking entry fields are added to the appropriate authority records.

Distribution of the Subject Mapping Data

The value of this project would also be diminished if there were not some mechanism for distributing the subject mapping information. Several options have been

explored, and one has been implemented.⁶ Files containing the enhanced LCSH and MeSH authority records have been put on the Northwestern University Main Library's server. These files are now available via FTP to any interested libraries.⁷

Results and Benefits of the Mapping Project

To summarize: The LCSH and MeSH systems have been mapped and the data added to authority records. The techniques developed during this project can be used to map other subject systems. During the project, specifications were devised for a subject mapping field, which were forwarded to MARBI with a recommendation that the field be added to the *USMARC Authorities Format*. The mapping data are being kept current by Northwestern University library staff; and the mapping data are also available to other libraries and information centers via FTP.

The results of the mapping project can lead to several benefits, several of which are discussed below.

One benefit will be to catalogers who use MeSH. For example, at the Northwestern University Health Sciences Library, about 20 percent of cataloging copy available to staff has LCSH headings, but no MeSH headings. By examining LCSH authority records for corresponding MeSH headings in linking entry fields, catalogers can more easily assign MeSH headings in cases where those are lacking. In addition, more copy is starting to appear in the databases of the bibliographic utilities that have MeSH headings, but no LCSH headings. In these cases MeSH authority records can be examined for corresponding LCSH headings.

Another benefit has been the addition of explicit *see also* reference tracings to MeSH authority records. In the past users had to be familiar with the MeSH "Tree Structures" in order to move from broader to narrower terms, or vice versa. Users now have explicit *see also* references in the online catalog directing them to broader or narrower MeSH terms.

The most obvious and important benefit of the mapping project is to use the results in an integrated LCSH/MeSH online catalog. Since the mapping data are now available in linking entry fields in MARC authority records, it should not be too difficult to take the next step and make the necessary changes to library management system software so that these fields display in an online public access catalog. By displaying the mapping data, users will be led from a heading in one system (e.g., MeSH) to its corresponding heading (or headings) in the other system (LCSH). This will effectively solve the

problem of incomplete retrieval in a multivocubulary catalog (at least those containing LCSH and MeSH) because there are no links between headings representing the same concept.

This final step—the actual utilization of the mapping data in authority records—is beyond the scope of the project at Northwestern. However, the authors are hopeful that library automation vendors will include this functionality in future versions of their systems.

References and Notes

1. An excellent analysis of the multiple vocabulary problem can be found in Carol A. Mandel, *Multiple Thesauri in Online Library Bibliographic Systems* (Washington, D.C.: Cataloging Distribution Service, Library of Congress, 1987).
2. The project was funded in part by a one year grant (1990/1991) from the College Library Technology and Cooperation Grants Program, U.S. Dept. of Education, Office of Educational Research and Improvement. The grant number is R197D90044-89. The title is *College Library Technology—Research and Demonstration Project—Integration of Multiple Thesauri in an Online Public Access Catalog*.
3. The modifications were accomplished fairly quickly and easily. Suppression of duplicate index entries arising from

identical headings in the same bibliographic record is one of the capabilities of the NOTIS software (version 5.0 or higher) that was installed at Northwestern in 1992. Resolving conflicts between references and headings was a local Northwestern enhancement to the NOTIS software. The technique, which we call "dynamic conflict resolution," turns conflicting *see under* references into *see also under* references in the OPAC.

4. Solutions to the fourth problem, identical headings with different meanings, fell outside the scope of the project. It is really the responsibility of the agencies that maintain these thesauri, LC and NLM, to resolve these conflicts.

5. The programs used in this part of the project, along with more detailed descriptions of the procedures used in the project are in the *Final Performance Report for College Library Technology and Cooperation Grants Program, Higher Education Act, Title II-D (CFDA No. 84.197), United States Department of Education, Office of Educational Research and Improvement*. March 26, 1991.

6. A file of MeSH authority records, enhanced by the addition of mapped LCSH headings in linking entry fields, was sent to the National Library of Medicine in 1993. NLM in turn planned to (i) add the mapping data to their Universal Medical Language System; and (ii) distribute the mapping data as part of their MeSH/MARC product. NLM still plans to carry out their first objective; but, at present, there does not appear to be a practical way for NLM to carry out their second objective.

7. Interested libraries can contact either of the authors for more information about the files, as well as the FTP address and file names.

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SPECIAL SECTION

The Development of Library and Information Technologies in Southeast Asia

Introduction: The LITA International Relations Committee Program, New York City, July 1996

J. Z. Zhou, Program Chair

Three decades ago, people referred to Asia as "third world"—as a region with many underdeveloped countries. By the mid-1990s, such designations made little sense, for by then economies in East and Southeast Asia had been growing rapidly for a quarter of a century. Today, the city-states of Hong Kong and Singapore are already classified as high-income economies, and income levels in Taiwan could overtake those in Belgium and Italy by the end of the century if current growth rates persist. Korea and Malaysia are not far behind, and Thailand and Indonesia, although considerably poorer, are also growing much faster than most countries in Europe and North America. Vietnam, a slow starter in the trend toward free market reform, mended its relationship with China in 1993 and restored diplomatic relations with the United States in 1995. Vietnam still has the lowest gross domestic product (GDP) per capita in Asia, but with an 8 to 9 percent annual GDP growth rate during the last two years it was among the fastest growing economies in the region. China has the highest GDP growth rate in the world (approximately 10 percent on average annually over the last fifteen years) and it is already the second-largest economy in Asia and the Pacific Rim after Japan. With the return of Hong Kong in July 1997, China

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could become the biggest economy in the world by the year 2010.

This economic development has had a direct impact on library and information technology development within these Asian countries. In this special section, Wilfred Fong points out in his article that the technological development in these countries began in academic institutions that were funded and monitored by their respective governments. Similarly, Tze-chung Li states at the end of his article that government support in the form of funding is the key to success in library automation. And Cate Hutton mentions in her article that, during her nine-month assignment there, the Tibetan provincial library director's principal role was to obtain funding for collection development and general library operations. She adds that that is why the newly built library in Lhasa, Tibet, contains a dance hall complete with Karaoke sound equipment and video equipment, allowing the library building to be used for fund-raising and the essential function of gaining favor with government leaders.

All three authors featured in our special section have worked in or taught lectures and courses related to library and information technology in different Asian countries. The ALA Library Fellow program, instituted more than ten years ago, focuses on open access to information, intellectual freedom, and international understanding. The library fellows sent to different countries are regarded as information ambassadors, and most of them are involved in teaching and staff training. In my opinion, the successful development of library technology needs three key ingredients: economic growth, government support with funding, and highly trained professional staff from within the library and information industry.

Following the format used in previous programs by this commit-

tee, three speakers presented papers at the July 1996 program; each is reprinted here. First, Assistant Dean Fong from the University of Wisconsin-Milwaukee's School of Library and Information Science offers an overview of library and information technology in six East and Southeast Asia countries. Dr. Li from Rosary College's Graduate School of Library and Information Sciences then describes the development of library automation in Taiwan from the 1970s through the present. Finally, Ms. Hutton, 1993-94 ALA Library Fellow to Tibet, China, shows us how, during her experience in Tibet, poor infrastructure seemed to exoticize technology and make acquisition of it the mark of a "modern library."

Library and Information Technology in Southeast Asia

Wilfred W. Fong

The economic development of countries in Southeast Asia has accelerated in recent years. Business investments and educational research funds have tripled, leading to a growth in information technology. When studying the development of library and information technology within the countries of Southeast Asia, one must consider both economic and political points of view. Governments within these countries usually have direct control of the information flow in and out of the country.

As is the case in the Western world, technological development

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within Southeast Asian countries generally begins with academic institutions. The majority of universities in these countries are funded and administered by their government. Many university libraries automated their catalogs several years ago. With an Internet connection, patrons from these libraries are able to access the vast amount of information available on the Internet.

In addition, home personal computers (PCs) are becoming increasingly popular within these countries. In fact, several major computer companies are located in Southeast Asia. Creative Technology, Ltd., for example, is headquartered in Singapore, and is a key sound card manufacturer for the PC industry. China, Hong Kong, Malaysia, and Singapore are all major manufacturers of PC components, especially RAM chips, and Hong Kong has manufactured PCs since the days of the 386. In short, PC technology is no stranger to these countries. This article examines the following selected countries in the Southeast Asian region: Hong Kong, Malaysia, Singapore, and Vietnam. Although China is not considered a part of the region, it is examined here because its technological and economic development has a direct impact on the countries of Southeast Asia. Vietnam is an underdeveloped country but has full potential for growth, given that the Vietnamese government recently reopened its doors to the outside world.

China

Since 1978, when the Chinese government started to implement a policy of reform and opened up to the outside world, library services in China have made remarkable progress. It was estimated that in 1991 there were over 2,500 public libraries at the county level in China, which together housed over 300 million

volumes, nearly twice as many as in 1978. Over that same period, the total number of staff working in public libraries increased nearly fourfold, from about 11,500 to over 42,000.¹

The new facilities of the National Library of China (NLC), located in Beijing, were completed in October 1987. The NLC is a comprehensive research library which, under China's legal deposit regulation, acts as a general repository for all national publications in addition to its function as the national bibliographic center. It plays an important role in the national standardization of bibliographic control and in library automation and networking.² The NLC now houses more than 18 million cataloged items, although the building has an estimated capacity of 20 million volumes. In 1991, NLC developed an integrated library automation system with Japan's NEC, Inc. This system is capable of handling acquisitions, cataloging, circulation, and OPACs in simplified Chinese characters as well as in English. There are currently more than forty libraries using the system.³

In March 1994, China was formally connected to the Internet via the Institute of High Energy Physics (IHEP) network of the Chinese Academy of Science. The 64Kbps leased line connection was made possible by AT&T, which provided e-mail access for scientists at the National Science Foundation of China. The National Computing and Networking Facilities of China was given the country-level Internet domain name ".cn" in May 1994. Digital data network (DDN) was opened in 26 provincial capitals in 1993. Since then, DDN has been expanding to other major cities, including Jiangsu, Fujian, and Guangdong. A fiber optic cable network was expected to have been completed by the end of 1996. Satellite and microwave networks are also being extended to cover the country.⁴

With strong economic growth and increasing foreign investments, the Chinese government has recognized the importance of upgrading its information network and has implemented joint ventures with telecommunications and information corporations in the United States, Japan, and Europe to help build the national information superhighway. The mainland China internet consists of two parts: public networks controlled by the Ministry of Posts and Telecommunication (MPT) and private networks. Under the administration of the MPT, there are twenty-two main fiber optic systems and nineteen large satellite earth stations. The private networks providing connections via fiber optic, digital microwave, and VSAT systems were run by corporations and other ministries such as The Ministry of Railways.⁵

Within a few short years, knowledge about the uses of the Internet in China has grown exponentially. The China Education & Research Network (CERNET) is the first nationwide education and research computer network in China, and is funded by the Chinese government and managed by the Chinese State Education Commission. It has eight regional network centers: Eastern China (South), Northeastern China, Eastern China (North), Southern China, Central China, Northwestern China, Southwestern China, and Northern China, including more than one hundred campus networks.

Following is a list of libraries that have their OPACs available via the Internet, except when noted. Although over 50 academic libraries have developed home pages, only a few have made their catalogs available on the Internet. This may be due to security issues or to the fact that some libraries do not have an Internet connection or online catalog. Users should be warned that the connection is very slow and may not even be available when the library is

closed. In some cases, users must have Chinese systems (e.g., Big 5 or GB) installed in their PCs in order to view the catalog. However, some sites have an English version available.

- Beijing University of Posts & Telecommunications (BUPT) Library (direct dial-in: 62282041; requires TWAY Chinese System and ONLAN software)
- Chinese Academy of Sciences (Academia Sinica) Library (difficult to access); (telnet://apt.las.ac.cn) For English catalog; login: guest; password: hello01 (i.e., "zero, one") For Chinese catalog; login: opac; password: opac
- Nankai University Library (telnet nklib.nankai.edu.cn)
- National Library of China (no catalog access, general information only) (<http://www.lib.tsinghua.edu.cn/english/beitu/>)
- Peking University (telnet pul2.lib.pku.edu.cn; username: OPAC)
- Shanghai Jiaotong University (<http://202.120.13.1>) (telnet 202.120.2.201; login: public)
- Tsinghua University (INNOPAC) (<http://www.lib.tsinghua.edu.cn>) (Chinese version) (<http://www.lib.tsinghua.edu.cn/english/index.html>) (English version) (telnet ds90.lib.tsinghua.edu.cn; login: public)

Although the quality of professional librarianship in China is steadily improving, there is a need for advanced degree programs in library and information science and continuing education programs with an emphasis on the use of technology. More importantly, access to PC hardware, software, and telecommunications equipment must be improved.

The Chinese government has decided to exert total control over information transmitted over the Internet in mainland China. According

to a BBC report published on June 22, 1996, "the [Chinese] Ministry of Posts and Telecommunications recently issued a new regulation to restrict public access and the use of the Internet, in light of increasing undesirable accesses to political news and information from inside China via the Internet by means of electronic mail, FTP, Gopher, World Wide Web, Usenet news, and so on." This strict policy will have a strong impact on Internet access, just as it has just begun to grow in China.

Hong Kong

Hong Kong, known as the "pearl of the Orient," is a British Colony of 409 square miles and a population of more than six million. This small island is considered one of the world's major financial centers, almost on a par with Wall Street. Technological advancement can be seen everywhere in Hong Kong. It has, for instance, the highest rate of cellular phones per capita, and use of the Internet is also widespread. Within a year, the number of Internet providers in Hong Kong has tripled due to heavy demand for Internet access.

