Proliferating Guidelines

A History and Analysis of the Cataloging of Electronic Resources

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Cataloging rules for computer-based materials were first introduced in the 1970s, and since then have undergone almost continuous modification and revision. This article focuses on analysis and comparison of the various codes and guidelines for practice issued for what are now called electronic resources. Creation of new cataloging rules has been spurred by introduction of new physical carriers, the preeminence of materials accessed remotely versus those with physical carriers, the need for guidance in cataloging specific instances of computer-based materials, and the evolution of the theoretical concerns underlying the cataloging codes. Based on this history of constant change, it is easy to predict many more changes in the cataloging standards for computer-based materials in the future. However, continuous changes in the cataloging rules may have produced as much confusion as clarity for working catalogers. Caution should be exercised in the creation of new rules and standards for cataloging electronic resources, as it is possible that older rules and standards may, in fact, be readily adapted to new types of electronic resources.

Libraries have collected computer-based materials since the late 1960s. Since then, the types and capabilities of computer hardware, computer media publication standards (or lack thereof), and the types of materials and information available in machine-readable format have continuously changed. Computer-based materials have come to libraries in a variety of physical carriers, or have become available remotely with no physical carrier at all. Since electronic data can be republished at almost no cost, multiple versions, many with only minor changes from the previous version, are the rule rather than the exception. Computer-based materials usually have short useful lives, and it may not be possible to tell if some new carrier type, content, or mode of access will be a substantial development, a transit point to some other form, or an evolutionary dead end. Because of the short history of electronic resources and their continuously morphing forms, there has not been a reliable body of cultural knowledge to draw on to create a definitive set of cataloging rules for these materials. This article focuses not on the process of the creation of new rules but on analysis and comparison of the various codes.

Creation of new cataloging rules has been spurred by introduction of new carrier units, the predominance of items with physical carriers versus items accessed remotely, the need for rules of application for specific instances, and evolution of the theoretical concerns underlying the cataloging codes.

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Anglo-American Cataloguing Rules, 2d Edition (1978)

Work on the development of cataloging rules for computer-based materials began in 1970. At that time, the American Library Association Resources and Technical Services Division Cataloging and Classification Section Descriptive Cataloging Committee formed a subcommittee to study computer materials and to attempt to formulate cataloging rules for them. Within a few years, a number of interested groups were collaborating on attempts to codify bibliographic access for these materials (Dodd 1977, 49–50). In 1978, the *Anglo-American Cataloguing Rules*, 2d ed. (*AACR*2 1978) was published. It was the first international cataloging code to introduce rules for the cataloging of computer media (Dodd and Sandberg-Fox 1985, 1). (Examples are presented in the appendixes to this article. See appendix A.)

The general material designation for these materials was machine-readable data files (MRDF), and they were defined as follows:

> A body of information coded by methods that require the use of a machine (typically a computer) for processing. Examples are files stored on magnetic tape, punched cards (with or without a magnetic tape strip), aperture cards, punched paper tapes, disk packs, mark sensed cards, and optical character recognition font documents. The term machine-readable data file embraces both the data stored in machine-readable form and the programs used to process that data (*AACR*2 1978 9.0A).

According to Sue Dodd, a pioneer in MRDF cataloging, "the biggest difference between the cataloging of books and the cataloging of MRDF is that the cataloger normally does not have an 'object in hand' to describe" (Dodd 1982, xvii). Additionally, there were no publication standards for MRDFs, and many could have been considered published only in a very general sense of the term. Nevertheless, the 1978 rules treated all MRDF as published. The cataloger was instructed to "Record the name of the publisher, distributor, etc., and of any agency responsible for the production or dissemination of a machine-readable data file (data archives, project groups)" (*AACR*2 1978, 9.4D1).

The disembodied nature of machine-readable data files affected the way that they were described. A machine-readable data file could easily change physical carriers (Dodd 1982, 70–71). The definition of MRDF is the last place in *AACR*2 1978 where carriers are discussed in any detail. A change in the physical form of the file was not considered to be a different item.

The order of preference for selecting the chief source of bibliographic information was also different for MRDFs. The chief source of information was referred to as an internal user label (*AACR*2 1978, 9.0B1). Preference for an internal source of information was in keeping with cataloging rules for other types of materials. *AACR*2 1978 acknowledges that an adequate internal source may not have existed, but does not acknowledge that the cataloger may not have been able to access the internal source. Accompanying documentation was the next best chief source of information. The container and carrier labels were the least preferable source of title, because of the presumption that the item that the cataloger had "in hand" may have been one of many physical manifestations of the item, and any labels on the piece might have been specific to that one item.

The mode of use note was used to record hardware and software requirements for viewing the MRDF. This information was treated more casually than it would be in succeeding cataloging codes. *AACR*2 1978 9.7B15 stated, "If the file cannot be used on all the facilities available to the user of the catalog or other list, specify its mode of use." The presumption was that another library might have had a version of the same data file that required completely different equipment to view and utilize.

Predictably, the physical description area recorded only the extent of the intellectual content of the MRDF. The cataloger was to record the number of logical records or statements, along with the programming language used to create the program file. This information was an immutable part of a MRDF and would not vary with a change of physical carrier. The physical carrier was not mentioned anywhere in this part of the record.

Interestingly, this edict about physical carriers does not seem to have been followed in older MRDF records in the OCLC database. An informal search of records on OCLC reveals that statements like "computer tape reels" (without specific reference to the number of reels) are frequently used. This may be because catalogers are used to describing a physical item and also reflects the fact that, under almost all circumstances, the library has custodianship of a physical entity of some sort. Even if that physical entity is not the ultimate expression of a work, users still need to know precisely what the library has available in its collection.

Microcomputer Software

The first microcomputer, the Altair 8800, was manufactured in 1975 (T. Dodd 1995, 14). Microcomputer development was not a significant factor in the development of the cataloging code. With the advent of the IBM Personal

Computer in 1981 (T. Dodd, 38) and the introduction of the Macintosh computer in 1984 (T. Dodd, 15), the cataloging landscape was changed forever. While relatively few libraries (mostly large research institutions) might catalog machine-readable data files, any school library might have an Apple Macintosh and some of the educational games or software designed for Macintosh use. Published microcomputer software with a uniform physical carrier and system requirements became an important category of library material, and the *AACR*2 rules for MRDFs did not directly address how to treat it.

