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Editorial

John M. Budd

As always, the success of this and every other serious journal depends to a great extent on the manuscript-review process. As editor of *LRTS* I am extremely fortunate to work with a superior editorial board and to rely on the excellent reviews of diligent and perceptive referees. These board members and referees deserve to be noticed. Please refer to the journal's masthead for the names of the editorial board. The referees (including board members) who supplied us with manuscript review reports in the year 2002 are:

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How Can Classificatory Structures Be Used to Improve Science Education?

Olha Buchel and Anita Coleman

There is increasing evidence that libraries, traditional and digital, must support learning, especially the acquisition and enhancement of scientific reasoning skills. This paper discusses how classificatory structures, such as a faceted thesaurus, can be enhanced for novice science learning. Physical geography is used as the domain discipline, and the Alexandria Digital Earth Prototype project provides the test bed for instructional materials and user analyses. The use of concept maps and topic maps for developing digital learning spaces is briefly discussed.

Knowledge structures, such as classification schemes and thesauruses, are not often thought of or used as pedagogical systems. Also known as classificatory structures or knowledge organization schemes, they are used to organize knowledge for retrieval in libraries. Along with other information systems in the library, the online public access catalog and bibliographic databases, these tools have generally been designed to meet the information needs of the user who is a researcher or professional librarian, not the novice learner. Trends in interdisciplinary study and research, the widespread availability of electronic information resources, and the interest of funding agencies in the development of educational digital libraries provide an incentive to investigate how one type of classificatory structure, the faceted thesaurus, can facilitate science teaching and learning.

First, we discuss how scientific reasoning as a general educational objective and learning outcome can provide a framework for the design of digital learning spaces. The goal of learning spaces is to facilitate the acquisition of scientific learning and reasoning skills in novice learners (Coleman 2001). Next, we explain the geosciences knowledge domain, with special emphasis on our test area, physical geography. We highlight some of the similarities between information organization for learning and knowledge organization in libraries. We find that concepts and relationships, classification, and vocabulary are critical components of both activities. Finally, we discuss the use of the faceted thesaurus as the foundation for digital learning spaces. We identify the enhancements needed for developing learning spaces in physical geography. The use of concept maps (Novak 2001) and topic maps (XML 2000; ISO/IEC 1999) is briefly discussed. The Alexandria Digital Earth Prototype (ADEPT) project provides the test bed for instructional materials and user analyses. ADEPT is supported by the National Science Foundation Digital Libraries Initiative Phase 2, and is a successor to the Alexandria Digital Library (ADL) project. For more information, see www.alexandria.ucsb.edu.

Olha Buchel (buchel@library.ucsb.edu) is Research Associate at the University of California at Santa Barbara, and **Anita Coleman** (asc@u.arizona.edu) is Assistant Professor at the School of Information Resources and Library Science, University of Arizona, Tucson.

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The Conceptual Framework

The conceptual framework rests on a synthesis of cognitive learning theories about scientific reasoning and concepts. Many theories discuss learning and define the characteristic steps of learning: component display (Merrill 1983), information-processing theory (Miller 1956), modes of learning (Rumelhart and Norman 1981), and mental models (Mayer 1989). From the perspective of cognitive processes that make up a scientific reasoning skill set, these theories show general agreement that scientific reasoning is closely related to problem solving and that it involves both inductive and deductive reasoning. A spatial representation theory of reasoning suggests that people do better when visualizing things, and therefore successful scientific reasoning includes observation and visualization skills (Leonard 1997). Ziman in his discussion of scientific research and knowledge provides a summary of many important aspects of science, such as patterns of fact, differentiating facts into categories, skills of observation, accuracy, relevancy, explanation, description, generality, and extensive reliance on and use of instrumentation, measurement, and models (Ziman 1984). From these theories and research studies, it is possible to derive an operational definition of the selective skills and critical steps in learning that are an integral part of the scientific reasoning process.

We define scientific reasoning as inductive and deductive thinking. Inductive thinking includes concept development, which is composed of concept acquisition, concept formation, and concept mapping. Deductive thinking includes hypothesis development, which comprises discovery, observation, model building, and evaluation/proof formulation based on empirical evidence. This definition can be correlated with educational objectives when teaching, and with learning outcomes while or after being exposed to learning activities such as lectures and laboratories. For example, training in concept mapping has been shown to facilitate acquisition of text information (McCormick and Pressley 1997). Therefore, in measurable terms of cognitive processes, scientific reasoning comprises:

- Concept acquisition (gathering facts, definitions)
- Concept formation and analysis (identification of associated properties, processes, phenomena, measuring equipments, observational methods)
- Concept mapping (specification or comprehension of relationships)
- Instantiation (illustration with examples and nonexamples)
- Generalization and categorization (definition of abstract general relevant properties, finding similarities with other members of the broader category)
- Problem formulation (designing an experiment; selection of parameters for manipulation)
- Hypothesis generation (discovery)
- Explanation (elaboration)
- Prediction (accurate, relevant calculation)
- Evaluation (interpretation of outcomes; use of empirical evidence)

This is neither a comprehensive, definitive, nor sequential list of scientific reasoning skills. It provides the theoretical framework for our design and prototype development of learning spaces. In this framework, concepts emerge as the foundational units for facilitating science learning. For a similar approach based on concepts, see Smith, et al. (2002).

There are a number of definitions of the word "concept" in the learning sciences. These definitions have been contributed by psychologists, educators, philosophers, linguists, and cognitive scientists and include the following:

- A concept is an idea or thought, more precisely the abstraction that represents or signifies the unifying principle of various distinct particulars (Barrow and Milburn 1990).
- Concepts represent the fundamental elements of all concept areas. In formal content situations, concepts are classes of objects, symbols, and events that are grouped together in some fashion by shared characteristics (Husen 1994).
- Most concepts are structured mental representations that encode a set of necessary and sufficient conditions for their application, if possible, in sensory or perceptual terms (Laurence and Margolis 1999).

These definitions show that concepts are not studied in an isolated manner; rather, they are studied in their associations or relationships with other concepts.

An important component of instructional design is the analysis of the concepts to be learned. Two basic types of analysis are: (a) content task analysis, which focuses on defining the critical characteristics of the concepts and the relationship of those characteristics according to superordinate and subordinate organizations, and (b) contextual analysis, which focuses on the memory and organization of the concepts (Husen 1994). Both types of concept analysis imply the specification of relationships among concepts. These relationships can be restated in the terminology of librarians: analyzing characteristics and superordinate and subordinate organizations of concepts, students define generic-specific and object-property types of relationships. During contextual analysis, students determine other types of relationships between concepts, which librarians know as associative relationships. Associations can also be defined between objects and processes, objects and events, tools and methods, etc.

Related to concepts, but not quite the same from the standpoint of educators, are the words "subject," "topic," and "class." The subject is a field of knowledge or established area of instruction, for example, the subject of mathematics. Subjects are often associated with disciplines. Teachers, scholars, and other workers tend to specialize in the study or use of a particular body of knowledge—or we could say subject/discipline. Subjects involve not merely their particular subject matter, but a particular kind of activity related to it. Topics, on the other hand, are subjects that invite treatment by a number of disciplines. The topic may involve a number of concepts from different subjects, or it may be led or dominated by a single subject. The topic web is a schematic, annotated way of planning the topic, showing how a variety of ideas, activities, subject areas, or skills are related to the core idea (Blake and Hanley 1995). Class is a group, set, or kind of things sharing common attributes. It is frequently associated with the set: a number of things of the same kind that belong or are used together.

Theoretically, a discipline determines its subject, identifies topics, breaks them down into classes and concepts, determines relationships, and teaches them via a number of activities. Physical geography is the domain used here to investigate how concepts are organized in classroom teaching and learning.

The Discipline of Physical Geography

Document analysis was used to examine the organization of content in one textbook as well as traditional classroom lectures supplemented by Microsoft PowerPoint presentations. We chose materials from introductory freshman and sophomore courses in physical geography. Informal interviews with two teaching faculty supplemented the formal document analyses. Curriculum materials used include Christopherson (2000).

Document analysis is a method of research that is used to study historical documents, usually primary source materials. This method can be used to investigate details like document type, date, creator, as well as answer questions like why was the document written and what can be inferred about the document creator and other pertinent subject matters. Education staff at the National Archives and Historical Administration have created and made publicly available via their Web site a number of document analysis worksheets for different types of documents, such as maps, text, etc. (NARA 2001).

Lectures and textbooks have been the primary tools of Western education for some time now. Lecture materials are unusual in that they can be considered as both primary and secondary source materials. Textbooks are clearly secondary source materials. Good lectures summarize, synthesize, and present a vast amount of material in a bite-sized chunk. Textbooks provide explanation, corroboration, and pointers to more materials on the subject. Both types of materials were examined in order to identify key aspects of their organizational structure.

A limitation of these analyses is the lack of observation of real learning activities, evaluation, and user studies of physical geography learning in students. However, we feel that such studies, while useful, should be preceded by a clear understanding of the nature of the discipline as perceived and presented by its expert teachers.

We found that organization by concepts is the preferred method for presenting learning material. Concepts are the building blocks in the educational process. Instructors teaching concepts also defined the terminology and explained the relationships among concepts. Thus, in geography teaching, a variety of resources for particular natural processes or phenomena are presented as terms selected and defined by the instructor; and relationships within and external to other processes, phenomena, tools, methods, classifications, theories, and states are explained, explored, and studied.

One of the key aspects of geography learning at the undergraduate level is vocabulary—terminological lists, lists of standard terms, and their definitions. Additionally, many geographic terms and concepts represent details of natural phenomena and require pictorial explanation. For example, alluvial fans and geologic folds are explained with text, verbal analogies, images, diagrams, maps, and photographs. Educators create personalized collections of images of natural phenomena, processes, and objects. These are accompanied by definitions, which sometimes are cross-linked with others, offered as a glossary, and used for presenting new material to students.

Scientific classifications are of great importance. The textbook contained about 70 classifications, ranging from objects (soils, rocks, minerals) to phenomena (hurricanes, tornadoes) to spatial and temporal divisions such as geologic time periods. Additionally, instructional materials pointed to a number of other classifications of objects and phenomena. For example, there are more than 2,000 coordinate systems alone.

A final aspect of organizing for learning in geography is the attention given to the expression (representation) of geographical concepts and their relationships using mathematics—measurements from instruments for specific concepts, equations that specify relationships. Through computation, most of these are ultimately transformed and represented as visualizations such as climographs, hydrographs, hypsographic curves, etc. These visual and mathematical representations are used extensively to promote basic scientific interpretation of complex phenomena and processes, often not possible by mere observation.

Real-world phenomena taught in physical geography are presented under disciplinary aspects of geography, geology, physics, biology, chemistry, astronomy, and other science and engineering disciplines. Synthesis of diverse perspectives is considered to be an outcome and strength of geographical knowledge and is consistently highlighted in presentations. This contrasts directly with the widely held view of science as essentially reductionist in nature. But it fits with the study of geography as an applied science, dealing with measurements, forecasting and modeling, and interpretation of natural phenomena.

Similarities and Differences between Organization for Learning and Knowledge Organization in Libraries

Summarizing, the two activities of organization for learning and organization for information retrieval in libraries appear to have many similarities. Concepts, relationships, and classifications are also key tools that are used to organize knowledge in libraries. Librarians, like educators, use the same concept-related terminology (but with somewhat different meanings), specify the same relationships, and are involved in similar processes related to concept analyses. How are library concepts different from concepts used by educators? Are terms, classes, facets, and subjects the same as concepts? How are concepts arranged in library classification schemes? How do librarians analyze concepts?

For librarians, a concept is a knowledge unit with similar characteristics. Often, the term "concept" is used interchangeably with words such as "term," "subject," "subject heading," "topic," and "facet." "Terms" are the main components of thesauruses, while "subjects" or "subject headings" comprise the subject heading lists, like Library of Congress Subject Headings (LCSH) or Dewey Decimal Classification. Unlike terms, which mainly include concepts from a specific domain related to phenomena, subject headings—human constructs—may include different types of concepts, specifically names, time periods, form, and topics. The main differences between terms and subjects can be described as follows:

1. In general, a term denotes a single concept, while a subject heading may consist of composites of terms, although it also may consist of a single concept (Dykstra 1988).
2. The guidelines for thesauruses give rules for establishing hierarchical relationships and for assigning associative and hierarchical terms. LCSH also has rules that are used when establishing new headings; however, composite headings are more difficult to relate than terms, and there remain many headings and relationships that were established before the rules were made (Dykstra 1988).

The term "topic" is frequently used interchangeably with the terms "subject" and "subject heading," or "topical subject." Topic represents an aspect of the main subject other than form, place, or period—for example, headings: Libraries, Agriculture.

"Subject" is defined as any one of the topics or themes of a work, stated explicitly in the title or text or implicitly in its message. In library cataloging, books and other items are assigned one or more subject headings that represent their content to assist users in locating information by subject. In indexes and bibliographic databases, the subject headings assigned to documents are called descriptors. Topics and subjects in library classifications are associated with document aboutness. In library cataloging, subject analysis has traditionally been carried out on the summarization level that is finding the one overall subject concept that encompasses or can represent what the whole item is about. Alternatively, the 20% rule is invoked where 20% of the document is about the subject (Taylor 1999).

In library and information science, class is "the first order of structure in a hierarchical classification, at which level major disciplines are represented. A class may incorporate one or more divisions, which in turn may incorporate one or more subdivisions" (Library of Congress 2001). Examples of classes are the fundamental disciplines or what educators refer to as subjects that are the foundation of the main classification systems: mathematics, physical science, human science, history, art, and so on. Classes are usually divided and arranged according to principles of categorization, such as shared properties and exclusivity.

Relationships among concepts are specified to varying degrees by different types of classificatory structures. For example, thesauruses generally specify only three types of semantic relationships (equivalence, hierarchical, and associative) (NISO 1993). Library classifications are limited in how relationships can be constructed or how many can be specified by many factors, such as the type of scheme (faceted or enumerative, universal or special) and the hospitality of the inherent notation. In faceted thesauruses or faceted classifications, the relationships are structured with a central idea in mind—for example, object, process, or event. However, most library classifications attempt to preserve the principle of containing relationships. Containing relationships include:

1. Main class or basic subject in relation to all its subdivisions
2. Genus in relation to species
3. Whole in relation to part
4. Class in relation to its members (Langridge 1973).

The principle of containing relationships does not mean that each item must be more special than the one preceding it. Many items are neither more general nor more special than those adjacent. For example, a book on Mozart in general would precede one on Mozart's operas, etc. Such knowledge organization structures correlate well to topics in education, where concepts from different knowledge domains are related to one topic. These relationships are often based on contextual analysis, and the relatedness is based on proximity of concepts in the text. For instance, the concept "drainage basin" is highlighted as a heading in a textbook; other concepts like sheetflow, interfluves, gullies, and continental divides appear in text below this subheading. According to the inclusion relationships principle, drainage basin is a broad term, and sheetflow, interfluves, gullies, and continental divides are narrow terms.