The Hong Kong Urban Council oversees the operation of thirty-one public libraries, including a central library, a specialized art library, fifteen district libraries, eleven small libraries, and three mobile libraries. The entire library system has a total collection of over 3.1 million items. Internet access is available to patrons at the main City Hall Reference Library. Additional Internet access locations will be added to branch libraries. All public libraries have been fully automated using Dynix since March 1995.⁶

All higher educational institutions in Hong Kong are funded by the government. There are a total of seven such institutions: City University of Hong Kong, Hong Kong Baptist University, Lingnan College, The

Chinese University of Hong Kong, The Hong Kong Polytechnic University, The Hong Kong University of Science and Technology, and The University of Hong Kong. These seven university libraries have made their online catalogs available via the Internet. Their catalogs can also be accessed through each individual university homepage. Telnet addresses are as follows (current automated library systems are shown in parenthesis next to the name of the university):

- City University of Hong Kong (Bauhinia) (telnet libcatalog@peking.cityu.edu.hk)
- Hong Kong Baptist University (INNOPAC) (telnet hkbulib.hkbu.edu.hk; login as "OPAC")
- Lingnan College (INNOPAC) (telnet Inclib.Inc.hk:23) (<http://Inclib.Inc.hk>)
- The Chinese University of Hong Kong (INNOPAC) (telnet library.cuhk.edu.hk)
- The Hong Kong Polytechnic University (Spirit) (telnet library.hkp.hk:23; login as "Library")
- Hong Kong University of Science & Technology (INNOPAC) (telnet uslib.ust.hk:23 or <http://library.ust.hk>)
- The University of Hong Kong (INNOPAC) (telnet hkulbr.hku.hk, login as "hkulopac")

In addition to these seven institutions, Internet users have access to the following academic library catalogs:

- Hong Kong Academy for Performing Arts (INNOPAC) (telnet 202.40.141.2)
- Hong Kong Institute of Education (INNOPAC) (telnet edlis.ied.edu.hk)
- Hong Kong Open Learning Institute (Dynix) (telnet oliu1.oli.hk; login "netpub")

The Hong Kong Hospital Authority, which administers all public

hospitals, also has its online catalog accessible via the Internet:

- Hong Kong Hospital Authority (INNOPAC) (telnet 202.64.48.100; login as "library")

One of the most significant issues facing the library profession in Hong Kong is uncertainty about the current political situation due to the fact that in mid-1997 China will take over governance of the island. This change in political power will certainly have an enormous impact on Hong Kong's libraries, and particularly on academic libraries, which have enjoyed freedom in collection development and an affluent budget. As reported above, the Chinese government has decided to control Internet traffic on the mainland. Whether this strict policy will be implemented in Hong Kong after the takeover later this year remains to be seen.

Malaysia

Malaysia, a country with a population of approximately 17 million, has a variety of racial backgrounds. Malays, Chinese, and Indians form the majority on the peninsula, while Iban, Kadazan, and Bidayuh are the primary indigenous ethnic groups in Sabah and Sarawak. Bahasa Malaysia is the official national language, but Chinese dialects and Tamil are still widely used in their respective communities. Most people also speak English.⁷ With this diversity of languages, library automation is no easy task.

In 1996 the Prime Minister of Malaysia announced an economic plan called Vision 2020, which reflects the vision of a fully developed and industrialized Malaysia by the year 2020. The plan is essentially a long-term vision containing broad policy directions encompassing various facets of development.⁸

As part of Vision 2020, the Malaysian National Library (Perpustakaan Negara Malaysia) (<http://pnm.my/opac.html>) plans to become a world class library with high-tech facilities. It is poised to lead the nation in its pursuit of knowledge. In addition, public libraries in two other states in Malaysia have developed Internet access:

- Kedah State Public Library (Malay version: http://kdh.lib.edu.my/Malay_Version/main.html English version: http://kdh.lib.edu.my/English_Version/main.html)
- Sabah State Library (<http://sbh.lib.edu.my/index1.htm>)

Malaysia has a centralized system of educational administration organized into four hierarchical levels: national, state, district/division/residency, and school. There are a total of nine universities and four technical colleges. Following is a list of higher education institutions that provide Internet access to their library catalogs:

- Universiti Kebangsaan Malaysia Library (Malaysia National University) (<http://www.library.ukm.my/>) (tn3270: 161.142.16.88)
- Universiti Pertanian Malaysia Library (University of Agriculture Library) (<http://www.lib.upm.edu.my/>)
- Universiti Teknologi Malaysia Library (Malaysia Technology University Library) (telnet psa.utm.my:23; login: spac) (<http://psz.utm.my/infolan.htm>)
- University of Malaya Library (telnet 161.142.48.10; login: umlib; username: OPAX) (<http://www.cc.um.edu.my/library.html>)
- Universiti Utara Malaysia Library (telnet 161.142.40.10; login: library) (<http://www.lib.uum.edu.my/>)

Vision 2020 has direct implications for telecommunications devel-

opment and technological advancement in Malaysia during the coming years. Under the plan, Telekom Malaysia, the major telecommunications provider in Malaysia, is faced with the challenge of providing advanced telecommunications services by the year 2005. Telekom's four main visions are:

- increasing the telephone penetration rate from the current 10 percent of the population to 40 to 45 percent;
- increasing internal productivity and efficiency through the effective use of up-to-date information technology equipment;
- offering more value-added information services, including the establishment of a nationwide Integrated Services Digital Network (ISDN); and
- establishing an effective and comprehensive fiber optic cable network linking Peninsular Malaysia, Sabah, and Sarawak.⁹

With this improvement in telecommunication technology, libraries in Malaysia will be able to provide better services and will be able to take advantage of resource sharing.

Singapore

Singapore is a small country of about 247 square miles, even smaller than New York City. Barely more than thirty years after its independence from the Malaysian Federation in 1965, Singapore was expected to reach developed country status by the end of 1996, according to the Organization of Economic Corporation and Development. Singapore has undergone especially rapid growth and significant change during the past several years. This is due to the fact that the Singapore government has been greatly involved in the social and economic

well-being of the country. The government has also established an aggressive National Computer Board (NCB), which ensures strong growth in the nation's telecommunications sector.

The Ministry of Communications has recently announced the "Singapore ONE Project," the goal of which is to accelerate the building of a nationwide multimedia broadband infrastructure. Singapore ONE stands for Singapore One Network for Everyone. This broadband network unites and connects the entire country in a single open network that all Singaporeans can have access to. The project is part of the government's Information Technology 2000 vision which will allow a wide variety of commercial and governmental services such as video-conferencing, high-speed Internet, teleshopping, entertainment-on-demand, and electronic libraries to be accessed and transacted at the convenience of the users from anywhere in the country.¹⁰ This project will be directed by the Telecommunication Authority of Singapore, the National Science and Technology Board, and the NCB.

Singapore has been known as a country strongly supportive of library development. In his 1993 National Day Message, Prime Minister Goh Chok Tong stated that "the future belongs to countries whose people make the productive use of information, knowledge and technology. These are now the key factors for economic success, not natural resources." He continued: "Information is the currency of the future and knowledge is power. As the two are ever expanding and rapidly becoming obsolete, the capacity to learn is thus vital to keep the nation competitive, strong and prosperous."¹¹

In June 1992, a Library 2000 Review Committee was established to review the country's library services. Some one hundred librarians

and NCB officers worked together on the review. The goals of Library 2000 are:

- To establish Singapore as an international information hub;
- To preserve and promote Singapore's literary heritage;
- To provide for education, knowledge, and research; and
- To promote a well-read and well-informed society.¹²

Six strategic thrusts were developed as a result of the Library 2000 plan. They are:

A National Reference Library is established to bring library and information services closer to the community. It is recommended that five regional libraries, eighteen community libraries, and 100 neighborhood libraries be built within the next twenty years.

Five hundred libraries and information centers will be networked to build a "library without walls" that enables access to information and resources from anywhere at any time.

A national collection policy will be developed to ensure maximum coverage and minimum duplication.

Basic library services will remain free, but value-added services such as translating, analyzing, and repackaging information will be charged. The libraries will provide quality services through market orientation.

Co-location in commercial, educational or cultural buildings will allow better integration with the community and promote private sector support and sponsorship.

The development of a comprehensive Asian collection by the National Reference Library to make Singapore the one-stop regional information center on Southeast Asia, China, India and other parts of Asia will be undertaken.¹³

The ongoing success of Library 2000 is evidenced, in part, by the Tampines Regional Library, which provides Internet access to its CD-ROM network:

- Tampines Regional Library (<http://home.pacific.net.sg/~trlel/trlhome.htm>)

In addition, the National Library of Singapore is a model library under the Library 2000 plan. The building of the new National Reference Library will also be revised to incorporate the main recommendations, which include the establishment and housing of the proposed business library, phase one of the arts library and the central business district regional library. Information on how Library 2000 is being implemented is available on the National Library's web site.

- National Library of Singapore (<http://www.livewire.ncb.gov.sg/library/main.html>)

Academic libraries in Singapore have received strong support from the government. The Nanyang Technological University Library (<http://www.ntu.ac.sg/ntu/lib/lib.html>), for instance, was built a few years ago in preparation for a future "virtual library." Singapore's other two higher education institutions can also be accessed via the Internet:

- National University of Singapore (<http://www.nus.sg/Library/home.html>)
- Ngee Ann Polytechnic University (<http://www.np.ac.sg:9080/library/library.html>)

Based on the Singapore ONE and Library 2000 projects, Singapore will soon become a leader in library and information technology. This will be a lesson for other countries to learn about the importance of the government's involvement in the development of library and information technology.

Vietnam

It took the United States more than nineteen years to recover from the Vietnam War. On February 3, 1994, the United States lifted its embargo on trade with Vietnam, and in 1995 the U.S. embassy reopened in Ho Chi Minh City. These events encouraged many U.S. companies to invest in Vietnam. Many improvements and changes, especially in the economic and social arenas, have been quite obvious in Vietnam in recent months.

Before the Vietnam War, the North Vietnamese government aimed to make library resources as widely available as possible. Today's government maintains this policy. Libraries, according to the Communist government, have a twofold purpose. The first is to reflect the ideological principles of the government, acting as an agent of propaganda; the second is to ensure literacy among the nation's population of 65 million. In this respect, Vietnam has been notably successful, winning UNESCO awards in 1978 and 1988 for its efforts. Its literacy rate is estimated to be over 85 percent.¹⁴ In addition, the number of public libraries has increased by 25 percent since 1975, and today the National Library has a collection of over 1.5 million volumes.

The other two major libraries in Vietnam are the Central Science and Technology Library and the Institute of Social Science Information. Operations within these libraries are still manual. Before the first integrated library system can be installed in Vietnam, library software developers must develop systems that recognize both English and Vietnamese. This development should be very close, as Microsoft announced the release of Windows 95 Vietnamese Version during 1996. With the availability of Vietnamese PCs and with economic growth, Vietnam will be ready for

the technological changes in the years to come.

Although there will be Internet access in Vietnam in the near future, the popularity of this networking technology may not grow as fast in Vietnam as in neighboring countries due to Vietnam's economic situation. Nonetheless, several giant U.S. telecommunications companies, such as AT&T and MCI, have already entered the Vietnam market to develop and improve the country's telecommunication networks. This will, in turn, provide library users in Vietnam with access to the unlimited resources available on the Internet. It is expected that academic institutions like Hanoi University and Hanoi Polytechnic will be the first to have Internet connections. As of this time, the Communist Vietnamese government is unclear on its policy regarding the Internet.

Conclusions

This article was an attempt to provide a brief overview of library and information technology in China and Southeast Asia. The countries in this region are growing rapidly, not only economically but technologically, as well. Along with advancements in technology, a country must have adequate funding resources to support ongoing development and improvement. China and the countries in Southeast Asia have the economic power to do so. Even more importantly, they have an educated workforce capable of working with the technology.

Although universities in many of the countries discussed here offer library education programs, there are only a handful of such programs offered at the graduate level. Vietnam's library education programs should be re-examined with the goal of producing graduates with the ability to handle the complexity of today's information technology.

Continuing education is also very important to librarians as a means of helping them cope with the latest developments in technology.

A search of the World Wide Web reveals that over 60 percent of the libraries in the Southeast Asia region have homepages, and that about 50 percent have Internet access to their catalogs. In the future, additional cooperative projects will be conducted among libraries in these countries.

In 1993, the National Library of Malaysia and the Malaysian Institute of Microelectronic Systems entered into a research and development project to establish a nationwide library network. With the Malaysian Vision 2020 in mind, this cooperative project will ensure the rapid development of the Malaysian national information infrastructure to provide public access to many indigenous databases.¹⁵

Presently, the National Library of Singapore and the National Computer Board in Singapore have committed to developing a digital/virtual library. This project requires an advanced national information infrastructure and restructuring public library services. In 1994, the Nanyang Technological University and the Information Technology Institute of the National Computer Board sponsored a joint project to provide an integrated environment to access library OPACs in Singapore. In addition, Singapore's SATIN project, funded by the National Science and Technology Board, will provide a network to link all science and technology libraries together. And, the National University of Singapore (NUS) Library InfoGate Network will provide electronic access to NUS documents in both text and image forms.¹⁶

The University of Hong Kong libraries, joined by other academic institutions in Hong Kong, including the Chinese University of Hong Kong, is undertaking a project to develop full bibliographic databases

(Chinese and English materials) to be networked in Hong Kong.

All of the countries discussed here are very receptive to new technology and have already started to invest in the further development of the Internet for information access. With the enormous resources these countries possess, it is time for libraries to reconsider their traditional roles and to take up the challenge of the concept of the virtual library. The involvement of governments in the development of library and information technology is a lesson for the Western world to learn.

References

1. Shaoming Tang, "A Brief Introduction to the Development of Public Library Serv-

ice in China," *Focus on International & Comparative Librarianship* 25, no. 2 (1994): 78.

2. Tang, "The Present and Future Development of the National Library of China," *Focus on International & Comparative Librarianship* 25, no. 2 (1994): 73.