In 1984, the Committee on Cataloging: Description and Access of the Cataloging and Classification Section, Resources and Technical Services Division issued a set of guidelines for cataloging microcomputer software using *AACR*2 1978. In an article published in *Cataloging and Classification Quarterly*, Sheila S. Intner pointed out that the *Guidelines For Using* AACR2 *Chapter 9 for Cataloging Microcomputer Software* effectively represented a second set of cataloging rules (Intner 1985, 54). Since the British Library also issued a set of guidelines at this time (Weihs 1986, 25), there were potentially three sets of rules to chose from. The cataloger was forced to choose a set of rules before describing the item in hand. This is the first instance of what has happened repeatedly with computer-based materials—a set of rules is issued and immediately superseded because of new developments in technology. Another set of rules is issued to address the shortfall. Catalogers are required to utilize multiple and sometimes conflicting cataloging standards in order to describe computer-based materials.

The *Guidelines for Using* AACR2 *Chapter 9 for Cataloging Microcomputer Software* were created specifically for published software. See appendix B. They reflected the increasingly standard (but still variable) publication practices for computer software and the increased importance of the physical carrier. The chief source of information (ALA RTSD:CC:DA 9.0B) was still "information recorded internally on the program file itself," but labels on the storage medium (i.e., the physical carrier) and on containers were preferred to information found in accompanying documentation (ALA RTSD:CC:DA 9.5). The cataloger was still instructed to begin the physical area of the record by enumerating files and number of records or statements contained in the file, but the carrier also was described.

Despite the increased importance of the carrier unit, the *Guidelines* did not accord the physical carrier consistent respect. A change of carrier was not considered a new edition. If "subordinate" files appeared on the same carrier unit with the dominant file, they were considered accompanying material and were recorded in the physical description in the same manner as guides or other physically separate materials (ALA RTSD:CC:DA 9.5D). Again, the primacy of the intellectual content was asserted over the specific form of the material. In contrast, in the note area, "mode of access" was changed to "system requirements," suggesting that the software was not going to be transferred from one carrier or operating system to another. The hardware and software requirements were to be given in a stated order and in as much detail as possible.

Anglo-American Cataloguing Rules, 2d Edition, 1988 Revision

The urgent need for revised cataloging rules caused the publication of a draft version of the *Anglo-American Cataloguing Rules* revised chapter 9 for computer files before the appearance of the complete *Anglo-American Cataloguing Rules*, 2d ed., 1988 rev. (*AACR*2R 1988). The hope seems to have been that the early release of this chapter would restore a single standard, which could be used for all electronic resources (Weihs 1987, 53).

The *Anglo-American Cataloguing Rules*, 2d ed., 1988 rev. (*AACR*2R 1988) reflects the increasing standardization of computer-based media. See appendix C. However, the rules took into consideration the likelihood that the physical carriers still would change faster than the cataloging code. Instead of the long list of carriers given in the 1978 code, chapter 9 in *AACR*2R 1988 gave the following definition for computer files: "The rules in this chapter cover the description of files that are encoded for manipulation by computer. These files comprise data and programs. Computer files may be stored on, or contained in, carriers available for direct access or by remote access" (*AACR*2R 1988, 9.0A1).

The general material designation (GMD) was changed to "computer file." The selection of this general material designation represented a compromise between two factions—one preferring to retain "machine-readable data files" and one preferring "computer software" or something similar. "This [general material designation] is a true compromise; no group finds it entirely satisfactory, but all appear to be able to live with it" (Weihs 1987, 53).

The chief source of information was still an internal source, but reflecting the increasing standardization of the format of microcomputer software, the internal source was referred to as the "title screen" (*AACR*2R 1988, 9.0B). The source of the title was to be given in a note. This change was based on "informal studies," which suggested that depending on whether an internal or external source was chosen as the chief source of information, very different catalog records could result (Weihs 1987, 54). This note aids catalogers who wished to verify that a utility catalog record matched their item in hand. Requiring this note also was the first official semi-acknowledgment of the open secret of computer file cataloging—namely, that it has been more

exceptional to catalog a computer file from internal sources than from the labels.

The major change in the edition area was somewhat camouflaged. It instructed the cataloger not to make a new edition for minor physical changes such as a change in the number of disk sectors (*AACR*2R 1988, 9.2D1). Different physical configurations, such as a change in diskette size or a change in the operating system required to operate the software, were not listed as minor changes and were to be considered separate items.

*AACR*2R 1988 acknowledged both published and unpublished computer files. Rule 9.4F1 stated, "Give the date of publication, distribution, etc., of a published computer file" and followed up with, "Give the date of creation of an unpublished computer file." (*AACR*2R 1988, 9.4F2). No guidelines were given for distinguishing a published from an unpublished file.

In the physical description area, the cataloger was to "record the number of physical units of the carrier" (*AACR*2R 1988, 9.2D1). These changes reflected the fact that most computer file materials at the time of the code's creation were assumed to be direct access materials for which the physical carrier was significant.

An unusual stipulation in the computer file rules was the inclusion of a "file characteristics" area, which attempted to characterize the form of the material within the description. No parallel area in the cataloging record existed for other material types. The file characteristics area indicated the type of file (allowed to be either computer data or computer programs) and the number of records, statements, or bytes. This information was to be given only if it was accessible and could be stated in clear terms. This area represented another compromise between the software and machine-readable data file camps (Weihs 1987, 54). In the MAchine-Readable Cataloging (MARC) format, the file characteristics were placed in field 256, which was a required field, even though *AACR*2R 1988 stated that this information was optional. In practice, this field was seldom used in catalog records. The frequency with which it was omitted from computer file records reflected its lack of flexibility and lack of relevance for microcomputer software.