Concept, subject, and facet analyses are the processes by which public knowledge structures are used and created. They are familiar activities to librarians, and distinctions between them are often not made. Concept analysis, usually done by indexers, uses an indexing language or thesaurus. Subject analysis as done in library cataloging is the process of assigning subjects (subjects are much broader than concepts or facets) from a controlled vocabulary list (or a thesaurus) to a document. Discourse communities interpret facet analysis in different ways. Classificationists, designers of classification schemes, perform facet analysis when they try to identify the fundamental classes needed or inherent in a subject. The definition of facet analysis we use in this study is based on the original work of Ranganthan. It is also currently used by the Facet Analysis Theory (*Facet Analytical Theory* 2001) project to create subject-based portals for the Web. Facet analysis is the "rigorous process of terminological analysis where the vocabulary of a given subject is organized into facets and arrays, resulting in a complex knowledge structure with both semantic and syntactic relationships clearly delineated" (Broughton 2002, 137).

These analysis techniques are used to solve the disambiguation problems of semantics, which are well-known problems in information retrieval. When a user searches using a word or phrase, do the records that are retrieved with the same words or phrase really correspond to what the user meant? Classificatory structures take care of semantic problems such as synonyms and homographs in many different ways—for example, thesauruses use qualifiers and parenthetical statements. They also specify relationships between terms. Semantics therefore refers to the meaning of the term, both its dictionary definition as well as all the associations to it. Definitions are called the "reference" or "denotation," and associations are called "connotation." Definitions are limited and often standardized by community consent and use, but connotations may be infinite since they are determined by personal experience. Thesauruses select associations and include them in three kinds of semantic relationships; indexing languages try to describe many more associations. However, we find that in geography teaching many more associations (connotations) need to be specified and described for the novice learner. This is one important difference. Another difference is that definitions (denotation) must also be provided. Given these surface similarities, we decided to find out how, if, and what knowledge organization system could be used to facilitate physical geography science learning. Our specific questions: How can library classification schemes and thesaurus-type knowledge structures be used for educational purposes? How can differences between organization for learning and for information retrieval be reconciled?

There are a number of earth sciences thesauruses that include physical geography and these are described briefly in appendix 1.

To answer the question of whether a thesaurus can be used for educational purposes, a comparison of concepts in two types of information resources was carried out. Concepts from physical geography texts and the major thesaurus in the geosciences, *GeoRef*, were compared. We also examined the information system *GEOBASE*, a database that indexes materials in physical geography.

Physical geography is one of the subjects in geosciences; it may be considered a marginalized knowledge domain because it does not have a major classification scheme or a thesaurus devoted only to it. We found that documents on physical geography have just a linear list of terms rather than a thesaurus for collection indexing and retrieval. The *GeoRef* thesaurus does contain some terms used in physical geography, but many of them are not included. According to our preliminary estimates, 65% of concepts explained in the textbook cannot be found in *GeoRef*. Examples of concepts not found in *GeoRef* are angle of incidence, angle of repose, atomic number, atomic weight, autumnal equinox, available water, average global temperature, azimuth. A full list of concepts not in *GeoRef* is available on the ADEPT server at http://piru.alexandria.ucsb.edu/~buchel/concepts/p4.html.

To answer the question of how a library classification scheme can be used to support science learning, we examined two widely used classification schemes: Library of Congress Classification and the Dewey Decimal Classification. We found that many physical geography concepts are excluded from these major, albeit general, classification schemes. We speculate that this is so because concepts are neither subjects nor topics. Examples of geography concepts not found in these tools are open and closed systems, law of basin areas, leeward. However, these terms are needed if geographic information resources such as maps and datasets are to be more adequately described for information retrieval in a library catalog that supports science learning.

Some universal classification schemes are employed primarily outside the United States, but many of these are based on subjects and disciplines similar to LCSH and DDC, so geology concepts would be separated from geography, resulting in educational limitations.

Another disadvantage of current universal classification schemes is their use of the principle of containing relationships, not the principle of building relationships around the main idea—object, process, or event—as the guideline for knowledge organization. Thus, they do not represent the concept relationships that reflect the order of things in science.

Scientific classifications differ from library classifications and subject thesauruses in many ways. One significant difference is that library classifications are based on the literary warrant and link topics to subtopics. Many scientific classifications (chemistry, physics, biology, medicine) belong to disciplines that have widely accepted classifications and categorizations. Most of the concepts in these disciplines might naturally fit into thesaurus hierarchies based on the is-A relationship, often referred to as broad term (generic) - narrow term (generic) (BTG-NTG) relationship. The proliferation of special library classifications and thesauruses in many science disciplines shows that many more relationships and deeper subject intension is often needed than provided by general-purpose schemes. Physical geography, however, is a discipline that is somewhat unique. Geographers and geomorphologists do not have unanimous approaches to classifying real-world phenomena or processes; rather they have multiple classifications based on various criteria. All are considered equally important for teaching the science of geography.

Limitations of Existing Knowledge Structures

As early as 1944, Swank pleaded for a critical discussion that recognized the interrelationships between classification, library catalogs, indexes, and bibliographies (Swank 1944). While in the digital world these tools are certainly merging and can be merged, our analysis shows that other critical interrelationships that need to be considered for the development of digital learning spaces are the ones that integrate knowledge structures and reference sources. This means that we should explore the merging of knowledge structures such as classification schemes and thesauruses with reference works such as encyclopedias and dictionaries. Included in this list are glossaries, gazetteers, and terminology lists. Reference tools like Xrefer (www.xrefer.com) and Atomica (http://atomica.com) already support limited thesaurus+definition+encyclopedia linkages. However, we do not discuss the integration of these sources further in this paper. We focus only on the limitations of classificatory concepts such as hierarchy, semantic relationships, and order as they are currently implemented or used in knowledge structures. The enhancements needed are also discussed.

The thesaurus' hierarchical relationships—generic, instance, and partitive—are not enough to describe the full granularity of how phenomena or processes or objects are analyzed in physical geography. To illustrate this point, let us consider types of "atmosphere," specifically, its NTG relationships. Figure 1 shows them listed in alphabetical order.

All these concepts represent types of atmosphere. They are all linked to atmosphere with one type of relationship, NTG. However, for a specialist in the field, these concepts differ in their relationship to the concept atmosphere; namely, they are based on different classifications that consider different criteria. Following the faceted thesauruses' practices, such as those in the Art and Architecture Thesaurus (A&AT, available at www.getty.edu/research/tools/vocabulary/aat), these different classifications can be maintained in different "nodes," which simply mean different sets of subtypes. Nodes themselves are treated as nonindexing terms and are shown in angular brackets in figure 2.

By default, the conventional thesauruses and thesaurus construction software, such as Multi-Tes (available at www.multites.com/), arrange narrower concepts in alphabetical order. Such an arrangement is not a satisfactory

Atmosphere
- NTG
  - heterosphere
  - homosphere
  - ionosphere
  - mesosphere
  - ozonosphere
  - stratosphere
  - thermosphere
  - troposphere

Figure 1. NTG Relationships for "Atmosphere"

Atmosphere
- NTG
  - <composition criterion>
  - homosphere
  - heterosphere
  - <temperature criterion>
  - mesosphere
  - stratosphere
  - thermosphere
  - troposphere
  - <function criterion>
  - ionosphere
  - ozonosphere

Figure 2. Nodes for "Atmosphere"

foundation for building learning spaces in physical geography. In real geography learning, concepts are arranged in a certain order, which is by no means alphabetical, and differs depending on the concept. It may be chronological or based on disciplinary logic. For example, geological time periods are arranged in a chronological order that is based on macro time scales. Other times, arrangements are based on micro time scales (seconds or minutes or even less). The need for ordering concepts exists in library classification schemes too (for example, the DDC has preference order, and Colon Classification recommends a citation order). However, general thesauruses usually do not specify a citation or preference order. The exception is faceted thesauruses, such as the A&AT. Our findings suggest that ordering of concepts in sets (or nodes) is desirable for enabling learning.

It would also be useful to add multiple ordering of concepts—for example, as the concepts are organized in the textbook. In the literature, concepts can be repeated as subtypes of one concept under different classifications. For instance,

1. N. Lancaster (1995) differentiates the following dune types:
   - Crescentic dunes (barchans and crescentic ridges)
   - Linear dunes
   - Star dunes
   - Parabolic dunes
   - Nebkhas
   - Lunettes
2. E. D. McKee (Christopherson 1999) differentiates:
   - Crescentic dunes (barchans, transverse, parabolic, barchanoid ridges)
   - Linear dunes (longitudinal, seif)
   - Star dunes
   - Other dunes (domes and reversing)
3. L. Aufrere (Christopherson 1999) classifies dune in the following way:
   - Longitudinal
   - Oblique
   - Transverse

In these classifications, linear, crescentic, and star dunes appear in two classifications. To incorporate all these classifications into a thesaurus, we would have to list some of the terms as subtypes of sand dunes twice or more. A sample concept map including all sand dune classifications is available at http://piru.alexandria.ucsb.edu/cmaps/dunes/Sand%20Dunes.html. The classifications are taken from Nicholas (1995).

Some universal classification schemes are employed primarily outside the United States, but many of these are based on subjects and disciplines, so geology concepts would be separated from geography, resulting in educational limitations.

Another peculiarity of concept arrangements in textbooks is that they are not in the alphabetical order usually found in thesauruses. Very often orderings carry additional semantic information—for instance, they show chronological sequence or evolution. Thesauruses should reflect such scientific orders. These orderings do not necessarily have to be displayed for the users; they can be used only by librarians or in the background. The users will just see the sequence of concepts in a way the phenomena or their types are arranged in nature, or in chronological order or the order in which scientists usually arrange them.

Ranganathan suggested the following possibilities for order in array within a facet in addition to alphabetical order (Langridge 1973):

- Increasing quantity. Types of polygons could be arranged in this order: triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, nonagon, decagon, hendecagon, dodecagon, etc.
- Later in time. Writers in literature could be arranged according to their date of birth.
- Later in evolution. Living things could be arranged in this way.
- Spatial contiguity
- Increasing complexity. Methods, instruments, machinery could be arranged in this way.
- Canonical order. This means a traditional order, such as arithmetic, algebra, geometry.
- Favored category or literary warrant. This order could give precedence to the subjects in the array about which most had been published.

Subject intension is depth of the subject, the micro-topics. If relationships that support scientific theories, classifications and categorizations, and concepts on a level of even micro-topics are available, they can be used for the construction of concept maps. Concept maps are gaining quick popularity as a favored instructional material in many disciplines (Novak 2001). There are a number of software packages that allow students and instructors to construct concept maps. *IHMC software* is available at http://cmap.coginst.uwf.edu and *Inspiration* is available at www.inspiration.com. However, our experience at ADEPT indicates that many instructors do not have the time to build concept maps and organize their materials using them. Another reason why concepts maps are not widely constructed in science is because it is very difficult to build a concept map from scratch and show the complexity of relationships on one plane, as opposed to multidimensional space. However, instructors are often willing to use concept maps in instruction if they are constructed, maintained, and organized by other responsible entities, such as libraries.

Convergence

We conclude that a faceted thesaurus based on scientific classifications of disciplinary-specific facets such as objects, processes, phenomena, and methods can provide the foundation for developing digital learning spaces in physical geography. It must be constructed with great care given to the contents, categorization, and quality of the hierarchies. For example, polyhierarchies must specify roles and have more detailed associative relationships. An ALCTS committee has been investigating the area of subject relationships; see www.ala.org/alcts/organization/ccs/sac/rpt97rev.html for their report. Hierarchies must also link types and parts of objects to objects, processes to processes, etc. Besides overcoming as many of the limitations mentioned above as possible, other specific enhancements are also needed and are described below.

Facets: Facets are "clearly defined, mutually exclusive, and collectively exhaustive aspects, properties or characteristics of a class or specific subject" (Maple 1997). Our analysis derived similar facets in physical geography that were originally assembled as universals in the context of all disciplines (Dahlberg 1978):

- objects (for instance, landforms, hydrologic bodies, rocks, soils)
- properties, attributes
- processes and activities (fluvial processes, eolian processes, atmospheric processes)
- instruments
- theories, principles, classifications
- applications
- disciplines (geophysics, geostatistics, geochemistry, etc.)

Names for Relationships: Another desirable enhancement that should not be overlooked is more detailed specification of the associative relationships among concepts. Relational structures—indicated usually by an abbreviation RT for related term or by AS, often used for associative relationships—are neither sufficient nor explicit. While the task of decoding what is hidden behind the abbreviation would not seem to be complex for the more experienced users of a specific domain, for the novice domain users, in our case, students, it will be difficult to understand the nature of RT relationships without specification. Therefore, for students a short explanation of the associative relationships is necessary.

Labels for Nodes: Node labels are organizational devices that are often used to arrange hierarchical displays (Milstead 1998). An example of node labels for concepts of atmosphere types is shown in the next section. Node labels are enclosed within angled brackets.

Support for Orders in Arrays of Related Concepts: As discussed previously, concepts in the relationships can be ordered not only alphabetically, but also in chronological, evolutional, canonical, and other sequences. Agreement is needed for how objects should be ordered in geosciences. For instance, in our example with atmospheres, the flexibility of defining sequential orders lets us arrange concepts of atmospheric types in the natural order as is shown in figure 3.

Using Topic Maps for Digital Learning Spaces

Many technical and theoretical approaches offer solutions to interlink concepts; semantic nets, ontologies, topic maps, and concept maps are some of them. The use of the ISO Topic Map standard, XTM, as a tool for building and displaying digital learning spaces is briefly explored in the following paragraphs (XML 2000).

Topic maps provide "a standardized notation for interchangeably representing information about the structure of information resources used to define topics, and the relationships between topics" (XML 2000; ISO/IEC 1999). The topic definition in the standard is similar to the librarian's definitions of topics or subjects. However, it is possible to use topic maps for linking concepts and specifying relationships between them. In other words, it is possible to construct information resources such as concept maps based on classificatory knowledge structures, like the faceted thesaurus using the XTM standard. In doing so, no significant distinction between concepts and topics is made.

As examples of topic maps, XTM and faceted thesauruses have many features in common:

- Both link concepts.
- Both treat concepts and relationships separately.
- Both use controlled vocabularies.
- Most relationships in both standards have symmetrical counterparts.

```
Atmosphere
    NTG
        <composition criterion>
        homosphere
        heterosphere
        <temperature criterion>
        troposphere
        stratosphere
        mesosphere
        thermosphere
        <function criterion>
        ozonosphere
        ionosphere
```

Figure 3. Natural Order for "Atmosphere"

- Both serve as backbones in information systems that allow linking the information resources to the concepts; the only difference is that topic maps do this internally within the topic map, and thesauruses do this externally—surrogate bibliographic records carry linkages to the concepts in the thesaurus.
- In both standards hierarchies play an important role in information organization. The first step of organizing concepts into classes and subclasses of concepts in topic map construction is similar to the task of defining a genus and species, a primary task in building a thesaurus.
- Classes in topic maps and hierarchies in thesauruses facilitate a systematic approach to cross-referencing concepts from different facets; from these an ontologist will have a clear picture in terms of the categories for characterizing the concepts.