3. Tang, "A Brief Introduction," 79.

4. Qiang Zhu, "Latest Development of the Internet in Mainland China," *Microcomputers for Information Management: Global Interworking for Libraries* (Wilfred Fong, Guest Editor) 12, no. 3 (1995): 159-60.

5. Zixiang Tan, "China's Information Superhighway: What Is It and Who Controls It?" *Telecommunications Policy* 19, no. 9 (1995): 722.

6. URL <http://www.uc.gov.hk/ucpl/intro.htm>.

7. URL <http://www.jaring.my:80/msia/back/ms.html>.

8. An abridged version of the Malaysian Prime Minister's "Vision 2020" can be located via URL <http://www.jaring.my/msai/economy/msiaeco.html>.

9. URL <http://www.jaring.my/msia/economy/telecomm.html>.

10. URL <http://iagent.iti.gov.sg:5679/mita/96060304.html>.

11. URL <http://www.livewire.ncb.sg/library/cgi-bin/lib-12000.pl>.

12. Ibid.

13. Ibid.

14. Sandy Macmillan, "Library and Information Needs in Vietnam." *Focus on International and Comparative Librarianship*, 22, no. 2 (1991): 49-50.

15. S. Jaafar, "Jaringan ilmu: Libraries' Gateway to Global Information Resources," *Seminar on Global Information Networking for Library Applications* (Dec. 1994).

16. Edna O. F. Reid, "The Internet and Digital Libraries: Implications for Libraries in the ASEAN Region" (URL <http://www.mcb.co.uk/apmforum/alf/diglibs.htm>).

Technological Development in Asia: Library Automation in Taiwan

Tze-chung Li

Library automation in Taiwan began in the 1970s and has been marked by an impressive array of achievements since the 1980s. In 1972, the Department of Physics at National Tsinghua University began automation using an IBM 1120

computer for the book catalog of Western materials.¹ Three years later, in 1975, Margaret Fung experimented with an integrated library system of acquisitions, cataloging, and circulation on a Wang MVP minicomputer.² In 1980, the Chinese Character Code for Information Interchange (CCCII) was completed, and—a year later—the Chinese MARC was developed.³

In library automation, the National Central Library has taken the helm.⁴ Its Automated Information Service (NCLAIS) is the most ambitious library project in Taiwan. In 1980, the National Central Library and the Library Association of China jointly developed the Chinese Library Automation Planning Project with four main objectives: to develop the Chinese MARC format; to organize the data processing system for Chinese-language materials; to create a database for Chinese publications and introduce foreign databases; and to establish a national information network.

The National Central Library has developed four main databases: acquisitions, catalog, serials control, and index. The acquisitions database consists of four subfiles, namely: acquisitions, budget control, publishers/suppliers, and statistics. The statistics file provides statistical data on cancellations, budgeting, performance of suppliers, and average price. There is, however, no breakdown by discipline.

The index database indexes Chinese periodicals and gazettes published since 1983. About one thousand periodicals and gazettes are regularly reviewed for inclusion. The index database is not yet available for public access. Its print counterparts are *Index to Chinese Periodical Literature* and *Index to Chinese Official Gazettes*. A CD-ROM version is also available. The serial control has not operated as part of the integrated system.

The best and currently fully implemented database is the online catalog. This database uses the Chinese MARC format, structured on

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the basis of UNIMARC with modifications to meet local requirements. Full descriptions of bibliographic records in the Chinese language conform with the Chinese cataloging rules and, to a large extent, with the International Standard Bibliographic Descriptions and the second edition of the *Anglo-American Cataloguing Rules*. The online catalog database provides the source for publishing the *Chinese National Bibliography*, a monthly with annual and multiyear cumulations.

The online catalog of the National Central Library provides a dozen or so access points, such as title, author, Chinese subject heading, English subject heading, Chinese classification, Library of Congress classification, Chinese printed card number, SuDoc number, ISBN, ISSN, Library of Congress card number, and accession number. In addition, four qualifiers (language, publisher, publication date, and format) are available for restricted searching. A set of Chinese characters can be searched with Boolean logical operators. Four methods can be used for inputting Chinese: three-corner, chu-yin (phonetic symbols), ts'ang-chieh (radical index), and simplified ts'ang-chieh. In 1989, the National Central Library purchased a Tandem and developed a cooperative online cataloging project. At present, the National Central Library uses URICA, which began operation in March 1995.

A survey of library automation released in 1988 indicates that the National Central Library, the Academia Sinica, nine universities, four colleges, twelve special libraries, and two producers have implemented, developed, or tested their library automated systems to varying degrees.⁵ In 1984, the National Chengchi University began its automated circulation system designed by First International Computer (FIC), and later developed an FIC integrated library system. In 1986, the National Chengkung University

main library developed its own integrated system—admittedly rudimentary—for circulation, cataloging, and acquisitions.

Tamkang University's TALIS (Tamkang Automated Library Integrated System), implemented in 1986, is the first fully operative integrated system in Taiwan. It handles acquisitions, cataloging, serials control, and circulation. TALIS is operated by the DOBIS/Leuven program modified for Chinese characters. Its data structure is based on LCMARC. TALIS is basically a menu-driven system. It displays three choices: search the catalog; display your check-out record; and send a note to the library staff, after it is logged on. TALIS uses both ts'ang-chieh (radical index) and chu-yin (phonetic spelling) for Chinese input.

The Legislative Information System (LEGISIS), developed in 1985, consists of four databases: interpellation statistical data, interpellation, Chinese code, and legislative periodical literature. LEGISIS uses both menu and command searches. It is a well-developed system. Although full-text is not currently available, it lists the contents of three major law compilations: *Chung-hua-min-kuo fa-lu wei-pien mo-lu* (A Compilation of Laws in the Republic of China), *Lu-fa chuan-shu* (A Complete Work of Six Laws), and *Chung-hau-min-kuo hsien-hsin fa-kwei wei-pian* (A Compilation of Current Laws in the Republic of China).

A number of full-text databases have been produced. The most notable of these is the History of Twenty-Five Dynasties, developed by the Academia Sinica. This database, based on the printed version published by Chung-hau Book Company in mainland China, contains over seven million words. It can be searched by using either free-text or a controlled vocabulary. The controlled vocabulary refers to a single keyword set that includes the name of a person, the official title, the title of a book, the expression of time in terms of an era,

a dynasty, or an emperor; and ten classes of special terminologies.⁶ After the user enters characters for searching, the system displays such information as seconds spent, number of characters searched, and number of sections and terms, and asks whether the user wants to see the result.

In 1990, a study of nine representative library automated systems was conducted to evaluate the strengths and weaknesses of each system and to assess the problems facing library automation in Taiwan.⁷ The nine systems examined were: the National Central Library Automated Information Service, the Science and Technology Information Center of the National Science Council, the Agricultural Science Information Center, the Legislative Information System, the Academia Sinica databases, the National Defense Medical College, Tamkang University, National Taiwan Institute of Technology, and Chung Koh Library Products Company's CAS system. According to the study, the Science and Technology Information Center Network (STICNET) at the National Science Council, which went online in 1988, launched an innovative project. It acquired databases, such as BIOSIS PREVIEWS, CA SEARCH, COMPENDIX, ERIC, INSPECT, and NTIS, to be shared by participating libraries for a fee. Such a program is a good idea, yet has had relatively few users for the simple reason that access to the system is slow and cumbersome, although access has been improved in recent years. The National Science Council's library has not been automated.

The study pointed out several problems. First, all systems are menu-driven, while a few provide limited command search features. The menu approach provides a streamlined display of predetermined menu items for the user to choose. The user simply follows the displayed instructions to take a next step, yet the menu approach involves repeated

steps and lacks the flexibility and volatility of free-text searching. Since each system was developed with local requirements in mind, users will encounter a diversity of menu instructions.

The second problem identified in the 1990 study was the difficulty of grasping Chinese input. Currently, there are a number of programs that offer different methods of input, such as: *ts'ang-chieh*, which uses radicals; *three-corner*, which analyzes three corners of a character; *chu-yin*, which uses phonetic symbols; and *ping-yin*, which uses phonetic English alphabets. Considerable time and effort are required to learn each input method.

A third problem identified in the study was speed, which is a main factor in considering automation. A general guideline is that a simple search should take no more than five seconds. As noted earlier, a simple search at the National Central Library can take twenty seconds, and it can take more than two minutes to search two terms with a Boolean logical operator.

A fourth, and final, problem identified involved the precision of an online search, which is of primary concern to any user. A computer's query language enables the user to communicate with the computer. The user receives feedback from which to modify or restructure the strategy, change approaches, give new directions, and refine questions as the search proceeds. An effective information retrieval system enables the user to broaden or narrow his or her search, to search any word in the text, or to restrict a search by form, date, language, and other conditions. Not all of these features are seen in the library systems noted above.

In Taiwan automated library systems have been introduced from abroad or developed domestically. It appears that the domestically developed systems have not matched the usefulness and superiority of for-

eign software programs. As Lucy Te-chu Lee pointed out, the use of already developed programs with modifications to meet the local requirements is more economical and less time-consuming.⁸ Most of the problems identified earlier have been largely solved, as evidenced by the 1994 survey.⁹

In the 1994 survey of the library automated systems of fifty-two academic libraries, released in 1995,¹⁰ forty-six libraries reported having automated systems. Three institutions have not put their systems in use. Below is a chart indicating the number of institutions using automated systems for various functions:

<i>In Use#</i>	<i>Institutions</i>
Cataloging	43
Circulation	41
Reference	38
Acquisitions	27
Serials	26
All of the above	19

Among systems used, INNOPAC leads all others, as shown below:

<i>System#</i>	<i>Institutions</i>
INNOPAC	10
TOTALS	7
DYNIX	6
URICA	5

It may be noted that INNOPAC is also used by the Academia Sinica, and that URICA is used by the National Central Library.

Most of the libraries that have automated systems are accessible by dial-up or via the Internet. Internet IPs are, for example:

- National Central Library: 192.83.186.8
- National Taiwan University: 140.112.192.1
- National Chengchi University: 140.119.129.1
- Tamkang University: 163.13.1.10
- National Taiwan Institute of Technology: 140.118.331

A few universities have their own home page. The web sites of the National Central Library and National Taiwan University Library, for instance, are <http://www.ncl.edu.tw> and <http://tulips.ntu.edu.tw>, respectively. Using telnet to connect to the National Taiwan University's OPAC, a main menu is displayed with three choices: Tulips for Chinese Code (ETEN/Big5), Chinese for Chinese Code (CCCII), and Library for English mode. The menu for Library for English mode displays:

- L > Library Catalog
- R > Reserve List
- U > View your own circulation record
- I > Information about the library
- D > Compendex Reference Database (Campus only)
- O > OCLC FirstSearch database (Campus only)
- M > Medline/Drug & Pharmacy (Password required)
- F > List of Faculty Publications
- Q > Quit

If "Library Catalog" is selected, a submenu displays

- T > Title
- A > Author
- B > Author/Title Search
- S > Subject
- W > Keywords
- N > Call number
- O > Others (Govt. DUC #.ISBN, etc.)
- U > View your own circulation record
- C > Connect to another library
- X > Change language to Chinese
- R > Quit

It also serves as a gateway to fourteen domestic and foreign libraries, including Academia Sinica (Taiwan), Cambridge University, Oxford University, University of California at Berkeley, University of Hawaii, and MEYVYL.

The rapid progress of library automation in Taiwan in the 1990s

has been attributed to three main factors: good planning for automation; joint efforts among librarians to move towards automation; and, most importantly, the government's financial support in implementing automation.¹¹ The study "Total Planning of Nationwide Library Information Network System" (tseng-ti kwei-hua chuan-kuo tu-shu-kuan tse-hsin wang-lu hsi-tung), sponsored and approved by the Ministry of Education, lists six guidelines for automation: (1) the Chinese materials format should comply with ISO 2709 - Chinese MARC; (2) an automated system should use CCCII or be able to convert to CCCII; (3) a library automated system should be a part of an institution's network; (4) a library should pay attention to a vendor's maintenance service and the flexibility of the vendor's software; (5) experts on library automation should be consulted for implementing library automation; and (6) institutions of a similar nature should jointly develop a library automated system.¹² Certainly, the financial support of the government is the decisive factor for achieving library automation. Since 1991, with such financial support, many institutions have been able to acquire automated systems.

Although many achievements have been made in library automation in Taiwan, problems remain, particularly with regard to Chinese characters. Currently, a number of programs offer different methods of input, as noted earlier. The other key problem is the diversity of data coding programs. Ta-I Huang reviewed several coding systems that include the Japanese Industry Standard X0208-1983, the Chinese mainland GB 2312-80, Big5, Chinese Character Interchange Code, Unicode, and so

on.¹³ The author concluded that the best coding system is the Chinese Character Code for Information Interchange (CCCII).¹⁴ Yu Sung echoed Huang's view, pointing out that Big5 has a character set of 13,051, whereas CCCII consists of 53,049 characters. He thus considered CCCII more adequate for library use.¹⁵ Unfortunately, CCCII, though developed in 1981 and later used in the Chinese MARC, has never been accepted as the Chinese coding standard. Big5 can be converted to CCCII for data transmission, but not from CCCII to Big5 because the former contains more Chinese characters than the latter. Kai-tung Huang questioned the wisdom of different Chinese codings and suggested giving up self-interest and moving toward uniformity and standardization.¹⁶

In 1988, thirteen universities and colleges in Taiwan had automated library systems. By 1992, the number had increased to twenty-three. In 1994, there were forty-six institutions with library automated systems, a 254 percent jump in six years. As a developing country, Taiwan's achievement in library automation has been remarkable. She has moved well into the mainstream of modern technology. The next phase of achievement will be the uniformity and standardization of Chinese coding.