Interactive Multimedia

The first multimedia PC was marketed in 1991 (T. Dodd, 15). Computers were able to mimic other types of materials (such as videos or sound recordings) or mix all kinds of text and graphics and sound together. Kits were being produced that required a microcomputer, yet had noncomputer peripherals that operated in tandem with the software. Microcomputer software featuring multimedia seemed to be evolving into a separate category of materials. This led to the publication in 1994 of a new set of cataloging rules, the *Guidelines for Bibliographic Description of Interactive Multimedia*. See appendix D. Once again, within a few years of the issue of a unifying cataloging standard for computer-based media, a second standard for an intersecting set of resources was created. Once again, catalogers were forced to decide which standard to use.

The *Guidelines for Bibliographic Description of Interactive Multimedia* refined many of the cataloging rules from *AACR*2R and clarified some difficult areas of the description. The real obstacle in using the *Guidelines for Bibliographic Description of Interactive Multimedia* lay in determining what items met the definition of interactive multimedia:

> media residing in one or more physical carriers (videodiscs, computer disks, computer optical discs, computer audio discs, etc.) or on computer networks. Interactive multimedia must exhibit both of the following characteristics: (1) user-controlled, nonlinear navigation using computer technology; and (2) the combination of two or more media (audio, text, graphics, images, animation, and video) that the user manipulates to control the order and/or nature of the presentation (ALCTS CC:DA 1994, B).

While it was obviously possible to determine the number of physical carriers of a work by a simple process of observation, it has not always been possible to determine from external sources whether a resource offers nonlinear navigation, or whether the user has control of the order of the program. Documentation and packaging of resources may be deliberately misleading. Ordinary text files or databases were often promoted as interactive to make them more attractive to consumers. Using *AACR*2R 1988, a cataloger could describe any computer resource, but the interactive multimedia guidelines required the cataloger to decide if the materials met the definition of interactive multimedia and whether the guidelines should have been used in preference to the *AACR*2R 1988 rules for computer files, or in preference to the rules for kits or videocassettes. To make an accurate decision on whether or not a given resource really met the definition of interactive multimedia, it was necessary to load the file and examine its contents. Because few catalogers had adequate computer equipment to load the computer-based materials that they were cataloging, a standard that depended so heavily on viewing the resources was unlikely to have been utilized in the way it was intended.

The rapidity of technological change doomed the interactive multimedia guidelines. In 1991, it may have appeared that interactive multimedia was going to remain a

clearly definable category, but computer technology made the multimedia kit largely obsolete. By the time the interactive guidelines were published, multimedia computers had become powerful enough that they did not require numerous peripheral devices. A single CD-ROM could handle text, graphics, sound, and videos. The computer carrier became the true, predominant format. At the same time, interactive multimedia elements became commonplace even in software packages and textual databases. Games were excluded from consideration as interactive multimedia material because it was believed that they contained "predetermined software paths" that excluded truly nonlinear navigation. However, many computer games had become so complex that their "predetermined software paths" were harder and harder to locate. It became almost impossible to determine if something was really interactive multimedia even if it was possible to load the software.

Within a short time of the release of the interactive multimedia standard, it was clear that this standard was at best a stopgap measure. At its worst, it created unnecessary confusion. The records bearing the interactive multimedia general material designation were all too frequently a pastiche of cataloging rules that reflected the difficulty of distinguishing interactive multimedia from other computer-based resources and the uncertainty catalogers experienced in attempting to utilize the *Guidelines for Bibliographic Description of Interactive Multimedia*. At the first meeting of the International Standard Bibliographic Description Review Group (CF) in April 1995, it was agreed that interactive multimedia would be incorporated into the International Standard Bibliographic Description for computer files (Byrum 1995, 24).

Content versus Carrier

Physical carriers were not treated uniformly in *AACR*2R 1988. While rule 0.24 stated that "description of a physical item should be based in the first instance on the chapter dealing with the class of materials to which that item belongs," content rather than the class of materials categorized some categories of materials, such as maps. A map could be three-dimensional or two-dimensional, printed on the back of a deck of playing cards or on a shower curtain, and still be cataloged using the rules for cartographic materials. Classification theorists, uncomfortable with this contradiction within the code, sought a means of emphasizing the intellectual content of materials over the physical carrier, especially when dealing with interactive multimedia materials.

In the preface to the *Guidelines for Bibliographic Description of Interactive Multimedia*, there was a discussion of intellectual versus physical categories of information:

> Interactive multimedia as defined in these guidelines represent an identifiable class of resources with shared attributes, independent of the physical carrier which delivers the information. . . . Describing entire works in this way has been termed an intellectual rather than a physical description. . . . Indeed, there are several chapters in *AACR*2R which also focus more on gathering together intellectual characteristics of an entire package of information rather than on specific physical manifestations: serials, analytics, manuscripts (particularly regarding collections), music, and cartographic materials (ALCTS CC:DA 1994, iv).

While in *AACR*2 1978, carriers had not been considered an important part of the machine-readable data file cataloging record, the dominance of the mode of access (through a computer) meant that there was little question of how those resources would be cataloged. The de-emphasis of the carrier in the *Guidelines for Bibliographic Description of Interactive Multimedia* was significant. The emphasis on intellectual content in the *Guidelines for Bibliographic Description of Interactive Multimedia* pointed away from considering all materials requiring a computer for viewing and use as the same category of materials. Since it was possible to make a subcategory of those materials that are considered interactive, it was also possible to categorize computer materials in a broader way that would mean computer access was not considered the most important aspect of the material.

MARC Format Integration

MARC was initially developed for cataloging books. A family of related but not interchangeable MARC records was created in order that serials and nonbook formats could be accommodated in machine-readable form (Crawford 1984, 13). Some materials—for example, serial videos—challenged the usefulness of this approach, since certain fields necessary to express the seriality of the videos could not be used in a visual materials MARC record, and conversely, there was nowhere to express certain aspects of the video in a serial record. The Association of Library Collections and Technical Services/Library and Information Technology Association/Reference and Adult Services Division Committee on Machine-Readable Bibliographic Formats (MARBI) deemed it necessary to attempt to make the various MARC formats, if not exactly interchangeable, at least more flexible (Highsmith 1993, 1–2).