Standard thesaurus relationships can be mapped to topic map terminology as shown in figure 4.

The advantages of topic maps are that they are in XML format and have a number of software packages—for authoring, navigating, and displaying. These software packages help users and creators visualize the contents of the concept space and display explicitly concepts and relationships among concepts. The visualizations can be shown to users as concept maps. Concepts immediately related to a particular concept can be viewed as a concept map for the particular concept. The relationships in topic maps also have a much richer structure than the relationships in thesauruses. While thesauruses have only a predefined set of relationships, the XTM standard gives full semantic freedom in the specification of relationships. This is both an advantage and a disadvantage. Since concepts and relationships are important for librarians and educators and may vary based on discipline, different learning spaces can be designed for different domains.

Relationships in topic maps have two components: role-defining topic and role. Role-defining topic can be expressed as a verb; for example, written by, has, originates. The idea of including verbs in a concept space is interesting, since most library knowledge organization schemes have always tried to avoid verbs. In science education, verbs are important information elements and are used quite extensively: modify, move/transport, measure, capture, produce, protect, damage, form, originate, re/distribute, dissipate, accumulate, gravitate, occupy, cover, resist, protect, dissolve, decrease, increase, exist, generate. For the role-defining topics we initially recommend implementing isAssociatedWith, Has-Constitute/Comprise, IsStudiedIn-Studies, Uses-IsUsedBy, IsCausedBy-Causes using XTM. However, a more complex typology of relationships can also be specified.

Roles refer to the related concept and explain its category. For roles, names of basic categories—or facets—such as, processes, methods, tools, properties, objects; or their more detailed subcategories: landforms, landscapes, hydrologic bodies, vegetation, fluvial processes, and other can be applied. Roles are the elements that can make the topic map model especially attractive to educators and novice learners. Figure 5 shows the list of relationships and roles needed for teaching and learning about atmosphere.

Due to the complexity of the relationship structure in the XTM standard, the relationships have to be specified in both directions: from concept a to concept b and from concept b to concept a. From this perspective, the thesaurus appears to be a more efficient model; the symmetrical relationships (in our case from b to a) are derived from the relationship between a and b. The weakness of both standards though is that they lack the predefined behavior of relationships. While in thesaurus the behaviors are described in the NISO standard, no action is taken upon it by the existing software packages. For instance, knowing classes of concepts and the directionality of relationships, one could impose the constraints that would disallow such entries as Hamlet wrote Shakespeare, or erosion is made of sand. The constraints that would disallow such entries are necessary if we are going to use the help of the scientific community in building the relationships. Additional research of relationship behavior in concept spaces is highly desirable. Details are available in Hill et al. (2002).

Thesaurus	**Topic Map**
BTG-NTG - General term	<instance>
USE - Use this term	<baseNameString>
UF - Use this term instead	<variantName>
SN - Scope note	<scope>
NTG-BTG - Narrower term	<instanceOf>

Figure 4. Thesaurus—Topic Map Relationships Mapping

IsStateOf
IsMethodFor
IsClassificationFor
HasClassification
HasAssociatedMethods
HasStates
CanBeMeasuredWith
IsForMeasuring
HasProcesses
IsProcessOf
HasProperties
IsPropertyFor
IsAssociatedWithGeosystem
IsUsedFor

Figure 5. Typology of Associative (Related) Relationships for Atmosphere

The basic idea of topic maps is that all concepts are grouped around one central concept—topic via the inclusive relationship—*instanceOf*—instance. Each relationship can have a reference to a specific role-defining topic. The examples used in the XTM standard indicate that the topics for the relationships can be expressed as verbs. For instance, in creating a topic map about streams we could say: topic streams includes instance—*has*. Further, all related-to-stream concepts that can be linked with the verb has can perform specific roles in the relationship—in this specific case, all the components will have a role—*Part*. Different types of stream parts can be disambiguated by the more detailed specification of roles: *LongitudinalPart*, *CrossSectionalPart*, *Component*. An experimental visualization of the described set of relationships is shown in figure 6.

While the topic map standard offers a nice data model, it does not describe the theoretical details of construction for concept spaces: what relationships can be used, or how the relationships should be specified. Such principles must be developed. We believe that the underlying principles that are well suited for topic map construction are the principles of faceted thesauruses. These include strictly defined rules about specification of hierarchical relationships, use of controlled vocabularies, and construction of associative relationships. As a general organizational principle, we also propose using the "natural order of things" approach, described earlier. This means that we will structure relationships according to the order of things as perceived in science/nature. Streams will be related to streams, parts of streams, stream properties, and other objects related to the streams: e.g., terraces, fluvial processes, and physical, chemical, and biological properties. When this approach is followed, a subject ontogeny is maintained as well and becomes a part of public knowledge structures.

Topic maps can provide the conceptual framework for developing the content domain and scientific reasoning processes of student learning that can be associated with information resources. Because the standard builds a structured semantic network over heterogeneous and topically diverse resources, it allows easy and selective navigation to the requested information as well as easy maintenance. The interface for topic maps can be either conventional with hyperlinks, or graphical, the so-called hyperbolic browser interface that represents concepts as the nodes in hierarchies. Hyperbolic navigation where the user can rearrange nodes and bring areas into focus with the mouse has been shown to be a better interface for understanding of complex, heterogeneous data sets.

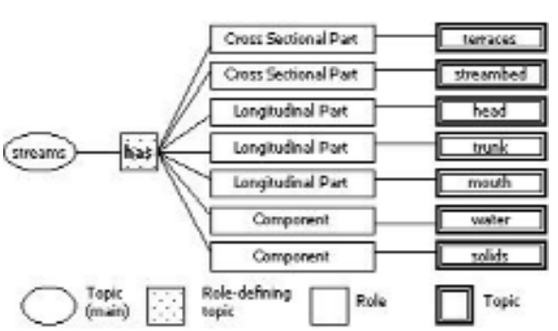

Figure 6. Visualization of Relationships for Stream

Hyperbolic visualizations with Empolis or Ontopia allow users to enter a search term/concept phrase (Empolis is available at www.empolis.com and Ontopia at www.ontopia.net). The system responds with a concept map for the term/phrase. Each node of this map has other concepts associated with it with specific roles such as *has-parts*, *isCausedBy-Process*, and so on. Each node can be activated as a live hyperlink to provide entry into other thesaurus maps that extend or narrow the relationships and concepts as appropriate. Each node also has occurrence roles, the information resources associated with each concept.

The use of topic maps for educational purposes may need certain improvements to visualizations, such as:

1. support for multiple ordering
2. display of hierarchical relationships
3. more interactive features that allow a user to select and save existing learning spaces. A click on a concept node should display the information about a concept—its scope and variant notes.
4. aggregation of resources by form/type (including micro-types such as charts, images, etc.) and number of resources (e.g., the number of models available for this concept)
5. visualization limited to one concept with immediate relationships, not the whole body of concepts

Conclusion

Summarizing, we find that classificatory notions, such as hierarchy, concepts, classes, facets, and vocabulary can be used to provide the digital learning spaces needed to support science education in physical geography. To do so, the critical places where the enhancements need to take place in a faceted thesaurus are described: terms to be more rigorously defined and maintained as concepts and facets, scope notes to include nodes that make the relationships explicit, semantic relationships to be extended with other disciplinary classifications and associations, and display of concepts and relationships in multiple orders. Other enhancements needed, such as combining definitions and illustrations with thesaurus terms and better understanding

of the behavior of relationships in concept spaces, have been identified and further investigation is recommended. Development alternatives include concept maps using concept mapping software or ISO topic map authoring. These approaches, specifically XTM, have been compared with existing principles and protocols for thesaurus construction and maintenance, and the advantages and disadvantages have been highlighted.

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Appendix
Thesauruses for Physical Geography

GeoRef—The thesaurus contains more than 27,000 terms, with several standard symbolic relationships, such as broader term, narrower term, related term, and use for. It also includes usage notes, dates of addition, and coordinates for selected place names. The GeoRef thesaurus is primarily used for indexing documents of the GeoRef database, the premier database from the American Geological Institute. It is the most comprehensive database in the geosciences and continues to grow by more than 80,000 references a year. The GeoRef database covers the geology of North America from 1785 to the present and the geology of the rest of the world from 1933 to the present. GeoRef is available at www.silverplatter.com/catalog/gref.htm.

GEMET—The General Multilingual Environmental Thesaurus (GEMET) has been created by merging different national and international thesauruses. The present Version 2000 of GEMET presents 5,298 descriptors, including 109 top terms, and 1,264 synonyms in English. The 5,524 terms belonging to the parental thesauruses and not included in GEMET constitute an accessory alphabetical list of free terms. GEMET provides a complete numerical equivalence (all the descriptors have an equivalent) with the included languages. GEMET is available at www.mu.niedersachsen.de/cds/Guided-Tour.htm.

Feature Type Thesaurus—A set of terms for categories of geographic places; these are terms to indicate the nature of a place. It has been designed for use with the Alexandria Digital Library Gazetteer. Feature Type Thesaurus is available at www.alexandria.ecsb.edu/gazeteer/FeatureTypes.

CIESIN Indexing Vocabulary was developed to index data resources and data sets related to human interactions in global change. Metadata records containing CIESIN indexing terms appear in the CIESIN Gateway, the Global Change Master Directory, and the Earth Observing System Data and Information System Information Management System. The CIESIN indexing vocabulary is available at www.ciesin.org/metadata/documentation/vocab/index.html.

In **NASA's Global Change Master Directory** terms are grouped into the following categories: data center, instrument, location, platform, and project. Particularly interesting to educators would be the instrument and location facets. NASA's Global Change Master Directory is available at http://gcmd.gsfc.nasa.gov/Aboutus/sitemap.html.

USGS Thesaurus is currently under development. It includes a high-level set of categories that will interface easily with the category structures currently in use within the USGS. Methods and sciences facets from this may be especially useful. The current version of the USGS thesaurus is available at http://alexandria.sdc.ucsb.edu/~lhill/usgs_terms/usgs/USGSMainPg.htm.

Other possible classifications, glossaries, and thesauruses can be culled from within physical geography, earth systems sciences, and other related disciplines like engineering. Some examples are:

- Glossary of Physical Oceanography and Related Disciplines (http://stommel.tamu.edu/~baum/paleo/ocean/ocean.html)
- NASA Thesaurus (www.sti.nasa.gov/thesfrm1.htm)
- Canadian Thesaurus of Construction Science and Technology (www.nrc.ca/irc/thesaurus/ctcst-searchform.html)
- EI Thesaurus (www.ei.org/eicorp/eicorp?menu=eithesaurusmenu&display=eithesaurus)
- INSPEC Thesaurus (www.iee.org/publish/support/inspec/document/thes)

Use and Perception of the DCRB Core Standard

M. Winslow Lundy

In January 1999, the Program for Cooperative Cataloging approved the core bibliographic standard for rare books, called the DCRB Core standard. Like the other core standards, the DCRB Core provides the framework within which catalogers can create bibliographic records that are less than full, but are as reliable as full-level records in description and authorized headings. In the three years since its approval, there is little evidence that the standard has been widely used. This study reports the results of a survey sent to forty-three participants who indicated in a preliminary query that they do use the DCRB Core or that they have made the decision not to use it. In the thirty-seven surveys that were returned, only about 16% of the respondents said they have used the standard to create bibliographic records for their rare books. The libraries that do not use the core standard find it inferior or lacking in a number of ways. Several of those libraries, however, are planning to use the standard in the future or are seriously planning to investigate using it. Such intent may indicate that the time is approaching when more libraries will find reasons to implement the standard. One impetus may come from the findings of a recent survey of the special collections departments of member libraries of the Association of Research Libraries that emphasize the size of the backlogs in those departments. If faster accessibility to specific portions of the backlogs would benefit users more than having full-level cataloging, application of the DCRB Core standard could facilitate reducing those backlogs.

Bibliographic control of rare book collections has always been a time-consuming and specialized process. The materials in special collections are there for particular and compelling reasons. Catalogers of such collections have traditionally identified those special attributes in catalog records with full-level bibliographic description, extensive notes, and as many access points as are deemed appropriate by both catalogers and curators. The bibliographic standards for cataloging rare books, with the principles of *Anglo-American Cataloguing Rules*, 2d edition (AACR2) underlying them, have evolved over a number of years, first in 1981 in *Bibliographic Description of Rare Books* and most recently in *Descriptive Cataloging of Rare Books* (DCRB), published in 1991. A new edition, with the title *Descriptive Cataloging of Rare Materials*, is now in preparation by the Association of College and Research Libraries, Rare Books and Manuscripts Section (RBMS), Bibliographic Standards Committee. The new edition will include rules for the various formats of materials. The documentation for books will be known as DCRM(B). While the current standard of DCRB is written primarily for books printed before 1801, it can be used for post-1800 imprints as well.

The Program for Cooperative Cataloging (PCC) has defined and approved core standards for many of the bibliographic formats, beginning with the stan-

M. Winslow Lundy (windy.lundy@colorado.edu) is Assistant Professor and Monographic Cataloger for the University of Colorado at Boulder Libraries.

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dard for books in the mid-1990s. All the core standards, written for use by the participants in the Bibliographic Records Cooperative (BIBCO) program, are intended to encourage "faster, better, cheaper" cataloging (PCC 1999b). They ensure the same reliability in description, authorized headings, and call numbers as full-level records, but they do not require as many notes or subject headings. In January 1999, the PCC approved the Core Standard for Rare Books. Called DCRB Core because it is based on the full standard of DCRB, the standard is intended for use in cataloging books with imprint dates between 1500 and 1800. The text of the standard was written and proposed by the Task Group for Developing a Standard for Core Treatment of Rare Books, a group that was charged with the creation of the core standard by the PCC Standards Committee and that included several members of the RBMS Bibliographic Standards Committee. The expected use of the DCRB Core standard is for cataloging books that have been chosen more for their need of accessibility than for their full bibliographic details (PCC 1999a).

Definition of the DCRB Core Standard

Two documents define the core record for rare books: Core Standard for Books (Books Core) and the DCRB Core. The Books Core requires authorized headings, a call number from a standard classification system, full fixed-field data, descriptive fields 245-4XX (title, edition, imprint, physical description, and series), but fewer notes (500, for source of title if not from the title page; 502, dissertation note; 505, contents note for multipart works with individual titles; and 533, reproduction note), only one or two subject headings, and as many added entries as the cataloger judges to be appropriate (PCC 1996). Significantly, notes for justification of added entries are not required. The frequently occurring bibliographical references note (504) is also not required.