References

1. Lucy Te-chu Lee, "A Study of the Automated Library Information System Development in Taiwan, ROC," *Library Association of China Bulletin* 120 (1988): 107-23.
2. Margaret C. Fung, *On Library and Information Science* (Taipei: Student Book Company, 1982), 135.
3. Ching-chun Hsieh and others, "The Design and Application of the Chinese Character Code for Information Interchange (CCCII)," *Journal of Library and Information Science* 7, no. 2 (1981): 129-43; and Lucy Te-chu Lee and others, "Chinese MARC: Its Present Status and Future Development," *Journal of Library and Information Science* 7, no. 1 (1981): 1-18.
4. Tze-chung Li, "Library Automation in the Republic of China: Practical Aspects and Perspectives" (paper delivered at the International Conference on the New Frontiers in Library and Information Services, May 8-12, 1991, in Taipei, Republic of China).
5. Lucy Te-chu Lee, "A Study of the Automated Library Information System Development in Taiwan, ROC."
6. Ching-chun Hsieh, "Full Text Processing of Chinese Language," *Journal of Library and Information Science* 11 (1985): 125-42.
7. Tze-chung Li, "Library Automation in the Republic of China."
8. Lucy Te-chu Lee, "A Study of the Automated Library Information System Development in Taiwan, R.O.C.," 122.
9. Lucy Te-chu Lee and Tao-ming Chuang, "Automated Library Systems in the National Universities and Colleges: The Taiwan Experience," *Journal of Information, Communication & Library Science* 1, no. 2 (1994): 24-33.
10. *Taiwan ti-chu ta-hsuen hsiao-yuan t-shukan wen-chuan tiao-cha feng-hsi pao-kao: pashih-san hsuen-nien-tu (An Analytical Report on Questionnaires to University and College Libraries in the Taiwan Area: 1994 Academic Year)* (Hsinchu: National Tsinghua University Library, 1995), 132.
11. Lucy Te-chu Lee and Tao-ming Chuang, "Automated Library Systems in the National Universities and Colleges."
12. *Ibid.*
13. Ta-I Huang, *Chung-wen tse-ma [Chinese Code]* (Taipei: Chang-song wen-hua shih-yeh Co., 1990), 29-82.
14. *Ibid.*, 83-85.
15. Yu Sung, "Library Automation and Networking in ROC: Review and Comments," *Journal of Information, Communication & Library Science* 1, no. 2 (1994): 11-18.
16. Kai-tung Huang, "Chung-wen-ma wai ku-pao chih-fung?" ("Should Chinese Coding Be Still Confined as It Is?"), *China Times* (Mar. 15, 1996).

High-Altitude Librarianship: The Adventures of an ALA Library Fellow in Tibet

Cate Hutton

The first phrase I learned in colloquial Tibetan upon arriving at the Tibet Autonomous Region (TAR) Library in Lhasa, Tibet, in January 1994 was "Lo min-duk"—"The electricity is out." The city, the region's capital, is served primarily by hydroelectric power and suffers from a drastic gap between supply and demand for electric power during the harsh winter months. The resulting power outages sometimes last for days at a time. When I enquired as to when the electricity was likely to come back on, I was cheerfully assured by my hosts that the situation would improve in the summer, or perhaps when the hydro power dam at the sacred lake Yamdrok Yumtso, was completed in a year or more hence.

Throughout my nine-month assignment as a 1993-94 ALA Library Fellow, I noticed that the lack of electricity at the TAR Library did not dampen the staff nor the administration's enthusiasm for information technology. Indeed, in some perverse way, the poor infrastructure with which the library was burdened seemed to exoticize technology and to make acquisition of it the mark of what it would mean to be a modern library. Accordingly, as a representative of a "modern"—that is, technologically advanced—culture, it was tacitly assumed that I would play an

important role in promoting the library's technological progress.

In fact, this assumption was so tacit that it was not expressed at all prior to my arrival in Tibet. Basing my preparations upon the original project proposal, I had assembled professional materials to assist with providing in-service training in technical services and basic library administration at the library technician level. "The most critical areas in which the new staff will need training," the proposal read, "are . . . in priority order, acquisitions; cataloging and Library of Congress classification; public services; preservation techniques and administration." The proposal also suggested topics, such as international acquisitions methods, preservation techniques for ancient, hand-printed books, and "the application of AACR2 to the Tibetan texts." Knowing that there would be no English-language training materials available on site in Lhasa, I carried with me copies of the *Anglo-American Cataloguing Rules* and *Library of Congress Subject Headings*, articles on acquisitions and preservation methods, and a textbook on technical services for library technicians.

In the initial project planning meeting held with the TAR Library administration, the library's director, Mr. Rikdzin Dorje, acknowledged that there were obstacles to carrying out the program as planned. Since the library was not yet open and the staff, therefore, was not yet "in-service," it would be necessary for me to change my anticipated training format. Instead of coaching the staff through their assigned tasks, as I had expected, I was asked to provide them with formal lectures in library science. As a consolation, I was free to teach on whatever was appropriate to aspiring librarians, as long as one of my classes covered computer usage.

Unfortunately, library technology was the one area of library operations I was *not* prepared to teach. However, despite the fact that I had not brought

along any relevant teaching materials, I agreed to the director's wish since it seemed very important to remain flexible and to start out the project on a positive note. At this point, already having had the subject matter as well as the training format of the assignment radically diverge from my expectations so early on in my stay, I wondered what other surprises were in store for me over the next nine months.

During the eight months that had transpired between accepting the assignment in May 1993 and arriving in Lhasa the next January, I was busy preparing physically and psychologically for my trip. My previous experience living with Tibetans in Nepal and eastern Tibet for a year had prepared me somewhat for the hardships of moving house from California to Lhasa (located at almost 12,000 feet elevation) in the dead of winter, and my graduate work in Tibetan language and literature was certainly invaluable for both my work at the library and for having some familiarity with Tibetan culture. However, despite this background, I frequently found myself feeling as if I were submerged in murky water in which I only occasionally was able to gain a glimpse of what was going on around me.

Obtaining permission to visit Tibet—whether from the Tibetan government in years past or the Chinese government now—has never been easy for Westerners. Undoubtedly, this was a large part of its allure for the great explorers of the late nineteenth and early twentieth centuries who saw it as one of the last geographical prizes to be captured. There is, by the way, wonderful travel literature about adventurers who tried to make it to Lhasa, but who were turned back at the periphery by emissaries of the former (Tibetan) government. When I applied in 1993 for official permission from the Chinese government to work in Tibet, I drew inspiration from Madame Alexandra David-Neel's abor-

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tive attempts to make it to Lhasa eighty years ago. Eventually giving up on legal entry into the country, the steely Ms. David-Neel became the first European woman to visit Lhasa by disguising herself as a Tibetan nun and fighting off blizzards and brigands to arrive at her destination. More than once during my long period of waiting for the final approval, I was tempted to follow her example.

When I finally arrived in Lhasa to work at the TAR Library, the changes wrought by the Chinese presence in the region were obvious. The Tibet Autonomous Region, or the "TAR," has been administered as such by China since 1965. It comprises only a small portion of what Tibetans themselves conceive of as Tibet. Ethnic or historical Tibet was a loosely joined confederation of peoples whose range extended through what is now the Chinese provinces of Xizang (the TAR), Sichuan, Qinghai, Gansu, and Yunnan. Until the 1950s, Lhasa had been the capital and cultural center of Tibet. It is now a frontier town in western China and provides economic opportunity, natural resources, and a population release valve for immigrants from China proper. In fact, the Chinese name for Tibet, "Xizang," is telling: it means "Western Storehouse."

Yet at the time of my visit, after approximately 35 years of Chinese occupation, Lhasa was one of only a few regional capitals in China without a functioning institution equivalent to a state library. The TAR Library, which was supposed to be the region's provincial-level library, had been in the planning stage since 1983 and was still not open. And, as far as I could tell, there were no other institutions providing library services to the public. Lhasa's two academic libraries at Tibet University and the Tibet Academy of Social Sciences—which, incidentally, I never toured since they denied me permission to visit—appeared to be only for those connected with the schools.

Several magnificent but uncataloged collections of old and rare books still existed here and there. Such collections included, for example, that of the Menzikhang, a hospital where a combination of traditional and western medicine is practiced, and that of the library of the Dalai Lama XIII, housed at the Norbu Lingka summer palace. I even heard mention of a school library created by a visionary schoolmaster in Shigatse, the second largest city in the TAR. By and large, however, most Tibetans had never heard the word "library," much less visited one.

A visit to Sakya Monastery early on in my stay in Tibet was enlightening regarding Tibetans' traditional attitudes towards books and their keeping. After making the rounds of the main assembly hall, we were invited by one of the temple keepers to make the circumambulation behind the altar, as a way of completing the pilgrimage associated with this temple. We paid the required penny to do so, and entered through a chicken wire gate into utter darkness. Our flashlights revealed the white, silky offering scarves called "kha-ta" which are often used to indicate respect for sacred objects. Coming closer we saw that the scarves had been offered to a huge mound of books, approximately 60 feet high. Although covered in dust and obviously inaccessible, my colleague from the TAR Library who was serving as our tour guide, was visibly excited to see these ancient religious books and to discover this "library."

Traditional Tibet possessed great monastic libraries and some fabulous private collections owned by members of the aristocracy or the monastic elite. It produced a large body of fine literature on medicine, religion, philosophy, history, and mathematics, as well as a great many outstanding scholars and religious adepts. However, being a medieval society until it was abruptly thrown into the twentieth century four dec-

ades ago, Tibet prior to Chinese rule was not fundamentally either a literate or egalitarian society.

From the standpoint of a society in which it is a privilege to be educated or literate, old and new Tibet are not much different from one another. This continuing illiteracy and paucity of educational opportunity is the root cause of Tibet's lack of an established public library tradition. Significantly, lack of literacy in their own language is one of the greatest challenges the Tibetan people have to preserving their language, and through that, their culture.

Serious political, financial, cultural, and social obstacles exist to library development in Tibet. In the case of the TAR Library, construction on the new building started in May 1991 and was near completion during the tenure of my fellowship in 1993–94. At that time, however, the library had not obtained actual legal possession of the new facility from its parent institution, the Cultural Affairs Bureau. This meant that the staff were not allowed into the building to begin acquiring or organizing the collection. Without adequate work space, shelving, or furniture, and without training or job assignments, it was hardly surprising that very little in the way of technical processing or other library activities had been undertaken by the time I arrived in January 1994.

Funding for the extensive military, police, and security forces used to insure Tibet's political stability is given priority over support of its cultural and educational institutions. As a result, the library director's principle role was to obtain funding for collection development and general library operations now that the TAR government had spent close to \$1.7 million (U.S.) on the library campus.

The new library building contained a dance hall—complete with lights, mirror ball, and sound equipment—which, it was hoped, could

be used both for fund-raising and the essential function of currying favor with local party leaders. Karaoke and video equipment was purchased for the library while I was in residence. The library's director and two deputies were amused to see my surprise that such facilities were necessary in what seemed to be a cash-strapped institution. Had I somehow missed the news that Tibet was now engaged in "market reforms" and, as part of that, the library needed to become a money-making enterprise? Over the next several months I watched as the library director donned various hats as a retail shop landlord, as an entrepreneur contemplating starting a guest house for foreign scholars who would be prospective library users, and as the proprietor of a successful German-style beer garden, which took advantage of the library's lovely tree-filled campus and its access to Chinese-language magazines for the browsing pleasure of its patrons.

It was evident from the scope of the building that there were ambitious plans for the institution. Built to house 1.5 million volumes and containing seven floors of stacks, the library facility is impressive by any standard. It has large reading rooms filled with blue-tinted windows to protect library users and materials from the effects of the strong mountain sunlight, and its roomy campus contains attractive, modern housing for staff members.

The library science staff, although small, was exceptionally well-educated by Tibetan standards. Many were college graduates—an unheard of achievement in a region where perhaps 80 percent of the population is illiterate.

Although none of the staff were professionally-trained librarians, a number had the highly sought-after skills of being fluent in both the Tibetan and Chinese languages. In fact, the library director expressed concern that he had already received

his unit's allotment of university graduates from the government, and that in the future he would have to make do by hiring less qualified staff. With the exception of one young librarian who had served at the National Library of China in Beijing for five years as a Tibetan language cataloger, none of the staff had any previous library work experience. Some had never even used a library.

Contrary to my expectations, all my trainees were ethnic Tibetans who filled the majority of the library science-related positions. They had been assigned to work in either the Chinese or Tibetan language collections, depending on their language abilities. The library staff was about equally divided between Chinese and Tibetan employees, with the Chinese concentrating in the accounting, facilities, and administrative positions.

The group's limited library experience required that I build a foundation in fundamental library science concepts and provide as much background as possible to illustrate my points. Challenges arose due to cultural or experiential differences, as well as wide divergences in respective conceptual frameworks. For example, I spent the greater part of one class trying to explain why "access" is the central value of modern librarianship. Those educated in the Chinese system had adopted the attitude that as institutions, libraries are more like warehouses of "cultural relics" (a common term in China) than service organizations dedicated to providing information for their users. Others were merely incredulous that a system would exist to locate a particular item—perhaps without even consulting one's teacher—that could then be checked out and used by an ordinary individual.

Aside from one scholar on the staff who had an extensive research background, I was never able to convince anyone at the library—including the director—of the need for sub-

ject cataloging. Viewing it as too troublesome and time-consuming, they patiently explained that it was superfluous: "If someone is looking for a book, he will already know its title since whomever he is studying with will have told him."

Training in reference skills seemed especially senseless to the staff, since they could not imagine that anyone would be foolish enough to come into the library to ask questions. In addition to being a social taboo, the common wisdom was that it could be downright dangerous.