"The process which is called 'format integration' consists of bringing together all the USMARC formations for different media into what is, in essence, a single format in

which data that are common to more than one medium are indicated by the same tags, codes, and indicators and in which unique tags, codes, and indicators are reserved for data that relate exclusively to one medium" (Gorman 1990, v).

MARC format integration spurred the promotion of cataloging rules that focused on the intellectual form rather than the physical carrier of a work. In spring of 1996, the second phase of MARC format integration was implemented. While format integration liberalized use of almost all variable fields across almost all types of MARC records, the fixed fields for the different record types remained relatively stable, which meant that there was still a family of MARC records used for different types of materials rather than a single integrated record.

Clarifications and changes were made to what types of material were to be cataloged on what type of MARC record. Computer file serials were to be cataloged on a computer file MARC record with a bibliographic level of "s" to indicate seriality (Olson 1996, 8). Previously, serial computer files could have been cataloged either on a serial or a computer file workform and both records would have been considered valid in OCLC. This change made the treatment of computer file serials consistent with other serially issued media publications, but it was a startling and unwelcome change for the serials cataloging community. Because most catalogers work in an online environment, the choice of MARC record type, rather than the selection of *AACR*2R 1988 chapter, was often the first intellectual step in categorizing materials. In some libraries, the MARC format type dictated which department would have responsibility for cataloging a work. Electronic journals and other continuing publications were already extremely important in the serials community, and the perceived loss of control over these materials created apprehension that the quality of the cataloging would suffer. In a paper presented in 1997, Jean Hirons and Crystal Graham stated:

> This paper does not presume to say who should be cataloging certain types of publications, only how they should be cataloged. Nevertheless, we are aware that those who have never cataloged serials tend to approach such publications very differently from those who have. In the digital world many more publications will be ongoing and will require application of principles long associated with traditional serials. By grouping such publications under a common category we can facilitate the education and training of all catalogers (Hirons and Graham 1998, 183–84).

A partial remedy for this perceived problem came from MARBI. In June 1997, MARBI redefined MARC record type code "m" in the fixed fields. While previously any material on a computer file carrier would have been cataloged as a MARC type "m" material or computer file format, type "m" was narrowed in its application and was to be used only for computer software, numeric data, computer-oriented multimedia, and online systems or services (Library of Congress, Network Development and MARC Standards Office). When the policy was implemented, computer file serials were required to be cataloged on the MARC serials format, since their serial content was considered more important than their computer file carrier. Eliminating the mode of access as the primary determinant of the MARC format has moved the format decision from the realm of relatively cut-and-dried descriptive decision making to the more amorphous world of subject/genre categorization. File content is not always clear from an external examination of the material. Even if the content is accessible, the existence of hybrid forms can complicate the choice of MARC format. The MARBI decisions represented a kind of end run around the *AACR*2R 1988 rule 0.24 by forcing an intellectual categorization of the work before the MARC format for an electronic resource could be selected.

The Network Development and MARC Standards Office at the Library of Congress issued further guidelines for type code "m" to offer more assistance to perplexed catalogers in applying the definition of type code "m." While the additional guidelines are helpful, they leave catalogers with some difficult decisions. One item's type code decision, for example, might depend on the importance of the search engine to a resource. Another's might be based on quantity of sound and graphics files (Library of Congress, Network Development and MARC Standards Office 1999). As a result, there is a good deal of variation in how these materials are treated, since the relative importance of a search engine may be a matter of perception as much as anything, and sound and graphic content may be difficult to determine for catalogers with limited access to the full content of the materials they catalog. Furthermore, since many integrated library systems replace the MARC type codes with their own custom set of material type codes or otherwise offer ways to specifically state the physical carrier of the cataloged item, determining which MARC type code to use for each electronic resource is often an intellectual exercise that does not offer any specific benefit to library users.

Online Resources and Metadata

While the Internet had been in existence from 1969 (T. Dodd, 14), it gained in power and scope with the introduction of the first graphical browser in 1993 (Freedman, 585). Also in 1993, MARBI created MARC field 856 to contain information on the location of files on the Internet. The exis-

tence of unique material in this new medium led to the questions: should the Internet be cataloged? And if so, how?

Because *AACR*2R 1988 was written when published physical material held primacy in electronic resources, there was a scramble once again to standardize the cataloging of this new type of remote access publication. However, no official standard was created solely for Internet cataloging. Cataloging practices were shared through the professional literature and venues such as the AUTOCAT electronic discussion list (Beacom 2002, 21). *Cataloging Internet Resources*, edited by Nancy B. Olson and issued by OCLC, was to serve as a guide to practice. Olson's manual points back to *AACR*2R 1988. The second edition of *Cataloging Internet Resources* also incorporates material from the ISBD (ER), to which the creators had access in draft form. *Cataloging Internet Resources* provides expanded terminology derived from the ISBD (ER) for the file characteristics area, using the word "computer" instead of "electronic" as in the ISBD (ER) (Olson 1997, 13–14). An examination of records for Internet resources in OCLC reveals that this expansion of terms that OCLC considered acceptable still did not bring the file characteristics area into common use.

The rapid expansion of the Internet and perceived competition between library catalogs and search engines led some to question the usefulness not only of the cataloging rules, but also of the complex and cumbersome MARC record as a means of providing access to Internet resources. Various metadata ("data about data") standards were touted as the best way to offer controlled access to Web pages. OCLC took a leadership role by developing the Dublin Core in 1995 (Chepesiuk 1999, 60). The Dublin Core has since undergone several revisions.

Dublin Core records are far simpler than MARC records (see appendix E). The elimination of fixed field coding is in itself a substantial simplification. Dublin Core records contain fifteen data elements. The data elements are: title, creator, subject, description, publisher, contributor, date, type, format, identifier, source, language, relation, coverage, and rights (Baker 2000). No set of rules has been formulated on how to fill these data elements and there is no equivalent to ISBD punctuation. Crosswalks have been created between MARC and the Dublin Core, and the current OCLC Connexion interface will display records in MARC format or in Dublin Core format as desired.