With the requirements of the Books Core as a base, the DCRB Core standard specifies additional or differing elements. Figure 1 presents the DCRB Core elements arranged in MARC tag order (PCC 1999a), with an indication of how or why the elements should be used. The code "dcrb" in field 040 $e is mandatory because the bibliographic description is based on the full standard of DCRB. Differing from the Books Core, the DCRB Core does not require a standard call number. Many libraries do classify their rare books, but other libraries use local call numbers. The DCRB Core standard does not require that catalogers who use local call numbers go an extra step and assign a standard call number as well. The title, edition, imprint, physical description, and series areas are all required if appropriate to the item being cataloged, just as they are in the Books Core, but their inclusion follows the descriptive method prescribed by DCRB and may apply the options for shortening the bibliographic record (ACRL RBMS BSC 1998b). The DCRB Core standard specifies two note fields (5XX) in addition to those required by the Books Core. If the cataloger transposes the elements on the title page in the transcription in the title field (245) of the bibliographic record, the transposition must be acknowledged in a 500 field. The citation/references note field (510) provides, in standard form, reference to bibliographic sources. In a full-level DCRB record, the 510 field may provide justification for information included in the catalog record. In a DCRB Core record the same reference may lead the user to information that has been omitted from the record, but DCRB Core requires only the five sources listed in DCRB rule 7C14 for post-1500 imprints. The final element of the DCRB Core standard, the index term field (655) that employs genre, form, or physical characteristic terms from standard thesauri, is encouraged but not required.

DCRB Core defines the minimum requirements for the bibliographic record. At the discretion of the cataloger, more note fields (5XX fields) and more access points (subject headings (6XX fields) and added entries (7XX fields)) may be added to a given record. This flexibility means that a core record may contain more than the minimally required fields without attaining the level of a full record.

Examples of a full-level DCRB bibliographic record (figure 2) and its corresponding DCRB Core record (figure 3) illustrate significant differences between the two standards. A DCRB Core record can be recognized by the encoding level code "4" (MARC and RLIN Leader/17 or OCLC fixed field, Elvl) and "dcrb" in the cataloging source field 040 $e. The examples used here have the appearance of OCLC records,

040 $e dcrb	**Cataloging source: Description convention** Mandatory (since the full standard is DCRB)
050, 082, 086, 090, etc.	**Call number fields** Not required (because many rare book collections use special call numbers)
245-4XX	**Title, edition, imprint, physical description, and series fields** (following the more inclusive descriptive method and extent for recording bibliographic details and the options prescribed by DCRB)
500	**Note field** Mandatory (if elements on the title page have been transposed in the 245 field)
510	**Citation/references note field** Mandatory (if one of the five citations specifically required by DCRB)
655	**Index term—Genre/form term** Not required but encouraged

Figure 1. Elements of the DCRB Core Standard Required in Addition to the Requirements of the Books Core

and the full-level record has been adapted from an existing OCLC record. Other examples illustrating the differences between the two standards can be found on the Web pages of the RBMS Bibliographic Standards Committee (Fletcher 1999).

The difference in the length of the two records is immediately noticeable. The core record has been created by using the options in the full DCRB standard for shortening the bibliographic description in several areas and by omitting fields not required by the core standard. In the publication area (field 260), the cataloger has followed the option in rule 4C6 in the full standard to shorten the field. Instead of transcribing all six names of the printers of the book, the cataloger has given the name of the first printer and a bracketed statement that there are five other printers. The DCRB Core standard does not require any of the thirteen notes used in the full-level record, including the notes that justify the main (100) and added (700) entries. The thirteen note fields (5XX) in the full-level record have been reduced to one note in the core-level record, the 510 field (the citation/references note). While the 510 is not one of the five citations required by the full standard (rule 7C14), the cataloger has chosen to include the 510 that gives the reference to the bibliography of Daniel Defoe because the bibliography contains substantially all of the information in the other notes in the full-level record. Even though this work is a multipart title, the contents note (505) as taken from the title page does not reflect distinct titles of the individual volumes. The contents note, therefore, has been left out of the core record. The DCRB Core record

```
Type:      a     ELvl:      Srce: c        Audn:          Ctrl:    Lang:  eng
BLvl:      m     Form:      Conf: 0        Biog:          MRec:    Ctry:  enk
                 Cont:      GPub:          LitF: 0        Indx:  1
Desc:      a     Ills: ab   Fest: 0        DtSt: m        Dates: 1724,1727
 1   040         [Library's OCLC code] $e dcrb $c [Library's OCLC code]
 2   042         pcc
 3   043         e-uk--
 4   049         [Local holdings code]
 5   050    4    DA620 $b .D4 1724
 6   100    1    Defoe, Daniel, $d 1661?-1731.
 7    45   12    A tour thro' the whole island of Great Britain : $b divided into
                 circuits or journies : giving a particular and diverting
                 account of whatever is curious and worth observation, viz. ...
                 : with useful observations upon the whole : particularly
                 fitted for the reading of such as desire to travel over the
                 island / $c by a Gentleman.
 8   260         London : $b Printed, and sold by G. Strahan, W. Mears, R.
                 Francklin, S. Chapman, R. Stagg, and J. Graves, $c 1724-1727.
 9   300         3 v. : $b ill., 3 folded maps ; $c 20 cm. (8vo)
10   500         Vol. 3 has title: A tour thro' the whole island of Great
                 Britain,... Vol. III. which completes this work, and contains
                 a Tour thro' Scotland, &c. With a map of Scotland, by Mr. Moll.
11   500         By Daniel Defoe. Cf. Furbank & Owens. Critical bibl. of Daniel
                 Defoe, 220, 223, 230.
12   500         Two of the maps by Herman Moll.
13   500         Imprint varies.
14   500         Vol. 1 in three parts, each with separate pagination and
                 register, and v. 2-3 in two parts, each with separate
                 pagination and register.  Index to v. 1 and 2 at end of v. 2;
                 index to both parts of v. 3 at end of v. 3.
15   500         Errors in pagination: v. 1 (2nd sequence) pages 129-131  mis
                 numbered 119-121; v.2 (2nd sequence) page 80 misnumbered 83.
16   500         Decorative initials, head- and tailpieces.
20   510    4    ESTC $c T71278
21   510    4    Moore $c 459-461
22   510    4    Furbank & Owens. Critical bibl. of Daniel Defoe, $c 220, 223,
                 230
17   500         Errata: v. 1, p. [128] (3rd group).
18   500         Publisher's advertisements on p. facing t.p. in v. 2 and on p.
                 [1-5] at end of v. 3.
19   505    0    (from t.p.) I. A description of the principal cities and towns,
                 their situation, magnitude, government, and commerce — II. The
                 customs, manners, speech, as also the exercises, diversions,
                 and employment of the people — III. The produce and improvement
                 of the lands, the trade, and manufactures — IV. The sea ports
                 and fortifications, the course of rivers, and the inland
                 navigation — V. The publick edifices, seats, and palaces of the
                 nobility and gentry : with useful observations upon the whole,
                 particularly fitted for the reading of such as desire to travel
                 over the island.
23   651    0    Great Britain $x Description and travel $v Early works to 1800.
24   651    0    Great Britain $x Economic conditions $y 18th century.
25   651    0    Great Britain $v Maps.
26   700    1    Moll, Herman, $d d. 1732.
28   700    1    Strahan, George, $d d. 1752. $4 prt
```

Figure 2. DCRB Full Record

contains only one of the subject headings (field 651) and one of the added entries (field 700) used in the full-level record. While the examples are coded as BIBCO records ("pcc" in the 042 field), any library that is not a participating BIBCO member may also create core records. The 042 will be absent from a non-BIBCO record.

Creating a core bibliographic record such as the one in figure 3 would obviously take much less of the cataloger's time. The time savings and therefore the cost savings may be significant factors for some libraries. To implement the standard, however, may alter the past practice of describing a book to the fullest to help users find the edition or issue of a title that they are looking for. The DCRB Core standard was written to give catalogers the option and discretion of using a less-than-full standard when collections have been identified as more important for access than for fuller bibliographic details. The flexibility of adding more to the core record and the dependence on the cataloger's judgment in choosing to add more are two key principles of all the core standards. These two characteristics may make use of the DCRB Core, in particular, an attractive alternative to the time-consuming full-level record.

```
Type: a ELvl:     4      Srce:   c       Audn:        Ctrl:        Lang:  eng
BLvl:   m   Form:        Conf:   0       Biog:        MRec:        Ctry:  enk
            Cont:        GPub:           LitF: 0      Indx:  1
Desc:   a   Ills: ab     Fest:   0       DtSt: m      Dates: 1724,1727
 1  040     [Library's OCLC code] $e dcrb $c [Library's OCLC code]
 2  042     pcc
 3  043     e-uk---
 4  049     [Local holdings code]
 5  050 4   DA620 $b .D4 1724
 6  100 1   Defoe, Daniel, $d 1661?-1731.
 7  245 12  A tour thro' the whole island of Great Britain : $b divided into
             circuits or journies : giving a particular and diverting account
             of whatever is curious and worth observation, viz. ... : with
             useful observations upon the whole : particularly fitted for the
             reading of such as desire to travel over the island / $c by a
             Gentleman.
 8  260     London : $b Printed, and sold by G. Strahan … [and 5 others], $c
             1724-1727.
 9  300     3 v. : $b ill., 3 folded maps ; $c 20 cm. (8vo)
10  510 4   Furbank & Owens. Critical bibl. of Daniel Defoe, $c 220, 223, 230
11  651 0   Great Britain $x Description and travel $v Early works to 1800.
12  700 1   Moll, Herman, $d d. 1732.
```

Figure 3. DCRB Core Record

Literature Review

Although a number of articles have been written about the Books Core and other core standards, little has been published about the DCRB Core standard. When the standard was being written, discussion and reports at the RBMS Bibliographic Standards Committee meetings were recorded in the minutes of the committee (ACRL RBMS BSC 1998a). The work of the DCRB Task Group was documented in its final report (PCC Task Group 1998). During the time of the task group's work on the standard, discussion and comments were solicited on the Exlibris list. All of those exchanges are available in the archives of the list (Exlibris 1997–1998). After the standard was written and approved, discussion concerning issues of its actual implementation and use was not initiated on Exlibris or Autocat, two lists to which many rare book catalogers subscribe.

Much of the literature treating the core record describes its development within the context of the history of the PCC, its purpose in encouraging "faster, better, cheaper" cataloging that can be relied on for quality of description and authorized headings, and its potential contribution to the success of the national program. There are, however, some studies and reports that investigate particular issues that are relevant to the DCRB Core. Several studies have been done to evaluate the time savings and cost-effectiveness of the core record. Thomas (1996, 102) notes that an unpublished study done at Cornell University by Boissonnas found that core records could be created 25% faster than full-level records. The UCLA/OCLC Core Record Project (Kelley and Schottlaender 1996), conducted from December 1994 to April 1995 with the same group of catalogers creating core- and full-level records, confirmed the assumption that core-level cataloging is faster than full-level cataloging (by 8.5% to 17%) and further confirmed that fewer subject headings and added entries are used in the core records. Other libraries' subsequent use of those core records in the OCLC database with little additional editing attested to the reliability of the records. Hyslop (1997) discusses an unpublished study of experimental core cataloging done at the Library of Congress in 1996. The experiment underscored the efficiency and productivity of cataloging using the core standard. Cataloging statistics at Colorado State University over several years indicated that the use of the Books Core to catalog government publications primarily in the backlog was successful in making

a greater number of books accessible more quickly than before the core standard was used (Lange 1998).

Two recent studies explore the sufficiency of the core record. The first study analyzes the access points and notes in the core- and full-level records and finds statistically significant differences in the two levels of records (Czeck, Icenhower, and Kellsey 2000). While the authors indicate the fields that catalogers may want to augment, they acknowledge that catalogers may want to accept basic core-level requirements unless the need for additional fields outweighs the time savings in the creation of core records. The second study is a pilot study of library users' opinions about the usefulness of the various elements in the core and full records (Letarte and Turvey 2001). Although the study finds the need for further research to confirm the preliminary indications about users' preferences concerning the usefulness of the various access points in the bibliographic records, it does indicate that even though users prefer full-level records, they still feel the core record is sufficient for finding the materials they need.

In a study conducted by interview of cataloger and cataloging manager attitudes toward the BIBCO core record, Banush (2001) found that both groups of participants, while generally satisfied with the core record, expressed varying opinions about its problems and benefits. The cataloging managers expressed more satisfaction with the core record than did the catalogers. Banush notes that this attitude of satisfaction with the core record is in contrast to the reduced percentage of core records actually created by the BIBCO participants during 2000 and early 2001. He also reports that there is a distinction between those accepting core records created by other libraries as copy cataloging and those creating original core bibliographic records. Even though libraries readily use other libraries' core contributions to the shared cataloging databases, often without revision, they are more reluctant to create them, preferring instead to create full-level records. Cromwell (1994, 423–24) reports that even before the Books Core standard was implemented as part of the BIBCO program, Stanford University used a similar standard with varying success. She suggests that the use of the core record cannot achieve the level of cost-effectiveness that is expected without the acceptance and understanding of the catalogers themselves about its purpose and its concomitant emphasis on catalogers' judgment and flexibility.

The published and reported studies of the efficiency and cost-effectiveness of creating core records point to an encouraging potential for the application of all the PCC core standards. The research about access points, users' perceptions, and practitioners' opinions tempers the findings of the efficiency of the core record while producing some statistical and qualitative data that encourages further study.

While the DCRB Core standard bears the approval of the PCC to be used by the libraries participating in the BIBCO program, it may be applied by any library, whether a BIBCO participant or not. In the three years since the approval of the DCRB Core standard by the PCC, however, there has been little evidence that the standard is being widely used. This study investigates the trends in the use of the DCRB Core by means of a survey designed to investigate catalogers' use and perceptions of the standard.

Method

To reach catalogers and special collections librarians who would be able to provide information about their experience with the DCRB Core standard, a query was posted to three lists: Autocat, Pcclist, and Exlibris. Although many people subscribe to all three lists, the profile of subscribers is different for each. Autocat is a list of several thousand people worldwide who are interested in cataloging issues; Pcclist is a list whose subscribers are from participating PCC libraries; and the subscribers to Exlibris are those who have an interest in the field of rare books and special collections. In November 2001, the query was posted to the three lists, asking three questions: (1) if anyone has cataloged using the DCRB Core standard; (2) if not, has a decision been made not to use the standard; and (3) if either is the case, would the recipient be willing to participate in a longer survey about the use and perceptions of the DCRB Core. The questions were posed in this way to find catalogers who have given some thought to the use of the core standard, whether or not they actually use it. The intent was not to seek responses from catalogers who do not use the core and have never considered doing so. Within a reasonable amount of time, only 15 libraries had sent responses, and of those, only 4 indicated that they use the DCRB Core standard. Thirteen, however, said they were willing to participate in a survey.