The teaching process also quickly uncovered a language barrier that went beyond our respective lack of fluency in each other's languages. In attempting to introduce fundamental library science concepts, I found that many common professional terms had never existed in Tibetan. For example, educated Lhasans use only one word, *gar-chak*, interchangeably for "index," "table of contents," "catalog," and "bibliography." We also had to create words for and define terms such as "floppy disk" before I could teach the computer class.

My first encounter with the library's computer came one afternoon after the convergence of two long-awaited conditions: the electricity came back on and the library's administrative assistant found the key to the small room at the rear of the old compound that housed the microcomputer, the copy machine, and a variety of books—old and new, rare and commonplace, and written in Tibetan, Russian, and Chinese. The computer and copier were covered with cloth to protect them from the ubiquitous layer of dust that covers most items found on the dry Tibetan plateau. The books, on the other hand, did not receive quite as good treatment. Although traditionally called the "Land of Snows," Tibet is primarily high desert and tends more toward sand storms than blizzards and snow banks.

With palpable expectation, the library staff who had followed me into the computer room watched over my shoulder while I switched on the power. The UPS beeped and shuddered, sprung to life, and the machine booted up. Scripts ran and, finally, the computer sat ready at the C:\ prompt. The group, which had been holding its breath up to this point, let out a collective sigh of disappointment. Dorje, using his several years of English language training, voiced the feeling of the entire group. "It isn't *doing* anything." Surprised, I asked what they had expected it to do and what, perchance, they might have sitting around in the way of software to make the computer do something useful. Thus we embarked on a long process of developing some terminology in Tibetan to explain what was not going on.

During the last two months of my stay, this process of developing a Tibetan language vocabulary for the profession became my focus. During this period, the staff and I compiled the first (to my knowledge) English-Tibetan thesaurus of library and computer science terminology. This involved coining terms and creating definitions in Tibetan for basic professional terminology so that Tibetan-speaking librarians have access to a shared vocabulary in their native language. It is my hope that, in the future, they will have a chance to receive additional professional training in Tibetan rather than Chinese. I found work on this project, which resulted in a 145-word thesaurus, especially rewarding and I enjoyed seeing the staff's enthusiasm for coining terms grow as their contributions were adopted by the entire group.

In addition to developing terminology essential to their work, the thesaurus project also gave the staff valuable experience managing a project and utilizing their newly acquired computer skills. Using a Tibetan language font loaded into WordPerfect, they were able to cre-

ate a professional-looking product. I was also pleased to see the library staff begin to take on the identity of librarians as their skills rapidly expanded and they integrated the new vocabulary with their work.

Aside from providing the TAR Library staff with a basic foundation in library science theory and a start on developing a common professional vocabulary in Tibetan, what did the project accomplish? First, the project connected the library with the outside world in a substantial way and exposed the staff to current standards of professional practice. By successfully completing this first international exchange, staff at the library and its parent department, the Cultural Affairs Bureau, gained confidence in their abilities to host visiting librarians and developed a commitment to pursuing the type of sustained, intensive training needed for the library to become a resource to benefit the region's people. My stint as an ALA Library Fellow was quickly followed by the arrival of a librarian from Beijing who will be in residence to provide staff training for three years.

It is my sincere hope that my efforts to replace the image of librarians as gatekeepers with that of service-oriented professionals will have some influence and eventually bear fruit at the TAR Library. For my part, I gained a sense of the crucial need to establish a true public library tradition in Tibet and the importance of initiating grass-roots efforts to promote education and literacy for the Tibetan people.

The ALA Library Fellowship served as a stepping stone to a new project with which I am now involved, the Tibet Small Libraries Project. Through my experiences at the TAR Library, I became aware that a decentralized system of community-based libraries to serve the region's mainly rural population would greatly help preserve Tibetan language and culture. Rather than

constructing imposing buildings that tend to discourage use, involving the community in building library structures can both keep costs down and encourage local ownership of the institution. By using technology appropriate to local conditions, such as adobe buildings and kerosene lamps, and by employing a level of library organization that can be sustained by part-time, locally trained staff, I hope to be able to provide Tibetan language books to beginning readers in places that have, up until this point, been completely unserved.

As an initial step, I have received governmental permission to build and operate eight libraries in a poor farming region 85 miles west of Lhasa. Working with a Tibetan partner who has sponsored the building of over 20 schools in the area, I hope to begin to bring educational resources to children and local families who have had little chance to develop literacy skills up until now. The official approval and local interest in place, I now need only to find approximately \$25,000 to fund the project.

In most parts of rural Tibet, it will be a challenge to find a sufficient number of readers in any one locale to warrant building a library. Accordingly, I am currently investigating the practicality of using bookmobiles as a way of delivering rural library services. I have a vision of the vehicles crossing the Tibetan plateau, traveling among nomad encampments and farming villages. I hope that in the future I can report back to you that this vision has become a reality.

Final note: The author is seeking assistance from librarians and/or educators with experience providing library and information resources to rural and largely illiterate populations in developing countries. Please address responses to Cate Hutton at the University of California, 300 Lakeside Drive, 22nd floor, Oakland, CA 94612-3550 or e-mail Cate.Hutton@ucop.edu.

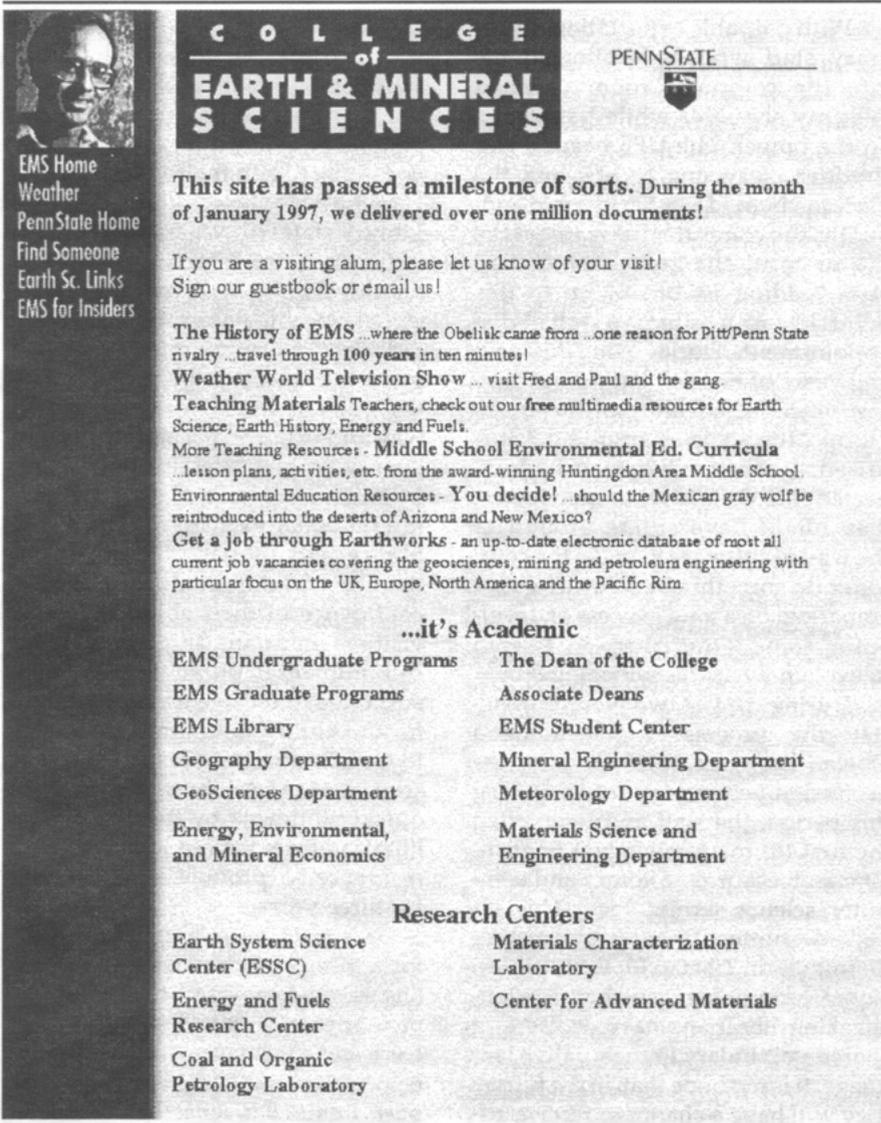
Collaborative Design of World Wide Web Pages: A Case Study

Paige G. Andrew and
Linda R. Musser

This paper describes the experience of two librarians who were approached by a departmental Webmaster to assist in taking what he had already created as his department's Web page and making it more useful to its intended audiences. The article documents the steps the librarians took to turn a miscellaneous list of Web sites from around the world into a more coherent and useful package of information. The result shows why librarians remain the most qualified individuals to turn to when there is a need to organize large amounts of information.

Librarians have been building expertise in organizing and maintaining information for centuries. Now we have the opportunity to move these skills from the world of paper and other physical formats to the electronic world. This paper describes the experience of two librarians who were approached by a departmental "Webmaster" to assist in taking what he had already created as his department's Web page and making it more useful to its intended audiences. It documents the steps the librarians took to turn a miscellaneous list of Web sites from around the world into a more coherent and useful package of information. The result shows why librarians remain the most qualified individuals to turn to when someone needs to organize large amounts of information.

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COLLEGE of EARTH & MINERAL SCIENCES

PENNSYLVANIA STATE UNIVERSITY

This site has passed a milestone of sorts. During the month of January 1997, we delivered over one million documents!

If you are a visiting alum, please let us know of your visit!
Sign our guestbook or email us!

The History of EMS ...where the Obelisk came from ...one reason for Pitt/Penn State rivalry ...travel through 100 years in ten minutes!
Weather World Television Show ... visit Fred and Paul and the gang.
Teaching Materials Teachers, check out our free multimedia resources for Earth Science, Earth History, Energy and Fuels.
More Teaching Resources - Middle School Environmental Ed. Curricula ...lesson plans, activities, etc. from the award-winning Huntingdon Area Middle School.
Environmental Education Resources - You decide! ...should the Mexican gray wolf be reintroduced into the deserts of Arizona and New Mexico?
Get a job through Earthworks - an up-to-date electronic database of most all current job vacancies covering the geosciences, mining and petroleum engineering with particular focus on the UK, Europe, North America and the Pacific Rim.

...it's Academic

EMS Undergraduate Programs	The Dean of the College
EMS Graduate Programs	Associate Deans
EMS Library	EMS Student Center
Geography Department	Mineral Engineering Department
GeoSciences Department	Meteorology Department
Energy, Environmental, and Mineral Economics	Materials Science and Engineering Department

Research Centers

Earth System Science Center (ESSC)	Materials Characterization Laboratory
Energy and Fuels Research Center	Center for Advanced Materials
Coal and Organic Petrology Laboratory	

Figure 1 Home Page for Penn State's College of Earth & Mineral Sciences

The College of Earth and Mineral Sciences at Penn State, like many other organizations, maintains a Web site¹ (see figure 1). This site provides information about the programs and people of the college and acts as a gateway to specialized resources of the college. In addition, it provides links to other Web sites that are relevant to the college's areas of interest such as geography, geosciences, meteorology, oceanogra-

phy, materials sciences, mining, and mineral economics. This area of the Web site is titled "Related Web Sites"² and is the area we were asked to assist in redesigning.

Description of Original Web Site

In the spring of 1995 the Related Web Sites page contained links to more

Some On-line Earth System Science Education Resources

Earth & Mineral Sciences' own [Earth Science Multimedia Resources](#)

Earth & Mineral Sciences' own [Weather Pages](#)

Email lists/Discussion groups

- [Science teachers/Lesson plan swaps](#)

Anonymous ftp (file transfer protocol)

- Science Lesson Plans

- [Ocean color data](#)

- [TOMS ozone data](#)

- [Earth, space science data](#)

- [Hand-held photos of Earth](#)

User ID: photos

PassWord: photos

- [GOES and GMS images](#)

Telnet services

- | | | |
|--|----------------------------|--------------------------------------|
| • nssdca.gsfc.nasa.gov | login: nssdc NSSDC | Global Change Master Directory |
| • spacelink.msfc.nasa.gov | login: follow instructions | NASA Spacelink educational materials |
| • glis.cr.usgs.gov | login: follow instructions | Geographic Land Info System |
| • fedworld.gov | login: follow instructions | Federal Information from STIS |
| • fedix.fie.com | login: follow instructions | Federal Information exchange |
| • madlab.sprl.umich.edu | 3000 | U Michigan weather |

Figure 2

Spring 1995 Related Web Sites Page

than 140 sites on the World Wide Web, primarily in the area of earth sciences. Although the page had achieved some recognition as a notable site for earth sciences, its size and organization made it unwieldy.³ General sites such as Yahoo and Carrié's Crazy Quilt were included, as were other miscellaneous resources, including Voice of America News.

The page was organized as a list of sites grouped by type of access—FTP, telnet, gopher, and so on (see figure 2). There was little annotation, and some dead sites were listed. The Web builder had reached a point where he recognized that he needed a new and more useable organiza-

tion for the page. This prompted him to approach the special librarian for the College about assisting in the redesign of the page.

He chose that particular librarian to assist him in the redesign for several reasons. First, he was impressed by the work the librarians in her area had done in the organization of the library's gopher system. Secondly, he knew the specific librarian he approached regarding the matter, and they had "talked Internet" before. Finally, he simply realized that he needed help in organizing what he had. The librarian agreed to assist and recommended the inclusion of another librarian in the project, a

cataloger, one of the "super-organizers" of the library world. It turned out to be a very fruitful collaboration for all three individuals involved.

Planning the Project

At the first meeting the librarians and the Web builder discussed goals, parameters, and a time line for the project. The Web builder was anxious to have a new design in place prior to the fall of 1995, giving the librarians nearly four months to complete their task. The purpose of the Web site and the priorities for its use were also discussed. Prior to this meeting the librarians had already perused the Web site to get an idea of its organization and format. They also examined some of the sites listed. During the initial meeting the librarians and the Web builder agreed that some of the sites might have to be eliminated or that the design might have to be narrowed in scope in order to better accommodate the primary purpose of the Web page.