The Dublin Core has both been praised as "a metadata pidgin for digital tourists who must find their way" (Baker 2000), and disparaged as "an ill-formulated subset of the MARC record"(Gorman in Jones 2002, 181). Because imbedded metadata can be deliberately falsified in order to create false hits in search engines, it is not clear that standard metadata will be widely accepted by search engines as the best means of resource retrieval.

The existence of the Dublin Core and other metadata schemes does suggest one major point—no matter how fast cataloging rules and standards for electronic resources change, the changes may not be regarded as fast or flexible enough to keep pace with the future development of the Internet. Perceptions that Internet resources cannot be described by existing cataloging rules, that cataloging rules take too long to change, and that the Anglo-American Cataloguing Rules are "too difficult" have created the existence of standards that are essentially competitors to MARC. Furthermore, the questions of what intellectual content a useful record should contain and what degree of uniformity is desirable for that content are largely sidestepped by metadata standards. This suggests a challenge to the future of the Anglo-American Cataloguing Rules to bridge the gap between the interests of those outside the cataloging community and the high standards of current library cataloging.

ISBD (ER)

International Standard Bibliographic Description (ISBD) is a concept that was developed as a means of standardizing descriptive cataloging**.** The initial ISBD for Monographic Publications was issued in 1973 and was used as the basis for developing national cataloging standards by a number of countries (ISBD[CF] Review Group, vii).

In 1997, the International Standard Bibliographic Description, Electronic Resources (ISBD [ER]) was issued. It was a revision of a previously issued standard ISBD (CF) 1986, which was an offshoot of an earlier ISBD that included machine-readable data files in with other nonbook materials) (ISBD (CF) Review Group, vii). The ISBD (ER) offered a more radical view of computer-based material cataloging than *AACR*2 1988, since it acknowledged the diffuse nature of computer-based materials. The ISBD (ER) even-handedly addressed the existence of both remote and direct access resources, unlike previous standards which tended to favor one type of resource over the other.

In addition to the new general material designation "electronic resource," several major changes were presented. One is ISBD (ER) area 3, "type and extent of resource." This area paralleled that of the file characteristics area or MARC 256 field. The "type and extent of resource" area contained a long list of potential terms. Allowance was made for the use of any meaningful descriptor in this area as long as it was preceded by the term "electronic." The expansion of terminology choices was an attempt to make this area more useful than it had been when the terminology was limited to a few terms, such as it was in *AACR*2R 1988. The ISBD (ER) implied

that catalogers would be asked to make genre determinations within the description of a resource.

Although this standard was innovative in its acknowledgment of the existence of both remote and direct access electronic resources, the standard treated physical carrier as of less importance than *AACR*2R 1988 does. Allowance was made for combining all physical manifestations of the same intellectual content into a single bibliographic record, with either multiple physical description fields or a single field combining all carriers (ISBD [CF] Review Group, 3). This was the most radical suggestion in the ISBD (ER). While this notion had been proposed for media materials available in a variety of forms as far back as 1970 (Weihs 2001, 167), it had not previously been included in an internationally accepted standard.

The inclusion of all physical forms of the content on the same bibliographic record allowed the record to focus on the content of the work. The physical forms of the work become subordinate instances of the intellectual work, which clearly shows the influence of research done on bibliographic relationships by Barbara Tillett and others (including the International Federation of Library Associations and Institutions' (IFLA) Study Group on the Functional Requirements of the Bibliographic Record). In this case, works that have what Tillett refers to as "equivalence relationships," e.g., works where the authorship and intellectual content are identical (Tillett 1991, 394–95), were grouped together on a single record. Conceptually, this was a shift from *AACR*2R 1988 (with its emphasis on specific item description) to the notion that the physical carrier of the information was of only incidental interest to users, who first and foremost would want access to information in whatever form it was available. This continued the de-emphasis on physical carrier found in the *Guidelines for Bibliographic Description of Interactive Multimedia* and the limitations placed on MARC type code "m."

ISBD (ER) retained cataloging terminology when describing physical carrier units, but did specify that a conventional term for an optical disc type should be included parenthetically after the official term. Here the standard was edging toward an acknowledgment that the cataloging terminology has always been technically exact but perfectly obscure to users.

Anglo-American Cataloguing Rules, 2d Edition, 1998 Revision Amendments 2001

The amended chapter 9 (Electronic Resources) was published in 2001. Aside from minor changes made in 2002 when the revised chapter 12 (Continuing Resources) was released, it remains the standard for cataloging monographic computer-based resources. The amended chapter 9 incorporates elements from the ISBD (ER) and the previous Anglo-American Cataloguing Rules for computer files. The need to evolve while staying within the limits of possible practice, bound by integrated library systems accepting traditional MARC records and the pectations of patrons, shapes this version of the rules (see appendix, example 6).

In the 2001 amendments to *AACR*2R 1998, rule 0.24 was changed from a specific charge to use the rules for "the class of materials to which that item belongs" (*AACR*2R 1998, 0.24) to an emphasis on "bring[ing] out all aspects of the item being described, including its content, its carrier, its type of publication, its bibliographic relationships, and whether it is published or unpublished" (*AACR*2R Amendments 2001, 0.24). The Joint Steering Committee for Revision of the Anglo-American Cataloguing Rules (JSC) wanted to proceed with caution in completely undoing this rule, but is continuing to investigate the idea of manifestation-based cataloging (Schottlaender in Jones 2002 , 17–18). There is an intent to allow for flexibility in the description of hybrid materials, such as electronic resources. Effectively, the cataloging code has been brought into harmony with the MARBI decision to limit the use of the type "m" record. However, it does not go so far as to discount the physical unit entirely in favor of intellectual aspects of the work.

The revised chapter for what are now called "electronic resources" is notable for its attempt to incorporate remote access, direct access, and interactive multimedia issued in more than one carrier under one code. While much of the electronic resource rules have been derived directly from the ISBD (ER), *AACR*2R 2001 has rejected the more radical theoretically based aspects of the ISBD (ER) in favor of a synthesis that retains the structure of traditional descriptive cataloging. It does not allow for multiple manifestations to be described on one cataloging record, as does the ISBD (ER). This approach may have been seen as opening the Pandora's box of placing all manifestations of a work on a single bibliographic record, regardless of format, which would fundamentally change the shape of the online catalog.