A few respondents to the query to the three lists indicated that they were responding because someone else had forwarded the query to them. Several more focused groups of potential respondents, therefore, were polled by e-mail: the liaisons at the BIBCO libraries, the members of the RBMS Bibliographic Standards Committee for the past several years, and the heads of cataloging, heads of special collections or special collections catalogers at member libraries of the Association of Research Libraries (ARL). Using this second method, 135 queries were sent to the three groups. Sixty-five libraries responded and, of those, 30 indicated that they would participate in a survey. By using these two methods, posting to the lists and soliciting individual libraries, 43 libraries were identified that were willing to participate in the survey. In March 2002, the 43 surveys were distributed to the participants as Word and rich-text-format attachments to e-mail messages. All participants were assured that

their names and the names of their institutions would be kept confidential. Thirty-seven surveys were returned.

Since most of the solicited libraries are large research institutions, the majority of the returned surveys are from that category of library. The responses to the list postings, however, came from a broader range of libraries. The overall group of respondents therefore has more diverse representation and includes public, private, university, government/national, and special libraries. The geographic distribution of the respondents includes libraries from the United States, Canada, and the United Kingdom. Fifteen libraries participate in the BIBCO program of the PCC. Twenty participants are OCLC member libraries, 2 are exclusively RLIN libraries, and 14 contribute catalog records to both utilities. One library catalogs solely in its own system.

Although the initial query was designed to identify willingness to participate in a survey and some responses indicated only yes or no to the three questions, 54 respondents supplied additional comments about the DCRB Core standard or characterized their cataloging practices or their collections. Of the 54 initial respondents, 24 did not wish to participate further, but included comments that will be discussed in a section in the following analysis. In addition, the six libraries that received the survey but did not return it provided some information about their reasons for using or not using the core standard. Their comments will also be included in the following discussion as indicators of perceptions about the DCRB Core standard.

The Survey and Results

The survey document (see appendix) contained 12 questions, most of which included multiple parts. The first two questions sought information about the type of library, the rare book collection, and the catalogers of the collection. Succeeding questions (3–5) asked about the original cataloging policies of the library, whether the DCRB Core standard has been considered, what decision has been made about its use, and whether any DCRB Core cataloging records have been created. Questions in the next part of the survey (6–9) suggested reasons for either using or not using the core standard. Further questions asked how DCRB Core records created by other institutions are handled (question 10) and whether any studies of users' perceptions have been done (question 11). Space for other comments was provided in question 12.

While it was expected that the institutional data would vary from the responding libraries, questions 1 and 2 were asked to determine ranges of information to characterize the participants. No clear conclusions can be drawn about the relevance of the type of library, the size of the collection, the number of volumes cataloged or in the backlog, the number of rare book catalogers, or the reporting hierarchy within the institution. Both large and small collections are represented among the responses, ranging between a few hundred rare volumes in a collection (1 library) to close to or more than one million rare volumes (4 libraries), with dozens to more than 175,000 volumes in the backlog. The number of original rare book catalogers ranges from .25 full-time equivalents (FTE) to 9 FTE. Only 8 of the 37 libraries have more than 1 FTE rare book cataloger, 11 have less than one FTE, and 2 did not specify a number; the remaining 16 have only a single full-time cataloger. The questions about the size of the collection and the degree to which it is cataloged fully, minimally, or not at all seemed to pose more problems for the respondents than any other questions. Several respondents indicated they would be delayed in returning the questionnaire until they were able to determine the statistical information about their collections. Rare book catalogers report to cataloging or technical services departments in 19 of the responding libraries, to special collections departments in 12 libraries, and to both departments in 6 libraries.

The survey asked about the cataloging policies of the libraries to determine how many libraries use full-level DCRB or full-level AACR2 for cataloging pre-1801 books (questions 3.b.i and ii). The answers were not as straightforward as expected. In responding to how much original cataloging follows the full DCRB standard, 11 libraries responded that they do all their pre-1801 cataloging using that standard, and 13 libraries responded that they catalog none of their books using the standard. When answering the reverse question of how much original cataloging of pre-1801 books follows the AACR2 full standard, 14 libraries indicated all and 15 libraries indicated none. One library catalogs none of its books according to either standard, but instead creates bibliographic records that are fuller than either DCRB or AACR2. Among libraries that do not adhere strictly to one standard, 12 libraries answered that they catalog some of their sixteenth- to eighteenth-century books using the full DCRB standard, and 7 indicated that they use full-level AACR2 for some of their books. The differences can only be attributed to the complexity with which catalogers of rare material view their work and to exceptions in cataloging practices.

To begin the inquiry about the use of DCRB Core by the responding libraries, four questions (3.b.iii–v and 4) were asked: have you considered using the DCRB Core standard, have you decided to use it, have you decided not to use it, and have you actually used it? Eighteen of the 37 libraries (48.6%) have considered using the DCRB Core, 14 (37.8%) have decided not to use it, and 6 (16.2%) have decided they will use it. Six libraries have, in fact, created records using the standard. The 6 libraries that have decided to use DCRB Core are not the same 6 that actually have

used the standard. One library said that the decision has been made to use the standard, but implementation has been hindered by staffing difficulties. Another library has applied the core standard without having made the policy decision that it expects to make in the near future. Two other libraries expressed their intention to use the standard in the future, one as soon as appropriate collections have been identified. Depending on the answer to the question of use of the DCRB Core, respondents were asked to indicate why and how they use the standard (questions 5–8) or why they do not (question 9). In each case, a list of reasons was given for potential responses with additional space for other comments.

In the discussion that follows, the responses of those libraries that use the DCRB Core standard will precede the responses of those libraries that do not use the standard. Each of the 6 libraries that use the DCRB Core did not answer all the questions; and since the number is small, only the positive responses will be noted. One library uses the DCRB Core standard to catalog all of its sixteenth- to eighteenth-century books. Four use DCRB Core for some of their cataloging; 1 among them uses the standard as the default, but enhances the record if there is a compelling reason. The sixth library uses the DCRB Core to catalog its rare books even though none are pre-1801 imprints. Three of the 6 libraries use the DCRB Core for particular reasons: for a specific collection or when lack of expertise or want of a significant reference work would make it impossible to catalog at the full level. All 6 have applied the standard at cataloger discretion. and 2 of the 6 also have applied it at curator discretion.

In response to why and how they use the DCRB Core standard, four libraries answered that they use it to save time, three to increase production, four to gain faster control over their backlog, and three because it is more cost-effective. In addition, one librarian whose institution does not hold any pre-1801 imprints replied that they use the DCRB Core because it is "better to capture the uniqueness of what we own in the archival and special collections department," and another respondent noted that they upgrade to the level of the DCRB Core standard some of the brief records for early imprints that can be found in the OCLC database. Only 1 library uses the standard as it is written, "since it is written to be flexible"; 2 other libraries sometimes use it as written. Four libraries add more fields than the standard requires. The additional fields include: notes for contents (505), immediate source of acquisition (541), and ownership and custodial history (561); genre, form, or physical characteristic terms (655); added titles (246 and 740); and local information required by the library's online system or cataloging policies. Five of the libraries encourage cataloger's discretion to determine whether to include additional fields and what the fields should be. The 6 libraries indicated the percentage of bibliographic records created using the DCRB Core standard to be less than 1%, 1%, less than 5%, less than 10%, and 100%, with one library reporting that no statistical records had been kept for DCRB Core records. In actual numbers 4 libraries reported they have created the following numbers of records: 10, 10–15, 18, and ca. 4,400. The fifth and sixth libraries were unable to give figures.

The library that catalogs all its sixteenth- to eighteenth-century books using the DCRB Core standard does not add bibliographic records immediately to OCLC, and there may be a period of time before they appear in the utility's database. The library that said it starts with the DCRB Core record as the default and enhances as necessary, creates its original catalog records locally without an 040 field (that would contain $e dcrb) because the generic 040 with the library's holding symbol (but without $e dcrb) is added automatically when the records are sent to OCLC. This library has not kept records of the number of DCRB Core records created. Given that these 2 libraries may create a considerable number of DCRB Core records without a way to track them in OCLC and that other libraries, that they have created a minimal number of DCRB Core records, it would be surprising if the national databases have a significant number of DCRB Core records.

The initial responses of the 2 libraries that said they have used the DCRB Core but did not return the survey indicate that they probably have created few catalog records using the standard. When 1 of the 2 libraries applies the DCRB Core, it does so only for seventeenth- and eighteenth-century books, not for fifteenth- and sixteenth-century books, and it never omits notes justifying added entries. The other library applies the standard in limited instances because it feels that rare books should be given full-level cataloging. Since the DCRB Core does not require a standard call number, this second library can contribute BIBCO records for broadsides and pamphlets that it does not classify. Adding these 2 libraries that did not participate in the survey to the 6 that did participate brings the total of known users of the DCRB Core standard to 8.

The 31 libraries that do not use the DCRB Core standard indicated their reasons in response to a ten-part question that suggested 9 possible reasons and asked for others in the tenth part (question 9). As indicated in table 1, each of the reasons was affirmed by some of the libraries. That the DCRB Core standard is inferior was the reason cited by most of the libraries, 19 (61.3%), that have not used it in their original cataloging records for rare books. Fifteen respondents (48.4%) said that the description is not accurate enough and that there are not enough access points with the use of the standard. Eleven (35.5%) stated that they have not used the DCRB Core because it would require learning a new standard, and 8 (25.8%) said they do not use the stan-

dard because they are unfamiliar with it. Six respondents (19.4%) reported shortages or changes in staff that have kept them from using the standard. Five libraries (16.1%) said that training is unavailable, and 5 also indicated that the use of the DCRB Core standard would disrupt the established workflow. Only 4 (12.9%) said they do not have material appropriate to catalog using the standard.

The opinion and perception of nearly two-thirds of the libraries responding that they do not use the DCRB Core standard is that the DCRB Core record is inferior to the full record. Almost half think that the standard does not provide enough access points and that the description is not accurate enough. Clearly these three most prevalent perceptions indicate that the survey respondents have not been willing to give up fuller bibliographic treatment for their rare books. This opinion of the lesser quality of the DCRB Core record as a reason for nonadoption by most of the respondents is reminiscent of a similar kind of negative perception and resistance to acceptance that were noted for the Books Core by Cromwell (1994, 423–24) in her observation that cataloger's attitude and acceptance are needed for the success of the Books Core. The six other reasons that the respondents affirmed for not using the DCRB Core standard are all operational obstacles within their libraries more than opinions or perceptions. Changes in libraries' current personnel, procedures, or materials issues might create more acceptable conditions for the adoption of the DCRB Core standard. Catalogers could learn the new standard or become familiar with it, changes or shortages in staff could be overcome with time or more money, a new workflow could be established, training could be sought, and appropriate materials might be acquired.

The participants gave a number of other reasons, however, for not undertaking use of the DCRB Core. In response to the possibility that a library may not have appropriate materials for using the core standard, some libraries qualified that reason noting the small quantity of rare books they catalog. Seven libraries said that they do not catalog many rare books, that they do so little original cataloging, especially of rare books, or that they have so few pre-1801 imprints that it is easier to apply the full standard and not worth applying a different standard when they encounter a title that may be eligible for core-level cataloging. One librarian replied that the categories of materials that would be candidates for DCRB Core-level cataloging are generally cataloged to their own minimal-level standard. Administrative or departmental policy to catalog all books at full-level DCRB was cited by 6 libraries as the reason for not applying the DCRB Core standard. Although 13 libraries answered that they do not use full-level DCRB for cataloging any of their sixteenth- to eighteenth-century books, 4 specifically reiterated that they use only AACR2 full for cataloging rare books. Two libraries emphasized their production goals and decisions to apply certain standards as reasons for not taking time to learn a new standard. One librarian thinks "the introduction of a DCRB Core standard runs contrary to the whole intent of DCRB to provide fuller description than AACR2." Another librarian said that not justifying access points is confusing to users and that if the cataloger starts to add more fields, it would be easier to create full-level records. Two respondents said their reference collections are not comprehensive enough to provide references in a 510 field to allow the abbreviated description of the DCRB Core standard. Two other libraries indicated that their backlogs are not large enough to need to implement DCRB Core cataloging. Four librarians each offered one of the following reasons: use of the Core does not increase production, it would create more inconsistencies in the catalog than are already there from so many changes in standards over the years, there is little time for the catalogers to assimilate the new standard, and catalogers prefer one standard not choices. These additional reasons and comments express strong opposition to the use of the DCRB Core standard. For the most part, they are internal or operational issues that pose obstacles to the adoption of the standard.

Table 1. Thirty-one Survey Respondents' Ranked Choices for Not Using the DCRB Core Standard (from Question 9)

Reasons	Yes	% Yes	No	Unanswered
Core is inferior	19	61.3	11	1
Description not accurate enough	15	48.4	14	2
Too few access points	15	48.4	16	-
Requires learning new standard	11	35.5	18	2
Unfamiliarity with standard	8	25.8	22	1
Shortages or changes in staff	6	19.4	24	1
Use would disrupt workflow	5	16.1	24	2
Training is unavailable	5	16.1	25	1
Material not appropriate	4	12.9	27	-
Additional reasons	18	58.1	-	13

Remarks from the 24 libraries that did not wish to participate in the survey provide further insight into why some libraries do not use the DCRB Core. Their reasons are categorized in table 2. Some of the reasons are identical to those of the survey participants: the rare book collection is not sufficiently large to warrant learning to catalog by any standard other than full-level DCRB (11 libraries); the library is not familiar with or even aware of DCRB Core (6 libraries); there are changes (5 libraries) or shortages (4 libraries) in staff; the DCRB full standard is not used (4 libraries); the policy is to catalog at the full level (3 libraries); and training poses a problem (1 library). In addition to these commonly held reasons for not applying the DCRB Core, 3 libraries indicated that they do not use any of the core standards, and 2 libraries hesitate to use the DCRB Core because it might prohibit a non-BIBCO library from enhancing the core record to a full-level record in OCLC.