Regarding the intended audience, the librarians asked whether or not the Web builder intended to focus on a particular theme such as global change, and whether the method of listing by type of access was preferred. This interaction between librarians and "customer" helped to determine some key points before proceeding to tear down what existed in order to redesign. Among the key points established were:

- The Web page was intended to serve the College of Earth and Mineral Sciences faculty, staff, and students and other educational institutions, including K-12 schools;
- The Web page was intended to act as a recruitment tool, in particular by adding interactive instructional material to the site;
- The Web page's links should be

multithematic, illustrating and reflecting the interests of the college, and it should include links to archives or collections of NASA photographs, satellite images, and other imagery; and

- The design should accommodate most of the sites listed on the existing page.

Beginning the Redesign

Following the initial meeting with the Web builder, the librarians each spent time examining the existing content of the page. They then met to discuss their findings and to brainstorm about possible new structures that would satisfy most, if not all, of the intended goals. Part of these discussions also focused on format changes, selected search mechanisms to include for better access, and how to classify or subclassify information found on the page. Examples of some of the questions the librarians posed were:

- How many subject themes should there be and how should they be arranged?
- Should we classify by geographic area, perhaps using the seven continents as a starting/reference point, or classify by country?
- Should there be an organizational list or index?
- Should we incorporate an alphanumeric or strict numeric classification scheme, such as the Library of Congress or Dewey classification systems?
- What about adding the ability to do keyword searches across all linked sites? Within a linked site?
- How can we improve the clarity of the information? Perhaps use a system of indentation, bolding, upper/lowercase lettering, bulleting, and subnumbering/sublettering? Should icons be used? Could color be used to identify types of sites?

- Should we recommend that most, if not all, of the linking sites have a brief annotation to assist in guiding the user?

The librarians felt that the next course of action involved spending time becoming more familiar with various aspects of good Web page design. This was accomplished by attending seminars at their institution, examining and using a Web-based self-study course,⁴ and comparing and contrasting similar Web sites already in existence to determine their strengths and weaknesses.

Brainstorming

After gaining some much-needed background information on designing Web pages, the librarians scheduled a brainstorming session designed to compare notes, create a new structure for the Web page, and draft a list of recommended changes to share with the Web builder. They then met one afternoon in a computer laboratory that gave them access to several workstations with Internet access, chalk and china boards to write and sketch ideas on, and a quiet place to concentrate on the task.

First, the librarians examined multiple Web sites together, particularly those which were similar in focus to this Web page, sharing their insights regarding characteristics that worked well or poorly. This became a "jumping off" point. Characteristics that seemed to work well at other sites, e.g., the use of colors to delineate major topics in a site, were retained in a list of recommendations to pass to the Web builder.

Next, the librarians scoured the existing Related Web Sites page, eliminating sites that did not fit the intended audience, were no longer live, or did not seem to fall into any of the topical areas on which the Web builder wanted to focus. This could

accurately be called weeding, but in a virtual sense as opposed to physically removing books or periodicals from one's shelves! Then began a process of grouping sites into subject areas. The librarians quickly discovered that, while some sites fit easily into one subject theme, many did not fit at all or could be placed into multiple areas.

Five subject themes were chosen—earth sciences, life sciences, physical sciences, general science, and interdisciplinary topics. These categories and labels deliberately mirror those in use in the K-12 curricula. In order to accommodate sites that could be placed into multiple subject categories, we recommended that they be posted in multiple locations. The sites that did not fit well into any of these subject themes consisted primarily of dictionaries, thesauri, encyclopedias, glossaries, and software. We decided to create a separate area on the page titled "Toolkit" to handle these reference materials. In order to highlight special types of resources, as identified by the Web builder, three additional areas were created—"Images," "Playground," and "Teacher Resources." These three areas were related primarily by format or function. The Image area contained sites with photographs, remote-sensed imagery, and so on; the Playground included interactive multimedia sites, such as those provided by sciences museums; and the Teacher Resources area included syllabi and other teacher resources intended to assist the teacher in creating and presenting classes on various topics.

Upon completion of this stage of the redesign, the librarians spent the remainder of the day categorizing the sites from the existing Web page as accurately as possible and creating a cohesive preliminary design to present to the Web builder. Specific suggestions to improve the page were also developed. These included providing brief annotations

for each site as well as using indentation or other formatting techniques to improve clarity. In addition, we recommended the elimination of those sites that fell outside the scope of the Web page either by target audience or by topic.

Presentation to the Web Builder

With a design for the new structure of the Related Web Sites page completed and a list of recommendations prepared, the librarians set up a meeting with the Web builder to present their design. A sketch of the redesigned Web page was presented to the Web builder along with the justification for the choice of design (see figure 3).

The meeting with the Web builder resulted in detailed discussions that led to significant revisions of the proposed Related Web Sites page design. This meeting helped the Web builder to focus more closely on the intended audience, for example, which had a direct impact on the arrangement of topical areas in the page. A social sciences area

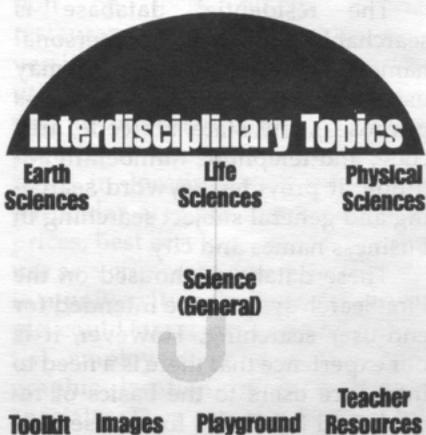


Figure 3
Diagram of Structure for the Redesigned Web Site

EMS Home
Weather
PennState Home
Find Someone
EMS Happenings
Course Materials
Earth Sc. Links
EMS for Visitors

EARTH & MINERAL SCIENCES

Earth Science Links

Pointers to Earth System Science Educational Resources

Here are some Earth System Science related Websites. We have sifted through the links we are aware of and put the best together with a short description. Please tell us if you find a broken link or would like to suggest some of your favorites for inclusion here. In order to provide organization to this growing compendium of links, sites have been assigned to one of these six categories.

Earth Science

Find climate, oceanographic, geological, and satellite information and data links here [just to name a few!]. Growing number of links to Earth system pages [multidisciplinary approach to Earth sciences].

Environment

A variety of information about our environment. Lots of government research pages. Data available on a variety of topics. Interested users should check out our Earth Science links, too.

Weather

Current weather info from around the world. Maps, movies, and tables galore. Pointers to meteorological research.

Geography

Look here for links to mapping, remote sensing, GIS and geography in general. Lots of government information and data available online.

Teacher Resources

Find everything from lesson plans and lab experiments, to discussion groups, to updates on educational technology, and more. If you're thinking of getting your class online, or just need some fresh ideas, be sure to peruse these links. Check out our K-12 links, too.

Kids (K-12)

For kids, or the kid in all of us. Online articles, exhibits, and experiments really make learning fun! Parents and teachers, check here for places to have your kids visit.

Figure 4
Page of Links, Formerly Called "Related Web Sites"

was also added—a need that arose from perceived pressure by the administrators of the college for equal representation for all departments rather than from the Web builder's intentions or perceived needs. Once again, the availability of a chalkboard was of great utility, allowing the three to creatively address changes and collaboratively map out a new and final design.

Summary and Conclusions

From start to finish the project stretched over a twelve-week period. Given the actual amount of time invested by the librarians, how-

ever, completion of the Web page redesign could have been accomplished in four weeks or less. The Web builder was very pleased with the recommendations presented to him and used many of them in later versions of the page, as he continued to revise the design based on changing needs (figure 4). Working with a graduate student, he implemented a new design that has resulted in the enhanced utility of the Web page, a design that works much better for him in the political climate of his workplace, and one which has brought recognition of quality to the page in the months since its reconstruction.⁵

From the librarians' standpoint

this project was intellectually stimulating and a very pleasant use of their organizational expertise and capabilities. We firmly believe that the collaboration has enhanced the perception of the capabilities and potential contributions of librarians. Librarians see, review, and share information about Web sites on the Internet on a regular basis, as well as create many of their own, and this activity—combined with our organizational skills—makes us well qualified to assist others in the design and creation of Web pages. Packaging and repackaging infor-

mation for the usefulness of our many and varied publics has long been the forte of librarians and a specialty of librarianship. We now move into the world of packaging and repackaging electronic information in a virtual world. As the amount of information available via the World Wide Web grows these organizational skills will become more critical to effective Web page design. Perhaps in the future, rather than waiting to be asked, librarians will promote their organizational skills as part of their core services to the public.

Directory Assistance on FirstSearch: Prospects and Potential

Lutishoor Salisbury and Don Batson

This paper highlights the advantages in using the Pro CD database on FirstSearch. It also identifies some weaknesses for business use and the constraints caused by the system. We provide guidelines and searching tips that will aid in maximum retrieval, usefulness of results, and cost-effectiveness.

There are a number of electronic phone directories on the market, giving buyers an opportunity to choose products that closely match their specific information needs and

searching abilities.¹ Most of these products, however, are CD-ROM-based and are not accessible from remote locations or through World Wide Web access for end-user searching. Select Phone was among the first of such products to emerge on FirstSearch, providing full end-user searching capability at an affordable price.

FirstSearch is OCLC's online reference system designed for end-user searching. It provides access to more than fifty databases in numerous subject areas. Because of its flexibility, FirstSearch offers all of the advantages of CD-ROM systems and locally mounted databases with no complicated installation, maintenance, and updating procedures.

Pro CD, previously called Select Phone, was introduced on FirstSearch in 1995. In the spring of 1996, the Pro CD database was split into two new databases on FirstSearch: Pro CD Biz and Pro CD Home.

Pro CD Biz contains approximately fifteen million records of white page listings of businesses mainly from printed phone directories in the United States and is updated quarterly. Pro CD Home contains approximately eighty million records of residential white page

References

1. College of Earth and Mineral Sciences: <http://www.ems.psu.edu> (1995).
2. Related Web Sites: <http://www.ems.psu.edu/RelatedWebSites.html> (1995).
3. Flora S. Cobb and Edward F. Lener, "Internet Resources for the Earth Sciences," *College & Research Libraries News* 56, no. 5 (May 1995): 319-25.
4. Marilynne W. Stout and Carrie A. Webster, "Designing/Structuring Text for the World Wide Web," [http://ets.cac.psu.edu/presentations/DesigningText/\(1995\)](http://ets.cac.psu.edu/presentations/DesigningText/(1995)).
5. "Two EMS World Wide Web Pages Earn Top 'Star' Ratings in Magellan Directory," *PennState Intercom* 25, no. 23 (Feb. 22, 1996): 8.

listings and is updated semiannually. Both databases are compiled from U.S. telephone directories.²

The business database offers the following access points for finding businesses: business and personal names (for select businesses that may use residential phones for business purposes), city, state, zip code, area code, telephone number, and Standard Industrial Classification (SIC) codes or SIC subject headings. In addition it provides keyword searching and general subject searching in business names and city.

The residential database is searchable by business and personal name (for select businesses that may use residential phones for business purposes), city, state, zip code, area code, and telephone number. In addition, it provides keyword searching and general subject searching in business names and city.

These databases, housed on the FirstSearch system, are intended for end-user searching. However, it is our experience that there is a need to introduce users to the basics of records and fields and to field searching capabilities using Boolean and proximity operators in searching. Such databases also require training to gain maximum benefits in re-

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trieval and to cut costs, especially when using the per-search pricing option on the FirstSearch system.

This study will attempt to highlight the advantages in using Pro CD on FirstSearch. It will also identify weaknesses in applying the system for business use. In addition, it will provide guidelines and searching tips that will aid in maximum retrieval, usefulness of results, and cost-effectiveness.

Advantages in Using Electronic Telephone Directories

Several advantages to using telephone directories in electronic format have been identified in the literature. These include the provision of many access points, ease of use, search and retrieval capability, and the ability to search over wide geographic areas and to manipulate the information found. Quinley,³ Foss,⁴ Tafel,⁵ Boettcher and Kingman,⁶ and Ernest, Beam and Monath,⁷ have identified other reasons for using electronic telephone directories. Among these are: ease in finding specific telephone numbers, business addresses, or residential addresses; ease in acquiring information on local hotels, motels, restaurants, dentists, doctors, universities, and car rental agencies; utility in finding an individual business or information for sales prospecting or market research; assistance in locating businesses in a particular area for identifying best prices, best services, and so on; and use as a crisscross directory. Patrons in a university or college, for example, could target jobs and find potential employers in a certain geographic location or in a certain specialty. They can also be used for finding small businesses in a particular area when doing so might otherwise be difficult using a telephone directory in paper format.

Why Use Pro CD Directories on FirstSearch?

It is well known that many small and medium-sized libraries do not subscribe to a comprehensive collection of telephone directories in either print or on CD-ROM. In a study conducted by Mooney,⁸ among four telephone directories on CD-ROM, the "best buy" distinction went to Select Phone on CD-ROM in all three categories tested: accuracy, ease of use, and search-and-retrieval capabilities. This is the same database made available on OCLC's online reference service, FirstSearch. They provide access through telnet and World Wide Web on the Internet, with full end-user searching capabilities. In addition, FirstSearch offers the flexibility and advantage of providing access to this kind of resource to large or medium-sized libraries or businesses through annual subscription pricing. It also provides simultaneous access through the per-search option to smaller libraries, businesses, and individuals who could not otherwise afford to have access to this kind of resource.

FirstSearch subscription pricing allows payment of a fixed fee for a continuous subscription year for an unlimited number of searches in the Pro CD databases. Greater volume of use achieves cost-effectiveness. There are three components of subscription pricing: simultaneous logons, database subscriptions, and database user limits.