Increased flexibility resulting from the revised 0.24 is apparent in rule 9.0A1, which notes, "Electronic resources often include components with characteristics found in multiple classes of materials so there will frequently be a need to consult other chapters."

The primacy of internal sources as the chief source of information has been broken. The chief source of information in the new chapter is "the resource itself." While internal sources appear first in the list of acceptable sources, the list also contains "the physical carrier or its labels." A helpful footnote gives a definition of "label" that may reduce the errors of terminology sometimes found in cataloging records' descriptions of the information embossed or stamped on the disk.

Attempts to accommodate multipart multimedia materials can be seen in rules 9.2.B5 and 9.4F4. Rule 9.2B5 clarifies the treatment of variant edition statements on different pieces of a multipart item. Similarly, rule 9.4F4 simplifies the choice of publication date for multipart items with various dates on the separate pieces.

The "type and extent of resource" area does not use the expanded terminology posited by the ISBD (ER). The same three acceptable descriptors from *AACR*2R 1988 are updated by substituting "electronic" for "computer," but otherwise remain the same. It appears that either the JSC was unable to reach agreement on an acceptable list of terms or, possibly, it is acknowledging that the field is not useful in most integrated library systems. This field is no longer included in Library of Congress records and may not survive another revision of the rules.

Rule 9.4B2 states, "Consider all remote access electronic resources to be published." This means that remote access resources receive the same treatment in terms of publication that machine-readable data files were given in 1978. Despite the contention of some that Internet resources are a unique problem in cataloging, the rules articulated more than twenty years ago still remain valid for describing remote access resources.

In the physical description area, catalogers are now authorized to use conventional terminology. This eliminates library terminology that had technical exactitude, but little real world currency. This change may lead to some variation in terminology, but should be welcomed because it should create better access for catalog users.

Interestingly, no changes were made in the system requirements area. Despite all the changes in hardware and software that have occurred since the initial rules for cataloging microcomputer software, the same information that was considered relevant to users at that time is considered to be relevant now.

Continuing Resources

Web resources created challenges to the definition of a serial. *AACR*2R 1988 defines as a serial as "A publication in any medium issued in successive parts bearing numeric or chronological designations and intended to continue indefinitely"(*AACR*2R 1988, 662). Web resources, however, are intended to continue indefinitely. Many merely absorb new content, usually not on any regular schedule. Materials that clearly meet all aspects of this definition of serial in the print environment would go on the Web and transform themselves from orderly progressions of numbered parts into amoebas, expanding and dividing without the regimentation of traditional serials. Despite the fact that these materials could not be cataloged as serials since they fail to meet all the necessary criteria, they still require serials control (subscriptions, continuing payment, and other aspects of serials maintenance).

Hirons and Graham recommended the development of a "three dimensional approach to the cataloging rules" (Hirons and Graham 1998, 181) in order to bring these errant resources back into the serials fold. The direction, which was pursued from Hirons and Graham's work, was the one referred to as "Model B" in which "we remove the requirement for successive issuance . . . in order to include indeterminately issued updating publications, such as continuing loose leafs and databases. In this model 'serial' is defined as 'a publication that is intended to continue indefinitely'" (Hirons and Graham in Weihs 1998, 196).

Another advantage of such an approach is facilitation of a "single record approach" that limits the number of cataloging records that need to be created and maintained for a single title. Enabling electronic and paper versions of the same intellectual content to be represented by a single catalog record simplifies catalog searching. This approach also accommodates the frequent changes of online resources and does not split online and paper versions of the same information on the basis of the definition of a serial.

The implementation of Model B in the *Anglo-American Cataloguing Rules*, 2d ed., 2002 rev. creates the category of continuing resources, which encompass traditional serials, which have been given a slightly looser definition, and the newly defined integrating resources, which are "a bibliographic resource that is added to or changed by means of updates that do not remain discrete and are integrated into the whole" (*AACR*2R 2002, appendix D-4). Continuing resources may be traditional materials such as updating loose-leafs or Web-based materials. Cataloging of integrating resources revives an older standard of serials cataloging, that of latest entry cataloging. The most recent iteration of the resource is cataloged, while its former titles, publishers, physical attributes, and publication frequencies are relegated to notes. In this way, the history of an electronic resource can be maintained on a single record.

How well the integrating resource rules will work in the everyday cataloging world remains to be seen. Implementation of the first phase of integrating resource cataloging (acceptance of the rules and some MARC coding changes) took place on December 1, 2002. The second phase (consisting of other, more substantial MARC coding changes) will take place in June 2003 (*OCLC Technical Bulletin* 247, 3–4). Observation of current trends in the OCLC database suggests that a kind of class distinction may be made in integrating resources. Publicly available materials tend to have cursory Dublin Core records, which do not allow for the linking or historical development aspects of cataloging created with *AACR*2R 2002. Purchased resources are more likely to receive full-level cataloging

treatment, whether they are integrating resources or conventional serials.

Future Considerations

Based on the history of the cataloging of computer-based materials, one can easily predict that there will be more changes both in the resources themselves and in the cataloging rules that are applied to them. New and ingenious types of electronic resources will no doubt appear in the near future, and cataloging rules and standards must be sufficiently flexible to accommodate them. Cataloging rules for electronic resources should be written broadly in order to be applicable to the widest possible range of carriers and formats. Rules written for narrow instances have a short life.

The problems of cataloging electronic resources have led to the development of new framework standards that challenge the hegemony of the MARC format in library catalogs. Framework standards, like the cataloging rules, need to be flexible and scalable to be viable in the future electronic environment.

Finally, caution should be exercised over the introduction of new cataloging rules and standards. Continuous changes in the cataloging rules can create as much confusion as clarity for working catalogers. Careful consideration should be applied before deciding that some new electronic resource manifestation requires a whole new set of rules. An examination of the records created using the various cataloging rules reveals more similarities than differences. Observation of OCLC record errors and problems suggests that transition periods or periods in which more than one standard is in use are the times when there is the greatest confusion among catalogers and the greatest inconsistency of cataloging for electronic resources.