Table 2. Categorized Reasons for Not Using DCRB Core from Twenty-four Nonparticipants in Survey

Reasons	No.
Not enough of a collection to make it worthwhile	11
Not informed enough or aware of DCRB Core	6
Cataloger is retiring or have a change of staff	5
Do not use DCRB full	4
Have a shortage of staff	4
Do not use any core standard	3
Policy is to catalog at full level (including BIBCO records)	3
Other libraries would not be able to enhance records to full level	2
Feels the need to justify added entries	1
Feels limitation in training	1
Feels limitation in knowledge	1
Does not do BIBCO for books	1
Has not cataloged rare books in a while	1
Does not create BIBCO records for rare books	1
Only a few catalogers are trained in DCRB	1
Too little time to discuss issues related to DCRB Core	1
Has a large backlog	1
Uses Books Core	1
Catalogs few original records for rare books	1
Differences between core and full are minor	1
Using core does not save much time	1
Doubts can convince Special Collections of value of core records	1
E-resources are becoming priorities	1

Each of the following reasons was cited by a single library for not employing the DCRB Core standard: added entries should be justified in a note; knowledge is too limited to apply the standard; BIBCO books records are not created; BIBCO rare books records are not created; rare books have not been cataloged recently; only a few catalogers are trained to use DCRB; too little time is available to discuss DCRB Core and issues related to it; the backlog is large; the Books Core is used instead; too few original records for rare books are created; the differences between core and full level are minor; the core standard does not save much time; the value of DCRB Core records cannot be sold to Special Collections; and, finally, e-resources are becoming more of a cataloging priority than printed special collections materials. Common emphases and implications that run through many of these reasons are the little availability of time and the desire for adherence to fuller standards, two characteristics that have long been in competition in technical services processes in libraries. One library, however, intends to use the DCRB Core standard, and two others are considering using it.

How well cataloging copy is viewed and used by other libraries is one way of evaluating the efficacy of a cataloging standard. Responding to question 10, 9 participants in the survey said their copy catalogers accept DCRB Core records without changing them, although 1 library said there was room for cataloger's judgment and 2 libraries indicated that they might add subject headings or local notes. Nineteen respondents said their copy catalogers edit DCRB Core records locally. In response to the question of whether original catalogers enhance DCRB Core records to full level locally, 29 libraries answered in the affirmative; 5 do not enhance core records to full level locally. At 16 libraries, original catalogers enhance DCRB Core records to full level nationally; at 16 libraries they do not enhance nationally, although 2 libraries said they may do so in the future. Four of the respondents noted that their catalogers have never seen a DCRB Core record; 1 of them would edit if a core record were encountered. Since there is so little evidence for the creation of DCRB Core records, it is surprising that not more libraries commented that they have not seen them in the bibliographic utilities. Further research in the databases of the bibliographic utilities is needed to confirm that the DCRB Core standard has as yet found little acceptance and use among rare book catalogers and curators.

The final question on the survey (question 11) asked if any use studies of DCRB Core records have been conducted. Not surprisingly, none of the respondents has done such a survey. In their additional comments, however, three librarians said they think the purported time savings of core cataloging records are not worth the cost to the users in locating materials they need. These opinions are greatly supported by many special collections departments' preferences for using the DCRB full standard.

Conclusions

Clearly, the preponderance of the evidence indicates that most libraries surveyed have not used the DCRB Core standard and prefer to catalog their rare books using a full standard, whether DCRB or AACR2. The DCRB Core standard was not written as a replacement for full-level cataloging for all rare books. The standard states that the expectation is that materials cataloged using the DCRB Core will be chosen more for their accessibility than for full bibliographic treatment (PCC 1999a). Eight libraries (six survey participants and two that did not participate) have identified appropriate collections to catalog using the DCRB Core standard. Among the responses received both in the initial query and in the survey itself, six additional libraries indicated that although they do not now use the DCRB Core standard in their cataloging, they are expecting to do so in the future or seriously want to consider using it. The total of fourteen libraries that either do use the DCRB Core or almost assuredly will use it in the future indicates the beginning of acknowledgement of the value of the standard and a more positive attitude among some catalogers toward the standard.

A recent survey of the special collections departments of the ARL libraries finds that large portions of the collections are uncataloged (Panitch 2001, 49). Although formats other

than books form the bulk of the uncataloged collections, an average of 15% of the book collections have no access through any form of bibliographic description, and 49% have access only through a card catalog. Many non-ARL libraries may also have large proportions of their special collections in uncataloged backlogs. According to the minutes of recent meetings of the ARL Task Force on Special Collections, one primary issue under discussion is the question of providing increased access to those backlogged materials through bibliographic control (ARL Task Force on Special Collections 2002).

Many of the books in backlogs may have existing bibliographic records in OCLC and RLIN that can be used by copy catalogers. For those books that do not already have catalog records in the bibliographic utilities, however, the application of the DCRB Core standard in creating original bibliographic records has potential. To begin a project to catalog backlogged material using the DCRB Core standard, a primary task for special collections librarians is to identify specific collections that will be appropriate for DCRB Core-level cataloging. One library among the survey respondents is considering cataloging its early French pamphlets using the DCRB Core. Other pamphlet collections or subject collections, such as political or religious tracts, may be candidates for DCRB Core cataloging. One librarian said that using a cataloging template for materials issued by the same publisher would make DCRB Core cataloging even more efficient. Several libraries indicated that they are looking for appropriate collections. One respondent noted that sometimes the DCRB Core standard is applied to enhance a brief cataloging record to bring it up to a higher level without the necessity of enhancing to the full level.

In addition to identifying collections that are candidates for DCRB Core cataloging, libraries will need to encourage cataloger's judgment to help overcome the resistance to using core standards. Because the flexibility of the core standard permits a wide range of additional elements in the core record, the cataloger is not limited to the bare minimum requirements. Not every book in a backlog will be a candidate for core-level cataloging, but identifying the proper collections and undertaking DCRB Core-level cataloging projects can help increase accessibility to those materials that users do not know exist in rare book collections.

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Appendix
Survey Questions

1. Information about your institution:
   a. Is your institution public or private?
   b. Is your library a public, college, university, special, government, or national library?
   c. Does your library contribute original bibliographic records to OCLC or to RLIN?

2. Information about your rare book collection and catalogers:
   a. How many volumes do you have in your rare book collection?
   b. How many volumes are cataloged fully?
   c. How many volumes are cataloged minimally?
   d. How many volumes are in your backlog?
   e. How many original catalogers (FTE) are on your rare book cataloging team?
   f. How many copy catalogers (FTE) are on your rare book cataloging team?
   g. Do your rare book catalogers report to the Cataloging Department, the Special Collections Department, the Cataloging Department within Special Collections, or another unit?

3. Information about your original cataloging policy:
   a. For nonrare books:
      i. Is it your library's policy to use or not to use the PCC core standards for books and other formats?
   b. For rare books:
      i. Is it your policy to catalog all, some, or none of your sixteenth- to eighteenth-century books using the DCRB full standard?
      ii. Is it your policy to catalog all, some, or none of your sixteenth- to eighteenth-century books using the AACR2 full standard for books?
      iii. Have you considered using the DCRB Core standard for cataloging your sixteenth- to eighteenth-century books?
      iv. Have you made a decision to use the DCRB Core standard?
      v. Have you made a decision not to use the DCRB Core standard?

4. Have you used the DCRB Core record for cataloging rare books? (If no, go to question 9.)

5. What determines your application of the DCRB Core standard? (Please answer all that apply.)
   a. Do you catalog all, some, or none of your sixteenth- to eighteenth-century books using the DCRB Core standard?
   b. If you catalog only some rare books using the core standard, do you use it to catalog particular categories of materials, e.g., those selected by date, subject, or collection?
   c. If yes, what categories of materials?
   d. Is the standard applied at cataloger discretion?
   e. Is it applied at curator discretion?

6. Why do you use the DCRB Core standard? (Please answer all.)
   a. Do you use it to save time in cataloging?
   b. Do you use it to increase production?
   c. Do you use it to help gain faster bibliographic control over a backlog?
   d. Do you use it because it is more cost-effective?
   e. Do you use it for any other reason? (Please specify.)

7. Frequency of use of DCRB Core standard:
   a. What percentage of your cataloging records is created with the DCRB Core standard?
   b. Do you use it as often as your library uses the core record for books and other formats?
   c. Approximately how many DCRB Core records have you created since the approval of the standard in January 1999?

8. How do you use the DCRB Core standard?
   a. Do you use the DCRB Core standard as it is written?
   b. Or have you decided routinely to include more fields than the standard defines, e.g., more 500 fields?

c. What additional fields have you decided to include routinely?
d. Do you encourage cataloger discretion in determining what additional fields to include?

9. If you do not use the DCRB Core record, what are the reasons? (Please answer all.)
   a. That you do not have material appropriate to catalog using the core standard?
   b. That it does not describe a book accurately enough for your users to identify what they need?
   c. That it does not give enough points of access to the material?
   d. That the core record is inferior to the full record?
   e. That its use would create a disruption of the established workflow?
   f. That its use would require catalogers to learn or accommodate a standard different from the one in long-time practice
   g. That training is not available?
   h. That you are not familiar enough with the standard?
   i. That shortages or changes in staff do not make it practical to learn a different standard?
   j. Any other reason? (Please specify.)

10. Your use of the DCRB Core record created by other libraries:
   a. If you have copy catalogers working on rare books, do they accept DCRB Core records as they encounter them, or do they edit them locally (other than adding call numbers)?
   b. Do your catalogers (copy or original) ever enhance DCRB Core records to full level locally?
   c. Do they ever enhance DCRB Core records to full level nationally in one of the bibliographic utilities?

11. Studies to evaluate the DCRB Core from the patron perspective:
   a. Have you undertaken any studies to evaluate the DCRB Core standard from the patron perspective?
   b. If so, what evaluation criteria did you use?
   c. Would you be willing to share your evaluation criteria?

12. Do you have any other comments about the DCRB Core standard?

Managing Administrative Metadata

The Tri-College Consortium's Electronic Resources Tracking System (ERTS)

Norm Medeiros, Linda Bills, Jeremy Blatchley, Christee Pascale, Barbara Weir

This article describes the Electronic Resources Tracking System (ERTS), an administrative metadata management tool created by the Tri-College Consortium (Bryn Mawr, Haverford, and Swarthmore colleges). ERTS stores and provides access to data elements associated with electronic resources, such as license restrictions, authentication means, technical contacts, and statistics availability. ERTS was developed using the FileMaker Pro database application and is mounted on our intranet. The database is utilized by technical and public services staffs at all three colleges.

A growing need exists for metadata management of administrative issues related to electronic resources (e-resources). Some of these issues include license restrictions, authentication means, technical contacts, and statistics availability. Integrated library systems (ILS) do not easily accommodate such metadata, and paper files maintained by serials librarians have proven inadequate both in accessibility and organization. Making e-resource metadata quickly available to interlibrary loan and reference staffs is facilitated by an online gateway of the ERTS model.

Norm Medeiros (nmedeiro@haverford.edu) is Coordinator, Bibliographic and Digital Services, Haverford College, Pennsylvania; **Linda Bills** (lbills@brynmawr.edu) is Tri-College Special Projects Librarian, Tri-College Consortium; **Jeremy Blatchley** (jblatch1@brynmawr.edu) is Serials Librarian, Bryn Mawr College, Pennsylvania; **Christee Pascale** (cpascale@brynmawr.edu) is Cataloging Librarian, Bryn Mawr College; **Barbara Weir** (bweir1@swarthmore.edu) is Assistant Director for Acquisitions, Systems and Data Management, Swarthmore College, Pennsylvania.

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In the Beginning

Discussions about the state of Tri-College e-resources were held in 2001. The focus of these discussions, which were sponsored by a Mellon Foundation grant, was ensuring consistent access to e-journals throughout the consortium. This original charge was broadened later that year and resulted in development of the ERTS system. The authors comprise the founding members of the ERTS Team.

We held a number of brainstorming sessions to identify the results each library hoped to achieve with ERTS. Particularly due to our consortium status, numerous discussions were necessary so as not to overlook any one library's specific needs. Some of the goals for ERTS included:

- immediate access to license information for all e-resources purchased by the Tri-College Consortium libraries
- various statistical reports not easily available, if at all, through our integrated library system
- notification services that alert staff when e-resources are about to expire

We began identifying data elements based on these needs. The suggested fields, and the information we expected to place within them, fit into four categories:

- Licensors: entities from whom we license e-resources
- Items: individual e-resource titles
- Purchases: acquisitions data concerning e-resources
- Vendors: entities from whom we purchase e-resources

After consulting established element sets, particularly those maintained by the University of Washington (Jewell 2001) and Johns Hopkins University (HERMES 2001), it was comforting to see that our direction was quite similar. Appendix 1 lists the elements used in ERTS.

Scope

ERTS exists in large part because of limitations inherent within integrated library systems. That said, the ERTS Team was wary of duplicating information already held in our local catalog. Thus we sought to restrict ERTS's scope to those data either unavailable, or not easily retrievable, through our ILS. Since the predominant mission of ERTS is to track license information, few freely available electronic resources are entered. (Unlike similar e-resource systems, ERTS has no patron-accessible component and does not deliver e-resources to the Web.) Only in cases where a certain aspect of a freely available e-resource requires tracking, such as how the consortium has decided to catalog it, is it entered in ERTS. In cases of volatile aggregators, only a collection-level record is maintained. Resources we have decided to exclude from ERTS generally fall into these categories:

- extending less than a year's guarantee of access
- delivering incomplete holdings (e.g., only random articles are provided)
- not providing ready title-level access

License Information

As in many institutions, electronic resources are heavily used in our libraries. As a result, serials and acquisitions personnel field numerous questions from public services staff regarding license restrictions. The paper files we maintained before ERTS were not an adequate medium for promulgating license-related information. Ellen Finnie Duranceau's efforts with license tracking at MIT were influential at pointing the way toward a networked file for staff use (Duranceau 2000). Apart from the license terms related to legal responsibilities (e.g., merchantability, indemnification, governing laws), ERTS stores elements that directly address what library services we can provide and what our patrons can do with a given resource. Some of these data include:

- ILL allowability: We have buttons for yes, no, n/a, and unknown. There is also a free text box to allow for further details (e.g., ILL allowed only via print). Our ILL staffs need to know this information, and occasionally reference librarians are asked about such restrictions.
- Number of simultaneous users: Because certain resources carry this restriction, this element helps public services staff troubleshoot the cause of a user not being allowed access. Documenting simultaneous user limits in ERTS provides a check that may help public services staff before assuming a more involved access problem is the culprit.
- Print restrictions: Some resources limit the number of pages printed per session, and others even prohibit printing. This element prevents the expenditure of valuable time trying to diagnose an apparent printing problem.
- Reserve restrictions: Staff responsible for electronic reserves need to know if such mounting is restricted in any way. An example of such a restriction is having a strict time frame for the duration of the e-reserve link. As with print restrictions, the licensor may obligate us to inform users of such restrictions or other license terms.
- SDI availability: This element indicates the availability of a service allowing patrons to register for e-mail notification when new content becomes available. Often, such content is in the form of journal issues or tables of contents.
- Archival guarantee: As we exchange print subscriptions for electronic equivalents, access to this information has become a great concern, especially since it is often hard to tease out of veiled licensing language.
- Negotiation contact: This element stores the name of the licensor's negotiation representative. This information is useful when we wish to alter the language in our license.
- General comments: This catch-all field is used to capture license data not covered in the fields above, such as a note concerning license revision dates.