Clients can also choose the per-search option, through which they can buy blocks of FirstSearch searches, with blocks of five hundred costing \$0.95 per search. The more blocks purchased, the cheaper the price. For example, if eighty blocks of searches are bought, the price reduces to \$0.55 per search. In order to increase use of the system,

there is a sale on searches once per year. During this sale, the price of a search is as low as \$0.50 per search. Open per-search pricing allows virtually an unlimited number of simultaneous logons to access FirstSearch under a single authorization. This subscription option may be the most promising method of accessing this database for institutions with lower volume demand for this type of information.

There are no connecting fees associated with searching these databases, nor is there a database fee as in the Dialog system. A cost is incurred only when a search is conducted in the per-search pricing option. If a user effectively constructs and plans, for example, two to three searches (approximately \$3.00) it is possible to do any of the following: target businesses in a particular area, download a listing of addresses and telephone numbers nationwide to create mailing lists, or find a long-lost relative at a much cheaper price than the cost of a search service or of using directory assistance. There is no restriction on the number of records that can be printed or downloaded.

There may, however, be a limit to the practicality of this database for business purposes since there is only one print format. Producing business cards or mailing labels, for instance, is not possible. Instead, records must be downloaded and modified using word processing software, and retrieved records must be added to another database for manipulation.⁹

Moreover, there is no need for dedicated computers and maintenance, as would be necessary for CD-ROM workstations. Large organizations could save thousands of dollars on telephone bills that might go toward directory assistance. They would also improve users' satisfaction by providing access to this resource twenty-four hours a day from the comfort of their homes or offices and at their own convenience.

Searching Characteristics

Using Online Help

Understanding the structure of the database can help a user to obtain precise search results in a cost-effective way. Using **h <database name>**, e.g., **h pro cd biz** or **h pro cd home** will provide information on the scope and coverage of these databases.

For effective retrieval, it is advisable to be able to identify the field labels that will be used in searching and in browsing the Wordlist—an online dictionary valuable for browsing to find exact names of persons, businesses, or SIC codes or subject headings. The Wordlist also identifies the number of records appearing for each in the database. There is no charge for browsing this dictionary in the per-search pricing option. Typing **h pro cd biz labels** or **h pro cd home labels** before or during a search finds these. For effective retrieval and cost savings, getting into the habit of finding and reading these screens and labels is important. Appendix 1 lists the field labels for both databases.

Examples of Search Strategies

Example #1: Simple Subject Search

In mailing a letter to the University of Massachusetts, a student realized that he did not have the zip code. A simple search in Pro CD Biz database as **s university massachusetts** would retrieve a record containing the zip code. Note that "su:" is not used in this search statement because it is the default field tag. The system also assumes an "and" between words.

Example #2: Combined Field Searching

For someone targeting addresses and telephone numbers of all land-

scape contractors residing in Oregon, conduct the following general search in the Pro CD Biz database, **s landscape contractor+ and st:oregon**. This search strategy would retrieve landscape contractors only when these two words are in either the business, personal, or city names field, and here retrieved only six records. The system does not search the SIC subject headings when a general subject search command is given. Please note that in the above example, **st:oregon** is used in this search instead of **st:or** because "or" is assumed to be the Boolean OR.

A more productive search would be to use the SIC codes in subject searching. To identify the SIC codes, display a record from the previous search and choose the appropriate SIC codes and SIC subject headings, or consult the Standard Industrial Classification Manual¹⁰ to identify the relevant code(s). A typical search using the SIC code for landscape contractors might be: **s sc:0782a and st:oregon**, yielding 432 records.

We have observed that some records do not contain SIC classification. Therefore, for comprehensive retrieval, searching using both strategies is advisable, as outlined.

A second example of a combined field search might be a family visiting from another state who would like to contact all Sears stores in the area. A quick and easy search in the business database formulated as **s na:sears and cy:dallas and st:tx** will retrieve 129 references to Sears stores located in the Dallas, Texas, area.

Example #3: Searching Using Boolean Operators

The FirstSearch system provides the capability for Boolean searching but is limited to two ORs in a search statement. If, for example, your company needs to advertise a job and to find addresses for all computer system consultants in the United States, a search formulated

as **s sc:computer system consultants** would retrieve all such persons or companies. If, however, one needs to narrow this search to certain states, such as Arkansas, Texas, Tennessee, or Florida, it would entail two searches as follows:

- (1) **s sc:computer system consultants and st:(ar or tx or tn)** and
- (2) **s sc:computer system consultants and st:fl**

Similarly, if a user is searching for all retail clothing stores in selected cities in Arkansas—e.g., Fayetteville, Little Rock, Pine Bluff, and Fort Smith—he or she would need to conduct two separate searches, such as:

- (1) **s sc:clothing stores retail and st:ar and cy:(fayetteville or little rock or pine bluff)** and
- (2) **s sc:clothing stores retail and st:ar and cy:fort smith**

Alternatively, an area code search, e.g., **s ph:501 and sc:clothing stores retail**, could yield a less precise but more wide-ranging retrieval in one search statement.

If, however, a user needs to find addresses and phone numbers only to family clothing retail stores, he or she would need the following two searches to retrieve this specific information:

- (1) **s sc:family clothing stores retail and st:ar and cy:(fayetteville or little rock or pine bluff)** and
- (2) **s sc:family clothing stores retail and st:ar and cy:fort smith**

Alternatively, the user could execute the above search using two search statements using the SIC codes as follows:

- (1) **s sc:5651 and st:ar and cy:(fayetteville or little rock or pine bluff)** and
- (2) **s sc:5651 and st:ar and cy:fort smith**

Example #4:

Using the Wordlist for Browsing. Looking in the Wordlist to verify correct spelling or the appropriate form of a name, or to identify the correct SIC classification or name of a city is always recommended. The Wordlist is, in effect, an online dictionary valuable for browsing to find exact personal and business names, SIC classification, and names of cities. There is no charge for browsing the Wordlist. Cost in the per-search option is incurred only when a selection is made. Therefore, becoming familiar in searching with the Wordlist labels that are being used is important. These labels end in an equal sign as in na= for names, sc= for SIC classification, and cy= for names of cities (see appendixes 1a and 1b).

Using Wordlist for Retrieving Company Name. Suppose a consumer is looking in this database to find the telephone number of Walmart Portrait studio in Midlothian, Virginia. For looking in the Wordlist, type **w** followed by the appropriate Wordlist or bound-phrase label, in this case, **w na=walmart**. The results are shown in figure 1.

It is evident from the above that we retrieve several different records, but that the state or city does not clarify the entries as expected. This severely restricts the effectiveness of this Wordlist in browsing in this index. To browse all Walmart entries by city and state, the user must do a search as **s (walmart or walmart)**. The results in figure 2 show a browsable listing from which the relevant entry could be chosen.

To be very specific in retrieval **s (walmart or walmart)** and **cy:midlothian** and **st:va** conducted using one search statement could be very effective. The results, together with the complete record, are shown in figure 3.

Using Wordlist for Browsing SIC Classification. An advertising company is

LOOKED UP: na=walmart

NO.	COUNT	WORD/PHRASE
1	1	na= wal lex oil co
2	1	na= wal lyn pic pac inc
3	1	na= wal machine co inc
4	1	na= wal man tool & engineering
->5	6	na= wal mart
6	1	na= wal mart automotive
7	1	na= wal mart conoco
8	1	na= wal mart discount
9	1	na= wal mart discount cit

Figure 1

SEARCH: walmart or walmart FOUND 372 Records

NO.	NAME	CITY	STATE
49	WAL MART DISCOUNT CITIES ST...	CHESAPEAKE	VA
50	WALMART PORTRAIT STUDIOS	MIDLOTHIAN	VA
51	WAL MART VISION CENTER OPT	LEESBURG	VA
52	LIBERTY FAIR MALL WAL MART	MARTINSVILLE	VA
53	WAL MART DISCOUNT CITIES	BIG STONE GAP	VA
54	WALMART PORTRAIT STUDIO	BLUEFIELD	VA
55	PIZZA INN THE LOCATED ACROS...	EASLEY	SC

Figure 2

looking for a listing of addresses and telephone numbers for all health clubs in Arkansas. A good starting point is to look in the Standard Industrial Classification Manual¹⁰ to find the SIC code that deals with health clubs. If a listing is not available in hard copy, then conduct a simple search in Pro Cd Biz as **s health club+**. This search will retrieve references mainly when the words "health" and "clubs" appear in the name of the organization. When the records are displayed, they show the number 7991 as the SIC code for Physical Fitness Facility.

The next step in searching would be to browse the Wordlist using **w sc=7991**. The results are shown in figure 4.

Five of the above entries relate to health clubs. Since only one entry could be chosen at a time for retrieval from the Wordlist, conducting this search in the following two steps for effective retrieval is advisable. The system allows only two ORs in one search statement.

- (1) **s (sc:7991 or sc:7991a or sc:7991b) and st:AR** and
- (2) **s (sc:7991c or sc:7991d or sc:7991e) and st:AR**

SEARCH: (walmart or wal mart) and cy:midlothian and st:va

FOUND 1 Record

NO.	NAME	CITY	STATE
1	WALMART PORTRAIT STUDIOS	MIDLOTHIAN	VA

Complete Record:

NAME: WALMART PORTRAIT STUDIOS
ADDRESS: 900 WALMART WAY
CITY: MIDLOTHIAN
STATE: VA
ZIP CODE: 23113-2600
PHONE NUMBER: 804-378-6748
ScCODES: 7221 PHOTOGRAPHIC PORTRAIT STUDIOS
PUB DATE: 1994

Figure 3

LOOKED UP: sc=7991

NO.	COUNT	WORD/PHRASE
1	2002	sc= 7948 racing including track operations
2	1	sc= 7977b
->3	11651	sc= 7991 physical fitness facilities
4	6453	sc= 7991a athletic clubs
5	16075	sc= 7991b health clubs & reducing salons
6	49	sc= 7991c spas
7	68	sc= 7991d physical fitness clubs
8	68	sc= 7991d physical fitness clubs
9	2921	sc= 7991e gymnasiums

Figure 4

SEARCH: zp:37928 and sc:(7011a or 7011b) found 5 Records

NO.	NAME	CITY	STATE
1	HOTEL NIKKO ATLANTA BUCKHEAD	KNOXVILLE	TN
2	RIVERVIEW GRILLE	KNOXVILLE	TN
3	HYATT REGENCY KNOXVILLE	KNOXVILLE	TN
4	BLAKELY HOTEL THE	KNOXVILLE	TN
5	FAMILY INNS OF AMERICA	KNOXVILLE	TN

Figure 5

Searching using SIC Classification and ZIP Code

A couple has an opportunity to attend a conference or to accompany their child to visit the University of Tennessee. They will need lodging while there, and they want to stay within a short distance of the campus. Searching the SIC code for hotels (7011a and 7011b) and the zip code for the University of Tennessee (37928), they retrieve the following records (figure 5).

A family has seen movies in which Moab, Utah, has been the location, and they have decided to vacation there. They know that, because of the expanse of area to cover, they might want to take advantage of a tour service. The following search in this database retrieved several tour services in the area of interest to them (figure 6).

Weaknesses and Suggested Improvements

When conducting the sample searches mentioned above, we found that there are several spelling mistakes in this database and that there is an overall lack of quality control. For example, there are several variants of the name for Wal-Mart, some entries do not contain the field for SIC classification, and, occasionally, inappropriate SIC classifications are assigned. One example of this was detected when we conducted a general search to retrieve law schools in the New York area, as s (universities or university) and law and ph:212. Several entries retrieved were classified under SIC code 8211, which is the code for elementary and secondary schools.

Another point worth noting is that it would be very helpful if they included fax numbers and toll-free numbers in the entries in the business database, for obvious reasons. And, an added value to the database

References

NO.	NAME	CITY	STATE
1	ADRIFT ADVENTURES RAFTING	MOAB	UT
2	WILLIAMS JOHN L	MOAB	UT
3	NAVTEC EXPEDITIONS	MOAB	UT
4	WORLD WIDE RIVER EXPEDITIONS	MOAB	UT
5	FARABEE 4X4 RENTALS	MOAB	UT
6	KAIBAB MOUNTAIN BIKE TOURS	MOAB	UT
7	OTINGERS LIN TOURS	MOAB	UT
8	MOAB ROCK SHOP	MOAB	UT

1. Elizabeth W. Foss, "Yellow Pages on CD-ROM," *CD-ROM Professional* 6 (Sept. 1993): 62, 64, 66-69.
2. *FirstSearch Briefing*, an update for libraries, January 1996. col. 1, p. 2. Also available from <http://www.oclc.org/oclc/new/fsbrief/9578fsb/fsbrfjan.htm>.
3. Mitchell Quigley, "Phone directories," *Database* 17 (1994): 18-30.
4. Foss, "Yellow Pages on CD-ROM."
5. Linda L. Taffel, "Dun's Electronic Yellow Pages," *Database* 12 (1989): 63-66.
6. Jennifer Boettcher and Bruce R. Kingma, "Telephone Directories: Alternatives to Print," *Reference Services Review* 22 no. 2 (1994): 53-61.
7. Douglas J. Ernest, Joan Beam, and Jennifer Monath, "Telephone Directory Use in an Academic Library," *Reference Services Review* 20 (1992): 49-56, 80.
8. Shane Mooney, "Directory Assistance on Disk," *PC World* 14 (Feb. 1996): 171-76.
9. David Z. Chroust, "From FirstSearch to WordPerfect: Cleaning Up Downloaded Screens," *Online* 17 (1993): 44-51.
10. United States Technical Committee on Industrial Classification, *Standard Industrial Classification Manual* (Springfield, Va.: National Technical Information Service, 1987).

Figure 6

would be to add brand names as an index for searching. With such an index, the database could identify computer dealers that sell a particular brand name computer or printer.