Constant shifts in terminology and style of cataloging records may inhibit record retrieval in online library systems and also may make it more difficult for users to understand the records that a search has retrieved. For example, a contemporary catalog will likely contain records with the general material designations "computer file," "interactive multimedia," and "electronic resources." Users must be able to identify all these as associated with computer-based materials. If the local system does not compensate for the limitations placed on MARC type code "m," retrieval of electronic resources will be dispersed throughout search results regardless of material type limits that the user may have placed. Users want to know whether a resource is computer-based or not. Such dispersion is a disservice to them.

Despite pressures to come up with "new" standards for new computer-based types of materials, changes should be implemented only after careful consideration. As has been demonstrated, sometimes old solutions can be applied with success to new problems, which demonstrates the robustness of the Anglo-American Cataloguing Rules. Consistency of information presentation and depth of detail are hallmarks of quality catalog records produced following the Anglo-American Cataloguing Rules, and they should be maintained.

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Appendix A
Anglo-American Cataloguing Rules, 2d ed. 1978, Chapter 9

```
OCLC:  XXXXXXX  Rec stat:  c
Entered:  XXXXXXX  Replaced:  XXXXXXX  Used:  XXXXXXX
Type:  m  ELvl:  L  Srce:  d  Audn:  Ctrl:  Lang:  und
BLvl:  m  File:  u  Gpub:              MRec:  Ctry:  miu
Desc:  a          DtSt:  s          Dates:   1977,

245 00 Current population survey. |p Annual demographic file, 1968 |h machine-readable data
file / |c principal investigator, United States Department of Commerce, Bureau of the Census.
260    Ann Arbor, Mich. : |b Inter-university Consortium for Political and Social Research
[distributor], |c [1977?]
300    data file (200,226 logical records) + |e codebook
490 0  Current population survey: annual demographic files (March)
440  0 ICPSR study ; |v 7559
522    United States.
523    |b Data collected: 1968.
565    200,226 records.
500    The Current Population Survey (CPS) is a household sample survey conducted monthly by
the Census Bureau to provide estimates of employment, unemployment, and other characteristics
of the general labor force, estimates of the population as a whole, and estimates of various
subgroups in the population. Each March, in addition to the core of
information mentioned above, the Current Population Survey: Annual Demographic Files provide
detailed demographic data representative of the non-institutionalized, United States civilian
population and male members of the Armed Services living in civilian  housing. Approximately
200,000 records are included for each year. The data files for the years 1968-1976 were
obtained from the Data Program and Library Service (DPLS), the University of Wisconsin. Some
data management operations intended to store the records more efficiently were performed by
DPLS. That organization also revised the original Census Bureau documentation. Sources of the
later files are listed in their individual descriptions. Please note that other, related
Current Population Surveys are conducted during March. These surveys are, nevertheless, sepa-
rate entities.
500    Holding archive: National Archive of Computerized Data on Aging.
500    ICPSR data class: Class IV.
651 0  United States |x Population |x Statistics.
650 0  Households |z United States |x Statistics.
650 0  Labor supply |z United States |x Statistics.
653     I. Census Enumerations: Historical and Contemporary Population Characteristics. |a A.
United States. |a 3. Current Population Survey Series.
710 1  United States. |b Bureau of the Census.
710 2  University of Wisconsin—Madison. |b Data Program and Library Service.
710 2  National Archive of Computerized Data on Aging (U.S.)
710 2  Inter-university Consortium for Political and Social Research.
```

Appendix B

Guidelines for Using AACR2 *Chapter 9 for Cataloging Microcomputer Software* (1984)

```
OCLC: xxxxxxxxx       Rec stat:     c
Entered:     xxxxxxxx  Replaced:     XXXXXXXX     Used:     XXXXXXXX
Type: m     ELvl: I     Srce: d     Audn:     Ctrl:  0     Lang: N/A
BLvl: m     File: b     GPub:            MRec         Ctry: dcu
Desc: a                              DtSt: s       Dates: 1982,

045    x8x8
090    QA76.8.A662 |b F73 1982
049    XXXX
245 00 Freeloader 500 software library |h machine-readable data file / |c compiled and edit-
ed by Sheryl A. Nutting... [and three others].
260    Washington, D.C. : |b American Software Publishing Co., |c c1982.
300    2500 + program files on 61 computer disks ; |c 5 1/4 in. + |e 7 sourcebooks (28 cm.)
500    In 7 containers.
538    System requirements: Apple II (or higher).
538    Disk characteristics: floppy disk, double sided.
500    Title from disk labels.
500    Includes indexes.
505 0   v. 1. Business & finance — v. 2. Utilities — v. 3. Graphics & sound — v. 4.
Education — v. 5. Games — v. 6. Adventures — v. 7. Home.
520    "... a compilation of public domain software for Apple computers... written by micro-
computer enthusiasts and donated to computer clubs for use by others."
650 0  Business |x Computer programs.
650 0  Finance   |x Computer programs.
650 0  Utilities (Computer programs) |x Computer programs.
650 0  Graphics |x Computer programs.
650 0  Education |x Computer programs.
650 0  Games |x Computer programs.
650 0  Home economics |x Computer programs.
700 1  Nutting, Sheryl A.
710 2  American Software Publishing Company.
753    Apple II
753    Apple II+
753    Apple IIe
```