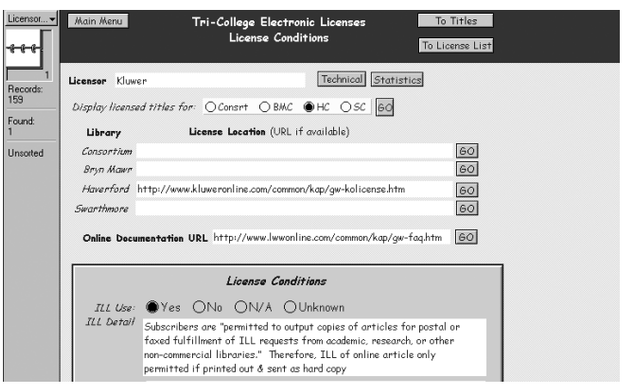

Figure 1: Technical Services View of a Licensor Record

Cataloging Information

Cataloging electronic resources in the Tri-College setting poses complications beyond the natural challenges inherent with this ever-changing media. When the Tri-Colleges first purchased electronic resources, a commitment was made to provide individual bibliographic records in our local catalog for each title. During this time, many journal publishers provided online access to their content, often free with the print subscriptions. As aggregators and large publisher collections became available, the challenge to provide title and subject access grew into an even more formidable task, as described expertly by Calhoun and Kara (Calhoun and Kara 2000). In order to continue providing individual title access in this environment, the Tri-Colleges employed several methods of cataloging, including a locally derived batch method, along with the more standard copy cataloging via cooperative resources like OCLC. Further adding to this quandary, the consortium libraries share a catalog. Although the libraries purchase many online resources collectively, there are numerous e-resources unique to a single library. Maintaining consistent cataloging standards across three separate technical services units is a challenge. ERTS supports sharing of these standards by centralizing cataloging information for the Tri-Colleges.

Initially, the cataloging elements in ERTS were linked to the licensor database. This architecture posed three problems, however:

- The licensor name (e.g., Elsevier Science) is generally not used by cataloging and reference staff to identify an electronic resource (e.g., ScienceDirect).
- Catalog librarians describe information about individual and collection titles that is not always consistent across multiple resources offered by the same licensor. For instance, a licensor may place title lists and holdings information for one of its collections on the Web, but not for another. This may affect the way the resources are cataloged. Appending these cataloging data to title records, rather than licensor records, gives us the flexibility necessary to record differences among collections.
- Several freely available collections for which the Tri-Colleges maintain cataloging procedures do not warrant a licensor record.

The cataloging database consists of approximately sixteen fields that are divided into four sections on the cataloging information page: Title; Tripod (the Tri-College Consortium's integrated library system) Searching Information; Technical Cataloging Information; and Publisher-Related Information. An explanation of each section follows:

Title

Cataloging uses this section, consisting of one element "Title," to identify the individual journal, collection-level, or aggregator title. The Tri-Colleges use the MARC 130 (Uniform Title) tag for local collocation and retrieval purposes within Tripod. The title field in ERTS replicates the locally derived 130 field. The intention is to facilitate ease of searching for public services staff. If they require more information about an electronic resource, they can then search the title in ERTS.

Tripod Title Searching Information (for Public Services)

This section, designed for use by public services staff, consists of two elements that identify the search keys necessary for retrieval of all titles in a collection or aggregation. The first field contains a URL that invokes an OPAC search in Tripod. The second element contains the Tripod search key and search term. Such a field might look like this: author=Project Muse.

Technical Cataloging Information

This section centralizes local decisions for Tri-College cataloging staff. It consists of three elements. The first field notes, whether individual titles within a collection, aggregation, or database, are analyzed. The second field indicates what method is used to catalog analyzed titles and where the file used for the locally batch-created records resides. The third field records any MARC fields that are unique to each collection, aggregate, or database. For instance, a cataloger might decide to use a series entry to help collocate related electronic resources. When this is the case, the 4XX field (and 8XX field, if necessary) would be recorded in this field. Also, if a 7XX field is recorded for a person or corporate body, it would be accordingly noted in this area.

Publisher-Related Information

This section incorporates URL and note fields. The URL field directs catalogers to a title list, usually located on the licensor's Web site, that is used in our batch load procedures. A brief note about the update pattern and frequency of these titles lists is also located here. The final element in this section is a note about whom to contact at the vendor for service updates.

Overall, the cataloging database is a modest component of ERTS. Yet it provides the Tri-College's cataloging community an invaluable tool. ERTS circumvents the need to record cataloging decisions on paper files or "in our heads," making for a stronger, more fluid approach to cataloging electronic materials throughout the consortium.

Purchase Information

Although much purchase information is available in our local catalog, we felt it would be useful to be able to view a title's cost over a five-year period, as well as to easily distinguish any one-time fees. Additionally, we wanted to have the ability to generate reports that would tell us how much we were spending on different categories of electronic titles. Each purchase event is captured in ERTS by entering the following data:

- Library: this is the purchasing library or in some cases may be the consortium as a whole.
- Licensor: selected from a drop-down list of licensors; this is usually the publisher/creator of the title.
- Vendor: also selected from a drop-down list; this is from whom we purchase the title. For cases in which one of the libraries acts as purchasing agent for the other two, that library would be recorded as the vendor.
- Purchase type: we have a need to distinguish among titles that are paid as electronic only, titles that carry an added cost over the cost of the print subscription, and titles that offer free online access as a consequence of a print subscription.
- One-time charges: we wanted to record this information separately so that it could be distinguished from annual costs. Price, paid date, expiration date, and ILS order number are also entered.

Generally, much discussion surrounds the initial decision to purchase a particular resource. The decision to renew a resource, however, is often made with less thought and in a very short time frame. It is most often the case that the need to make the renewal decision is prompted by a renewal form or invoice from a vendor and is sometimes received after the previous subscription has expired. We often do not take the time to ask ourselves important questions such as: How often was this resource used? Has the licensor provided good service in the case of technical problems? Can we justify the cost? Instead, we often rely on the gut feeling of our bibliographers. While their sense of the usefulness of the resource may be valid, we want to be able to provide more data and more time for them to make the renewal decision. Therefore, we have added an e-mail-alerting component to ERTS which uses the expiration date in the purchase record and notifies selected staff sixty days prior to the expiration of a title. This is a strategy we learned from the HERMES system implemented at Johns Hopkins University (HERMES 2001). We believe this gives us sufficient time to analyze usage statistics, cost, and service issues (which are available in ERTS) so that we can make informed renewal decisions. A 'renew' button in the purchase record moves the previous year's purchase data to a new column, retaining the ILS order number and purchase type. ERTS uses

Figure 2: Example of Data as Recorded in the "Technical Cataloging Information" Section

Figure 3: Example of a Purchase Record in ERTS

the price entered for the new year to calculate the price change from the previous to the current year.

A variety of reports can be generated from the purchase data in ERTS. For example, we can create reports totaling electronic acquisitions by purchase type (publisher collection, aggregator collection, electronic only, etc.) for the fiscal year or for any selected time period, giving us the title, the most recent paid date, and amount of each electronic resource, sorted by type of resource, then by title. A report on the number of records by purchase type and an annual expenditure comparison report can also be generated. Other report types can be created as needed.

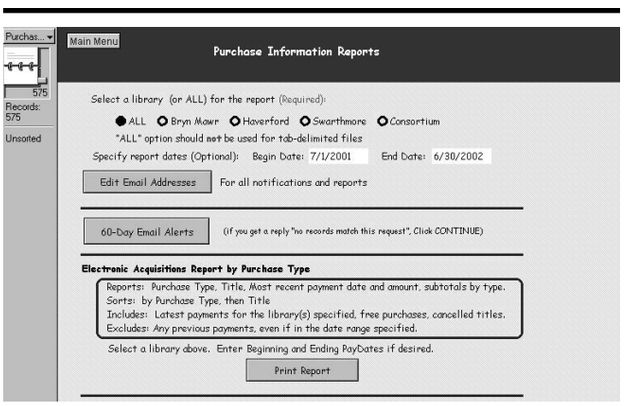

Figure 4. ERTS Report Module

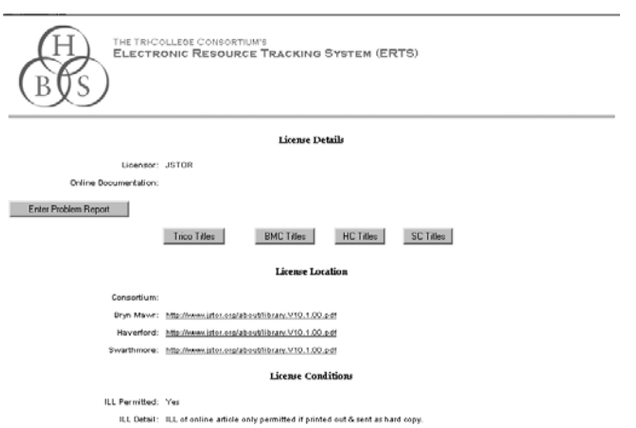

Figure 5. Public Servies View of a Licensor Record in ERTS

Technical Specifications

ERTS runs on FileMaker Pro, currently version 5.5 desktop (not server) software at Haverford's Magill Library. ERTS was developed on a Mac, but currently runs on Windows. Staff use Macintosh and Windows computers to access the database, which performs well on both platforms. Read-only access to ERTS is restricted to the three college campuses by IP address; editing privileges are restricted by passwords.

The staff functions of inputting, editing, and reporting are available in all three campus libraries through FileMaker's sharing system. Search functions for public services staff are available through a Web interface using the FileMaker CDML tags. Through the Web, users on the three campuses can search by licensor name or title and view the license restrictions that apply. Staff can also enter comments about an e-resource's system performance or access difficulties, which can then be made available to them at renewal time.

ERTS consists of six interrelated files or "tables."

- **Licensors** (entities from whom we license resources)—One record is entered for each licensor and used by all three libraries.
- **Items** (individual resource titles)—One record is entered for each title and used by all three libraries.
- **Purchases** (acquisitions data about the resources)—Each library maintains a separate purchase record.
- **Vendors** (entities from whom we purchase resources)—One record is entered for each vendor and used by all three libraries.
- **Service comments** (incident reports)
- **Administration** (constant data needed by several files)

More information about these files is available on the ERTS Web site, www.haverford.edu/library/erts/.

Conclusion

ERTS's well-defined mission does not prohibit its evolution. Plans are in place to create a workflow model that would track the various phases an e-resource goes through from selection to cataloging. In the same vein, we would like to interface ERTS with a locally developed trials database. Such a marriage would bridge the gap between trial use of an electronic resource and the decision to purchase it and would help the consortium better monitor the life span of its growing e-resource collection.

Although ERTS has satisfied its mission of making available administrative metadata to all staff within the Tri-College Consortium, it is likely the system will eventually outgrow its relatively simple infrastructure. Most e-resource systems are built using more robust database applications and are utilized not only to track, but to provide access to e-resources. ERTS could be redesigned to do this within its

current framework, but such efforts would be limited technically by FileMaker Pro's functionality and would overlap with other work currently underway in the consortium. Moreover, once ILS vendors begin to market ERTS-like systems, it may be logical to import the data into such a system so as to merge the administrative piece with the delivery mechanism.

Additional Resources

A number of other e-resource projects similar to ERTS are underway. Adam Chandler (Cornell University) and Tim Jewell (University of Washington) maintain "A Web Hub for Developing Administrative Metadata for Electronic Resource Management" at www.library.cornell.edu/cts/elicensestudy/home.html. This Web site features descriptions of other academic license-tracking projects, working documents, and a link to the *eresourcestudy* discussion list.

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Appendix 1
ERTS Tables and Element Sets—May 2002

Elements are grouped here as they are in screens presented to the user. Where portals display elements from other tables, those are shown in {}. Screens given here are those used by staff rather than the few simpler public views.

Table: Licensor

Our intent is to have one licensor record for all libraries that use that license, even if our terms differ slightly. There is a different field for each library to reference the complete license by URL to a vendor site or a local PDF file. Any differences in terms for ILL, printing, etc. would be described in the appropriate text fields.

Data appears in three separate displays: opening display with license conditions, technical information display, and statistics collection information display.

Field	Type	Purpose
Opening Display		
Licensor	Text	Organization that controls the license; chief link among the main tables
License URL Bryn Mawr	Text	URL to vendor license location or to local PDF of printed license. Bryn Mawr license
License URL Haverford	Text	Same: Haverford license
License URL Swarthmore	Text	Same: Swarthmore license
License URL Consortium	Text	Same: Consortium license (for joint licenses)
Online documentation URL	Text	URL location of online documentation for the licensor's products
License Conditions Section		
ILL allowed?	Values: yes, no, N/A, unknown	Quick info on ILL rights
ILL detail	Text	Explanation or exceptions if needed
Simultaneous user restrict	Text	Terms or limits on simultaneous use
Print restrictions	Text	Terms for printing
Remote access restrictions	Text	Terms for remote use
Reserve restrictions	Text	Terms for reserve use
SDI availability	Text	Notes on SDI services offered
Archival guarantee	Text	Long-term availability guarantees
Negotiation contact	Text	Licensor contact for contract negotiations
General comments	Text	Free text comments
Last updated	Date - autofill	
Updater initials	Text - initials	
Technical Information Display		
Technical contact	Text	Licensor technical contact for product access issues
{Service comments}	{Portal to service table}	Date, location, and beginning of each comment; link to service table
Authorization	Values: IP address, passwords, other	Type of authorization used for access

Authorization details	Text	Details of authorization
Content note	Text	Coverage, e.g., journals include letters, advertisements, etc.
Publication lag	Text	Lag time (or advance publication) vis-à-vis any print or other versions
Linking service	Values: Silverlinker, SFX, none, other	Which link servers are used with the product
Linking service note	Text	Linking service details
Statistics Information Display	**(Four sets of these fields, one for each library)**	
Statistics URL	Text	URL or other location to get use statistics
Schedule	Text	Statistics pickup schedule
Responsibility	Text	Person assigned to statistics
Instructions	Text	Special instructions for access or manipulation
Special Function Fields		
See Ref	Text	Creates a See reference in search results lists
LibraryChoice	Values: Bryn Mawr, Haverford, Swarthmore, Consortium	Facilitates retrieval of titles for one license and one library
Create Date	Date - autofill	

Table: Title

Title table includes information about individual titles subscribed through collections, titles of collections themselves, and titles of other electronic services such as indexes. The intent is to create a single place to search any electronic resource by its title and retrieve it.

The intent is to have one entry per title on which each library records which licensor they use for the title. The title information links back to the license table through the licensor name.