Summary Evaluation

Despite the few deficiencies identified above, this database is affordable and provides access to directory information to library users, small businesses, and the general popula-

tion from the comfort of their offices, homes, or businesses through the Internet. For libraries that subscribe to hard copy telephone directories, this electronic end-user access is truly attractive. The database offers enormous savings in physical shelving space allocated to phone books and in time in terms of ease of pulling together large quantities of data. In addition, it provides the ability to search the information by various access points.

Appendix 1 (a)

Pro CD Biz Labels

Kind of Search	Label	Remarks
Subject+	su:	Includes business, personal, and city names. EXAMPLES: su:pooley
ZIP Code	zp:	zp:43015
Phone Number	ph:	ph:914
City	cy:	cy:tulsa
Name	na:	Business, personal name.
SIC code	sc:	Standard Industrial Class. codes
State	st:	st:tx

Appendix 1(a) continued

Kind of Search	Label	Remarks
Bound-phrase Searches		
City	cy=	A bound-phrase search looks for a business or personal name, city, etc. to appear EXACTLY as you type it. We recommend that you find your term in the Wordlist first.
Name	na=	
SIC Code	sc=	

Appendix 1 (b)

Pro CD Home Labels

Kind of Search	Label	Remarks
Subject+	su:	Includes business, personal, and city names. EXAMPLES: su:farnol
ZIP Code	zp:	zp:43015
Phone Number	ph:	ph:914 ph:914-225-1617
City	cy:	cy:tulsa
Name	na:	Business, personal name.
State	st:	st:tx
Bound-phrase Searches		
City	cy=	A bound-phrase search looks for a business or personal name, city, etc. to appear EXACTLY as you type it. We recommend that you find your term in the Wordlist first.
Name	na=	

A "+" following the name of a kind of search means you can search simple plurals.

TLC: Total Library Computerization

On Point, Inc. 2606 36th St., N.W., Washington, D.C. 20007; (202) 338-8914. Price: First module, \$750, additional modules, \$700; complete, \$2,850; network, add \$100. System requirements: 386SX PC or Apple Macintosh Plus; VGA video adapter; mouse or pointing device; 4MB RAM, 7MB hard disk space; Windows 3.1 or higher or Apple System Software 7. For networked access: AppleTalk (Phase I & II) or Tops 2.1, 2.2, or 3.0 for Macintosh. Novell or any NetBios compatible for PCs compatible with AppleTalk Protocol (Farallon) or IPX standard (Novell) for mixed.

As its name suggests, Total Library Computerization (TLC) has the ambitious goal of providing small to mid-sized libraries with a single, integrated program for cataloging, interlibrary loan, serials control, and acquisitions. It also serves as a public catalog.

The patron interface offers a mini-menu that allows users to search brief citations or full records for authors, titles, or subtitles, and keywords. A wildcard search and truncation are also available.

Library staff enter a password-protected main menu of buttons that leads to modules for cataloging, borrowing, ILL, serials control, orders, and memos. Each module has a menu of three further buttons for reports, updating and editing, importing or exporting to disk, and three navigation buttons for changing modules, getting help, or exiting the system. Moving through the menus is reasonably intuitive, either by backtracking or jumping directly to another module from the control bar. However, at certain levels it is not easy to move back one step, particularly when one decides not to complete updating a record. New users may accidentally exit the system until they become more familiar with it.

Forms provided for entering new

records include fields for barcodes, multiple authors, lengthy titles, LC or Dewey classification, keywords, and abstracts, as well as publisher, series, and order number identification. New records may be added for books, serials, congressional publications, articles, chapters, and uncataloged and miscellaneous items. While videos, software, or recordings might be inserted into one of the existing categories, there is no clear choice these formats.

Records can be imported and exported from a variety of formats, including tab, csv, sylk, dbf, dif, wks, bas, and mer formats, which can be moved to and from diskettes into TLC. Perhaps most importantly, TLC now provides a MARC interface for importing records.

Circulation functions are handled in two modules: Borrow and ILL. A patron database may be created with name, address, phone, group designation, routing, and ID fields. Circulated items may be linked to bar codes. Overdue notices may be printed and address labels generated for patrons.

The serials check-in module allows staff to barcode specific issues. Claiming of missing issues is also built into the database through a link to a subfile for vendors. The vendors' subfiles have addresses and fax and phone numbers, and allow linking to purchase order numbers, check numbers, and date-paid information for accounting purposes. To facilitate order tracking, the TLC database provides fields for vendor codes, order and pay dates, and refunds.

Library staff using TLC can communicate with each other using either the memo module or a notes button. The memo choice subdivides into numerous fields; the notes choice basically offers a blank screen. Memo records can have up to six keywords assigned to them, as well as abstracts, titles, and authors.

The memo module could serve as a vertical file for widely used short documents.

In addition to subfiles for vendors and users, TLC has one for libraries, where staff can enter address and contact information.

A brief field is provided for policy information. The library subfiles are linked to the interlibrary loan modules. In addition to the several modules for day-to-day operations, TLC has another section, called reference. The reference files provide a place for storing older, completed records (such as a circulation transaction) for the purpose of generating statistics or planning budgets.

TLC's help files are available from the main menu and at most levels of the submenus. They may be viewed by broad content category and searched or browsed by keyword. Help sections may be printed. TLC also comes with an eighty-page printed manual that provides step-by-step instructions for its major functions.

The entire TLC program is based on the FileMaker Pro database software, version 2.1. It supplies the runtime version of FileMaker with an upgrade offer for version 3.0. In its network version, TLC will support a maximum of 25 users. FileMaker Pro version 2.1 will support a database up to 32 MB, while the upgrade supports up to 2 Gigabytes. The number of records and fields is limited only by disk space or maximum file size.

Librarians in small libraries who are looking for a single, microcomputer-based software package to manage the major functions of their facility should consider Total Library Computerization. It provides a well-thought out and easy to use but reasonably powerful integrated database management system that should meet most of their needs.—
James Hodson, University of Illinois at Chicago, jhodson@uic.edu

Business Resources on the Internet Plus: A Hands-On Workshop

by Gary R. Peete. Internet Workshop Series no. 3. Berkeley, Calif.: Library Solutions Press, 1995. 252p. paper, \$60 (includes Windows and Macintosh diskettes of presentation slides) (ISBN 1-882208-11-0).

Business information abounds on the Internet, and librarians want to know how to find it. With chapters featuring introductions to the Internet, e-mail, telnet, FTP, gopher, and the World Wide Web, this handbook is intended to teach librarians both how the Internet works and where to find useful business information. The contents of the book are reproductions of the slides and handouts used by an Internet trainer during hands-on workshops. This gives the reader the feeling of sitting through a training class, following the teacher's training program. For those who wish to carry this concept even further, disks with a Powerpoint presentation of those same slides are included.

The advantage of a book such as this is that it allows librarians around the world to take part in a business Internet session without traveling to a central location. By following the examples in the book, a reader can learn about a variety of Internet tools and sites. *Business Resources* also provides librarians with materials and ideas to use in their own training programs. However, the disadvantage of a book like this is that it presents dynamic material in a static format. The sites selected for examples cannot be changed and there is no dialogue between instructor and student. As both sites and search techniques evolve, this guide will become increasingly less useful. The book's emphasis on FTP and Gopher is already an indication that the In-

ternet has moved beyond this particular training program.

The work will be useful for librarians who wish to learn the basic features of the Internet using examples from the field of business. However, with the rapidly changing nature of business information on the Internet, this book does not provide a broad overview of business sources on the Internet. Librarians who expect a guide to sites will be disappointed, while those who just want to get started will find it quite useful.—*David Tyckoson, University at Albany-SUNY*

Information Technology and the Remaking of the University Library

Beverly P. Lynch, editor. *New Directions for Higher Education*, Martin Kramer, Editor-in-Chief, no. 90, Summer 1995. San Francisco: Jossey-Bass, 1995. 112p. (ISBN 0-7879-9918-0, ISSN 0271-0560, LC 85-644752). Single copies, \$16.95. Subscriptions (for 1995): \$48 for individuals and \$64 for institutions, agencies, and libraries.

This paper-bound volume is focused on the transformation of scholarly inquiry in an emerging academic environment in libraries. The authors of its seven chapters include university administrators, graduate library school educators, a chancellor of a university system, university librarians, and an executive director of an accrediting commission. Topics covered include revolutionary changes in higher education technologies, the library as place and as an integral part of the university's intellectual life, political issues and difficult decisions faced today in areas such as finances, competition, and administration/management of the information/instructional technologies within the institution, issues related to life-long learning and library user education in an elec-

tronic environment, planning and assessment activities, and challenges to face, as well as opportunities to realize, within the next decade.

This valuable work should be read by all university administrators who have major roles in planning, assessment, and decision-making and policy-setting, from facilities planners, risk management officers, presidents and provosts, and deans to university librarians and computer center directors. It is a powerful and thoughtful document that explores the thinking of leaders in many sectors of higher education. Trends are identified and confronted in insightful ways in relation to how the new digital formats and electronic networking influence every aspect of academic life, but particularly how they have begun more fully to both integrate and separate libraries from the teaching and learning process.

The majority of the authors tend to view the library as one of the more crucial components in the restructuring of the academic enterprise in a rapidly changing technological environment. Although it is not always easy to agree with some points made by each author, their perceptions are typical of much of what confronts libraries in building a strong and powerful agenda within the university. For example, Jones' comment that technology has little influence on the humanists seems to be an overgeneralization that does not apply equally to all teaching departments within a discipline. Atkinson's philosophy that without collections of some kind, information is useless, might well be questioned by some of our academic administrators, yet his arguments are sound and strong. The Stoffle and Williams article and the Wolff chapter emphasize the need to integrate libraries and librarians into the teaching enterprise in a more direct way, and both chapters are some of

the best thoughts put forward on this topic. Beverly Lynch's summary builds on their recommendations to force a new model for libraries that goes beyond document delivery and user education to the library's needed role in the development of interactive multimedia and instructional technology for the classroom.

Among the many interesting points and arguments made throughout the volume is the contention that although higher education is seen as a necessity rather than a luxury, competitors in the business and industrial marketplace are edging some academic institutions out of the way as traditional higher education is seen as too costly. The Langenberg article is also an eye-opening view of how strong leadership and retraining can possibly lead to reductions in the workforce and increases in productivity. Johnson's chapter on the comparative effectiveness and cost benefits in knowledge dissemination of the traditional "talking-head" lecture versus electronic methods of teaching causes one to rethink the enterprise.

One recognizes upon reading this book that technology may not be a savior in preservation efforts but an enemy as information stored online is subject to the same physical degradation over time as is the more traditional print on paper. On the other hand, there is also a strong thread that online systems and new partnerships can enhance teaching and learning, research, and development, as well as help us become more effective, efficient, and productive in developing lifelong learning skills and reaching more and more diverse higher education graduates.—*Maureen Pastine, Southern Methodist University*

Virtual Individuals, Virtual Groups: Human Dimensions of Groupware and Computer Networking

By Jo Ann Oravec. Cambridge University Press, 1996. \$49.95 (ISBN 0-521-45493-X).

Critical questions face administrators, managers, systems designers, and professionals in search of strategies, particularly technological solutions, to foster collaboration and cooperation among groups and individuals in contemporary work environments. How can networked-based systems serve as adequate platforms for effective collaboration, yet protect the rights and needs of individuals for self-expression, privacy, anonymity? How do humans express themselves and establish interpersonal relationships in "virtual" spaces? How do the architectures of computer networking and component technologies align with existing counterparts designed to support group work? Underlying all these questions is the need to understand how people collaborate in knowledge work. Oravec provides a thoughtful and substantive exploration of these questions, weaving together definition, analysis, and a literature review of remarkable breadth.

But let the reader be forewarned: this is not a management handbook, but a scholarly examination designed to give the reader a thorough and intellectual grounding in the human dimensions of networked-based systems, both in work and educational settings. Chapter 1 features an overview of research and application of "computer-supported cooperative work" (CSCW) and groupware in the framework of genre analysis. Oravec suggests that the identification of sets of computing capabilities into readily recog-

nizable concepts and application packages, along with the ethical and social contexts, have important implications for the management of information-related activities as well as for the well-being of individuals.

In chapters 2 and 3, Oravec offers an analysis of how people relate to and manage their own and others' identities as virtual entities, and outlines emerging strategies for the construction of such groups. The author devotes considerable effort to exploring the rhetorical dimensions of individual and group identities, bridging the research between identity and behavior, self and narrative, to the theory of human-system interaction and the potential shape of groups in the future. In later chapters, Oravec defines and analyzes the current "artifacts" of group interaction—such as video, blackboards, design tools, office environments—and their relation to network-based system applications. Exploring the cultural objects of privacy, anonymity, and agency, and their relation to virtual individual and group concepts as well as to computer "agents," the author concludes by developing an approach for the design of network-based systems for collaboration, with emphasis on collaborative writing and group decision making.

This book is a serious and effective attempt to bring together a complex scope of social, cultural, psychological, computing, and communication science theory. It will inform students, researchers, and professionals involved in the process of emerging technologies. Designers and managers of computer network applications will find this book invaluable, as will any professional engaged in the creation of new work or learning communities through the use of technology.—*Barbara MacAdam, University of Michigan*

Instructions to Authors

Information Technology and Libraries welcomes manuscripts related to all aspects of library information technology. Some specific topics of interest are mentioned on the masthead page. Feature articles, communications, letters to the editor, and news items are all considered for inclusion in the journal. Feature articles are refereed; other items generally are not. All material is edited as necessary for clarity and length.

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ment issues surrounding the development, implementation, and use of particular technologies.

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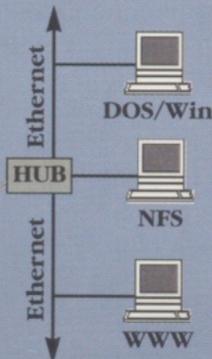
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