Appendix C

Anglo-American Cataloguing Rules, 2d ed.1988 rev.

```
OCLC: XXXXXXX         Rec stat:  p
Entered:  XXXXXXX    Replaced:  XXXXXXX    Used:    XXXXX
Type: m    ELvl:    Srce:    Audn:  d    Ctrl:    Lang: N/A
BLvl: m    File: b  GPub:                MRec:    Ctry: mnu
Desc: a                             DtSt:  s    Dates: 1993,

010    93-22558
020    0792902599 : |c $69.00
037    MS-900 |b MECC
041 0  |g eng
043    n-usp-
050  00 F880
082  00 979.5 |2 12
245  04 The Oregon Trail |h [computer file].
250    Deluxe VGA ed., version 3.0.1.
256    Computer program.
260    Minneapolis, Minn. : |b MECC, |c c1993.
300    3 computer disks : |b col. ; |c 3 ½ in. + |e 1 manual (72 p.)
538    System requirements: IBM PC, Tandy, or compatible; 640 K RAM; MS-DOS 3.3 or later;
hard disk; VGA
graphics capabilities; mouse.
500    Title from title screen.
500    Ed. statement from disk label.
521    Grades 5-12.
520    Educational simulation in which students experience an 1848  journey on the Overland
Trail from Independence, Missouri to the Willamette Valley of Oregon.
651   0 Oregon Trail |x Juvenile software.
651   1 Oregon Trail |x Software.
650   1 Frontier and pioneer life |x Software.
710 2  Minnesota Educational Computing Corporation.
753    IBM PC |c MS-DOS 3.3
753    Tandy |c DOS
```

Appendix D

Guidelines for Bibliographic Description of Interactive Multimedia (1994)

```
OCLC: xxxxxxx      Rec stat:  n
Entered: XXXXXXX      Replaced:    XXXXXXX    Used:  XXXXXXX
Type:  m    ELvl:  I    Srce:  d    Audn:      Ctrl:    Lang: eng
BLvl:  m    File:  i    GPub:                  MRec:    Ctry: cau
Desc:  a                              DtSt: s    Dates: 1995,

007    c |b o |d c |e g |f a
020    1900275007
092    520 |b Red
245 00 Redshift 2 |h [interactive multimedia] : |b multimedia astronomy.
246 1  |i Title on disc label: |a Redshift 2, explore your universe
246 3  Redshift two
246 3  Red shift 2
250    Version 2.0.2.
260    San Rafael, CA : |b Maris Multimedia, |c c1995.
300    1 computer optical disc : |b sd., col. ; |c 4 3/4 in. + |e 1 user guide + 1 systems
reference card + 1 installation card.
538    System requirements: IBM compatible 386SX or higher processor (486 recommended); 8 MB
RAM with 2.5 MB free; Windows 3.1 or higher; MD-DOS 3.3 or higher; Windows 95; 256 color
VGA monitor (64K/16 bit color
recommended); Windows-compatible sound card; double speed CD-ROM drive; mouse.
538    System requirements : Macintosh LC II or higher; 8 MB RAM with 2.5 MB free; System
7.0 or higher (System 7.1.2 required for PowerMac); Quicktime 2.0 or higher; color monitor
(14 in.); double speed CD-ROM drive; mouse.
500    Title from title screen.
500    Includes hypertext links to entries from: Penguin dictionary of astronomy /
Jacqueline Mitton.
520    Makes astronomy accessible to beginners yet delivers the highest level of accuracy
for the serious user. Contains over 700 astro-photographs, simulations of planetary movement
star fields, and more, and 250,000 stars, asteroids and other sky objects.
650  0 Astronomy |x Interactive multimedia.
650  0 Planets |x Interactive multimedia.
700 1  Mitton, Jacqueline. |t Penguin dictionary of astronomy.
710 2  Maris Multimedia (Firm)
753    IBM PC |c DOS 3.3
753    Macintosh |c System 7
753    CD-ROM
```

Appendix E
Dublin Core

Title	I Read It on the Internet!—Teaching about Web Literacy.
Identifier. URI	http://www.education-world.com/a_lesson/lesson230.shtml
Type.AACR2-gmd	[electronic resource]
Type. Note	World Wide Web Resource
Contributor. name Personal	
Coverage	
Creator. name Personal	
Date.issued.MARC21-Date	
Description	"I Read It on the Internet!—Teaching about Web Literacy" is an April 2, 2001 article by Linda Starr featuring various lesson plans and activities for all grade levels. Students learn about Internet hoaxes, Internet literacy, and how to evaluate a Web site. Starr also offers access to related links. Education World, Inc. provides the article online as part of its Lesson Planning Center resource.
Format. medium.	IMT
Language.ISO639-2	eng
Publisher. name	
Relation	
Rights	
Source. URI	
Subject. class. DDC	025.0407078
Subject. class. DDC	025.04
Subject. class. DDC	070.5797
Subject. class. DDC	375.001
Subject. class. DDC	371.3028
Subject. name Corporate	Education World, Inc.
Subject. topical	Electronic information resource literacy • Study and teaching • Aids and devices
Subject. topical	Internet (Computer network) in education
Subject. topical	Electronic publications
Subject. topical	Curriculum enrichment
Subject. topical	Lesson planning
Subject	Electronic publications

Appendix F

Anglo-American Cataloguing Rules, 2d ed., 1988 rev. Amendments 2001

```
OCLC XXXXX  Rec Stat n
Entered:  XXXXXXX  Replaced:  XXXXXXXX    Used:  XXXXXXX
Type:  m    ELvl:  I    Srce:  d    Audn:    Ctrl:    Lang:  eng
BLvl:  m    File:  i    GPub:  s            MRec:    Ctry:  flu
Desc:  a                                        DtSt: s  Dates: 2000,

040    XXX |c XXX
007    c |b o |d c |e g |f a
092 0  940.5318 |b T253 |2 21
049    XXXX
245 02 A teacher's guide to the Holocaust |h [electronic resource] / |c produced by the
Florida Center for Instructional Technology, College of Education, University of South
Florida.
246 30 Holocaust
250    Version 3.0
260    [Tampa, Fla.] : |b Florida Center for Instructional Technology, College of Education,
University of South Florida, |c c2000
300    1 CD-ROM : |b col., sd. ; |c 4 3/4 in.
538    System requirements: Windows or Macintosh computer; web browser; QuickTime 4.0; Adobe
Acrobat Reader.
500    Title from title screen.
521 8  Middle school and high school teachers.
520    "An overview of the people and events of the Holocaust through
photographs, documents, art, music, movies, and literature"—Title screen.
650 0  Holocaust, Jewish (1939-1945) |x Study and teaching (Middle school)
650 0  Holocaust, Jewish (1939-1945) |x Study and teaching (Secondary)
710 2  Florida Center for Instructional Technology.
```