Field	**Type**	**Purpose**
Main Title Display		
Title	Text	Title of individual journal, of collection, of aggregation, or of electronic service
Tripod title URL	Text	URL to search the consortium OPAC by the title
Consortium licensor	Values: Licensors	Licensor source for consortium
BMC licensor	Values: Licensors	Licensor source for Bryn Mawr
HC licensor	Values: Licensors	Licensor source for Haverford
SC licensor	Values: Licensors	Licensor source for Swarthmore
{License detail}	{Portal}	Displays selected fields from selected licensor record; links to complete licensor record
Format	Values: e-journal, e-book, database, collection, aggregation, other	Specifies type of title. Collections are groups of titles from a single publisher; aggregations are groups of titles from several publishers.
{Current purchase records}	{Portal}	Library and amount paid from each related purchase record; link to purchase record
Collection Cataloging Information		**Instructions for cataloging constituent titles of collections and aggregations**
Tripod collection URL	Text	URL to search the collection title on the OPAC
Tripod titles URL	Text	URL to retrieve all cataloged constituent titles on OPAC
OPAC search index	Values: author, title, JournalTitle	Type of OPAC search for constituent titles
OPAC search text	Text	Text of OPAC search for constituent titles
Title level cataloging	Values: yes, no, other	Whether title-level cataloging is done for the collection
Cataloging decision note	Text	Details on decision
Cataloger	Text	Name of responsible library and cataloger
Cataloging method	Values: mailmerge, OCLC, other	Whether cataloging is done on OCLC, with MARC records created through mailmerge process, or other method
Excel file location	Text	Workstation and file location of mailmerge Excel file and Word template
Cataloging method note	Text	Details of cataloging method
Overlay tag	Text	Tag and content used to overlay/update title cataloging records
Marc tag	Text - repeating	Standard fields for cataloged titles in this collection
Marc indicators	Text - repeating	Indicators for the fields
Marc data	Text - repeating	Data for the fields
Cataloging content note	Text	Additional cataloging notes
Publisher-Related Information		
Title list URL	Text	URL for the collection/aggregation title list supplied by the publisher
Title list note	Text	Details about title list
Title list update frequency	Text	Frequency of title list updates
Vendor local contact	Text	Vendor contact information if different for this title

Table: Purchase Information

This table tracks payments for electronic services. Each record is for only one library and links back to the title table through the title and to the licensor database through the licensor name.

Field	Type	Purpose
Basic Information		
Title	Text	Copied from title record
Library	Value: BMC, HC, SC, or consortium	Library or consortium for this purchase
Licensor	Value: from licensor table	Initially copied from title record
Vendor	Value: from vendor file	
5 Years of Purchase Data, Set of Fields Repeated for Each Year:		
Purchase type	Values: aggregation/collection, free w/ print, extra w/print, electronic only, other	Purchase arrangement in relation to print
Price	Number	Subscription price; if extra with print, generally the extra amount.
Paid date	Date	
Expiration	Date	
Order number	Number	Order ID in IOLS
Price change from prev yr	Calculation	
Single Fields		
Price change percent	Calculation	Calculated for most recent and previous price
One-time charge	Number	Any one-time charge involved in purchase
One-time charge paid date	Date	
Purchase notes	Text	Details of payment, price structure of purchase
Special Function Fields		
Time before expire	Calculation	Fields used to calculate and send e-mail alerts 60 days before expiration.
Expiration e-mail sent	Date	
Time since e-mail sent	Number	
E-mail notification subject	Concatenation	
E-mail notification text	Concatenation	

Table: Vendor

This table tracks very basic information about vendors—organizations we make payments to for the electronic resource.

Field	Type	Purpose
Broker	Text	
General contact information	Text	
Consortium contact	Text	Used if different from general information
Bryn Mawr contact	Text	Same
Haverford contact	Text	Same
Swarthmore contact	Text	Same
Notes	Text	

Table: Service

This table is intended to allow users to enter comments on service problems and to track the reports.

Field	Type	Purpose
Licensor	Text	Copied from licensor or title database
Comment	Text	
Date	Date	Date of incident
Location	Values: BMC, HC, SC, remote	
Submitted by	Text	Initials or name

Table: Admin

This table holds addresses used for e-mail notifications sent from the PurchaseInformation database.

Field	Type
Library	Values: Bryn Mawr, Haverford, Swarthmore, Consortium
E-mail address	Text
cc Address	Text

Book Reviews

Douglas Raber, Editor

Managing Records As Evidence and Information. By Richard J. Cox. Westport, Conn.: Quorum Books, 2001. 243p. $67.95 (ISBN 1-56720-231-4).

During the series of events that became known as the Iran-Contra affair, National Security Council Staff Officer Oliver North exchanged a number of e-mail messages with his superior, National Security Advisor John Poindexter. Sent via the White House e-mail system, these messages formed a crucial record of the events that constituted the Iran-Contra scandal. A decade's debate has raged between the various parties involved as to what kinds of documents, precisely, these e-mail messages were. Were they routine junk that could be purged by the White House, as the first Bush Administration contended, or were they important records and documents that must be preserved?

As Richard J. Cox discusses in this detailed study, the Iran-Contra affair is but one instance of which the very definition of what constitutes a "record" is the subject of public debate in the age of information technology. Modern corporations, businesses, and government agencies are well into an era where "the development of the personal computer has made every employee a records-generating dynamo" (99). This plethora of records presents a particular challenge for records managers and archivists. How do they sort through mounds of paper and electronic records to determine what is important and what is not? For Cox, the answer begins with clearly defining what constitutes a record, then using this definition as the basis for developing sound policies for records appraisal and maintenance.

Cox, a professor at the University of Pittsburgh's School of Information Sciences Archival Studies program, has published numerous articles dealing with records, archives, policy, and the nature and importance of the record in the Information Age. This volume distills, revises, and thematically encapsulates nearly a score of articles from a handful of journals. The result is a comprehensive, useful, and eloquently argued examination of the importance of accurate record management in a time when a record could just as easily be embedded in computer code as printed on a piece of paper.

Given the confusion over what constitutes a record, Cox opens his work with a chapter titled "Starting Policy: Defining Records." While this may seem unnecessary to many professional archivists and records managers, Cox makes a convincing case that the definition of "record" has become somewhat vague and elusive as computers have become commonplace tools for records generation and storage. Fundamental to any records management or archival policy is understanding that "records are discrete entities, with characteristics separating them from other information sources. They capture evidence because they document transactions" (16). They form the basis for organizational memory, help organizations comply with external regulations and rules, and exist as evidential markers regardless of whether they are handwritten letters, spreadsheets tucked in a database, or e-mail transactions. Cox illustrates how "archivists and records managers . . . wandered" away from the evidential role of records, then builds a compelling case for understanding that "records need to be the focus, as the source of evidence of the work of organizations and individuals and for purposes of corporate memory and accountability" (34).

After untangling the definition of records from the minefield of modern information technology, Cox's second chapter outlines ways to focus on records—not technology—as records management policies are created. Modern records creation and management is inextricably tied with software and systems design and implementation, calling for nothing less than "a new preservation paradigm for electronic records" (95). To manage records effectively and set workable policies, Cox argues, records managers must have enough understanding of the process to ensure that systems and software do not impair the ability to preserve records.

"The Policy's Spine: Appraising and Managing Records," the third chapter, discusses some of the differences between archival and records management policies in terms of value, electronic records, and preservation. Cox examines policies by the U.S. National Archives and other public agencies, using these examples to argue for clear and consistent policies for appraising, scheduling, and managing records while never losing sight of their evidentiary nature.

Cox concludes this work with two chapters dedicated to spreading the gospel of proper record-keeping policies. The first of these is a fascinating examination of public perceptions of archivists and records managers that includes examples from newspapers, contemporary movies, popular fiction, and children's literature. Sadly, Cox laments, the profession comes off as

dull and boring in the public's eye. "Surely records professionals can find someone who can communicate the details of their work in a fashion that captures public interest" (149). (Perhaps the archivists' equivalent of a John Grisham or John LeCarre?) He concludes this chapter with a serious examination of professional ethics, privacy, access, and policy in the light of public awareness and public scrutiny. The state of archival education is the subject of Cox's final chapter, and he examines both degree-granting programs and continuing education for practicing professionals.

The Iran-Contra e-mail debate is just one of the many examples of ambiguous or misguided record-keeping policies that fill this valuable and timely work. Cox's narrative repeatedly shows how such a seemingly simple thing as the definition of a record has often been lost in the Information Age. Fortunately, Cox also provides practical advice for creating workable, realistic policies to keep the evidential nature of records paramount as records managers and archivists navigate the technological complexity of the modern world. Clearly argued and well-written, this book will be welcome reading for anyone who creates or administers archival or records management policies.—*Gene Hyde (ghyde@lyon.edu), Lyon College, Batesville, Arkansas*

Maxwell's Guide to Authority Work. By Robert L. Maxwell. Chicago: ALA, 2002. 275p. $49 (ISBN 0-8389-0822-5).

"Authority work is important if a library wishes its users to have full access to its collections. Although doing authority work may seem more expensive than neglecting it, the cost of not placing headings in the library's databases under authority control—in terms of the wasted time and ill will toward the library of users attempting to navigate an uncontrolled database, to say nothing of the difficulties library staff will have in determining the extent of their collections—is undoubtedly greater than the initial expense to the library," states Robert L. Maxwell in this new book on authority work (263). Maxwell—already known as author of the current edition of *Maxwell's Handbook for AACR2R* (1997)—has given librarians another indispensable cataloging tool with the publication of *Maxwell's Guide to Authority Work*.

In the introduction, Maxwell does a good job of explaining what authority control and authority work are—and the reasons why libraries should spend time and money on them. In a chapter on "Standards Governing Authority Control," he lists the tools for formulating name and uniform title headings: *Anglo-American Cataloging Rules*, 2d ed., (AACR2), *Library of Congress Rule Interpretations*, the Name Authority Cooperative Program's *NACO Participants' Manual*, and the Library of Congress's *Descriptive Cataloging Manual Z1: Name and Series Authority Records*. Standards he cites for terms include ANSI/NISO Z39.19 *Guidelines for the Construction, Format, and Management of Monolingual Thesauri* and the *Library of Congress Subject Headings* and LC *Subject Cataloging Manual*—all discussed in detail in a later chapter. He also presents *MARC 21 Format for Authority Data*, the encoding standard for authority records, using explanation, examples, and an invaluable position-by-position table and description of the leader and 008 field of a MARC 21 authority records.

His chapter on "Basic Authority Control Procedures" includes workflow for establishing headings and field-by-field guidelines for creating authority records. Figures with helpful examples are attractively presented throughout the book and keyed to corresponding discussions in the text. Maxwell refers to other sections of the book throughout (usually by chapter number) when introducing topics that will be discussed in greater detail later on. Other sections are "Authority Control of Names," "Uniform Titles: General Information," "Uniform Titles: Particular Problems," "Series: General Information and Series Authority Records," "Authority Control of Terms: Thesaurus Building," "Authority Control of Terms: Subjects," and "Authority Control of Terms: Genre/Form."

The final chapter, "The Library and Beyond," is concerned with sources of authority records, outsourcing, and cooperative programs for the sharing of authority records. Maxwell also discusses library systems and database maintenance. "It is important to look upon authority work as an ongoing process, not something that can be undertaken once and then considered finished," he emphasizes in his conclusion (264).

Full of good explanations, helpful examples, and practical advice, the book is readable and easy to understand. I was impressed first thing when I saw the "Glossary of Acronyms" at the very beginning. Although there is no bibliography *per se*, Maxwell provides references to cited and other related publications and Web sites through end-of-chapter notes. It probably would have been helpful to have a cumulative list of resources at the end of the text, but having the notes at the end of each chapter is my personal preference—and many of them are explanatory rather than simply bibliographical. There is a thorough index, thankfully set in type the same point size as the main text, which facilitates locating and reading the entries. Overall, the book is well designed and physically attractive.

Previous manuals, such as Robert H. Burger's *Authority Work: The Creation, Use, Maintenance, and Evaluation of Authority Records and Files* (1985) and *Authority Control: Principles, Applications, and*

Instructions by Doris H. Clack (1990), have dealt with the practical issues of authority work, but, as change affecting technical services and cataloging continues to accelerate, librarians struggle to compete in the changing information environment and to deal with ever changing ways of doing well what we do. *Maxwell's Guide to Authority Work* is a welcome resource for twenty-first-century librarianship and is sure to become a classic.

Robert L. Maxwell currently represents the Association of College and Research Libraries (ACRL) to the Association for Library Collections and Technical Services Committee on Cataloging: Description and Access, and has chaired the Bibliographic Standards Committee of the Rare Books and Manuscripts Section of ACRL. He is associate librarian at Harold B. Lee Library, Brigham Young University.—*Linda Behrend (behrend@utk.edu), John C. Hodges Library, University of Tennessee, Knoxville*

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Usability Testing for Library Web Sites: A Hands-on Guide. By Elaina Norlin and CM! Winters. Chicago: ALA, 2002. 112 p. $32 paper (ISBN 0-8389-3511-7).

Norlin and Winters give us a basic guide for implementing usability testing for library Web sites. The book gives an overview of usability testing, its purpose, benefits, design recommendations, and includes a section on how to get "buy-in" to justify the need for usability testing.

The authors describe two types of "buy-in"—passive and active. Passive buy-in means that people go with the proposed idea because they "have to," unlike active buy-in in which people go with the proposed idea because they "want to" (19). The ultimate purpose of buy-in is "to rally the necessary partners who agree that your idea makes sense and is worth achieving" (19). Indeed, motivating library staff and stakeholders to implement usability testing is essential for the success of a usability project.

The authors argue that librarians have often adopted a "we know best" philosophy when designing Web sites, using technical language that may be ambiguous to many users. Usability testing could help librarians eliminate ambiguity and develop a common terminology and language that meet user needs. The book has a section on the needs of persons with disabilities. This is an important issue to consider not only when testing Web sites, but also when designing them.

The book describes various assessment tools to gather data, such as print and online surveys, as well as focus groups. It gives an example of a survey and a set of sample questions to use for focus groups. In addition, it suggests the development of specific tasks to give to participants who will test Web sites. The sample of tasks the authors present, however, lack questions about interface design and navigational features of Web sites.

The authors advocate a moderator and a recorder for each participant during testing. However, this method may be costly in terms of time and effort. If a library is seriously embarking on a continuous usability testing project, the library should consider acquiring a usability laboratory. Such a laboratory allows the observer and the participants to communicate easily using microphones and speakers within the room where the testing takes place. Most importantly, the cameras the laboratory is equipped with can record the participants' online activities, facial expressions, and verbalization; thus, the observer can collect both quantitative and qualitative data that may provide a holistic view of the participants' assessment of the sites.

The book makes a positive contribution to the literature of usability testing in that it emphasizes user-centered design, provides a systematic approach to testing Web sites, and is written in nontechnical language. Novices to the topic of usability testing can use this book to obtain basic information about the topic and how to get their usability project started. Those who need advanced information about usability testing should consult Jakob Neilsen's site at www.useit.com. —*Dania Bilal (dania@utk.edu), Associate Professor, School of Information Sciences, University of Tennessee, Knoxville*

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