Guest Editorial

eLRTS: An Old Friend In New Dress

Norm Medeiros

Norm Medeiros is ALCTS President-Elect and before his election, served a three-year term as the *LRTS* Book Review Editor. I have asked Norm to write a guest editorial for what will be the last volume of *LRTS* issued in print. Volume 59 of *LRTS* will be the first volume issued as e-only. I also welcome Elyssa Sanner as the new Book Review Editor and the new members of the *LRTS* editorial board.

I am honored that Mary Beth invited me to write this editorial, the last to appear in print. Beginning with the next issue, *Library Resources and Technical Services* will be available exclusively as a digital journal. Although I fully endorse this move, I will not be around to christen the inaugural e-only issue. Having been recently elected as ALCTS president for the 2015–16 term, I am stepping down from the editorial board and book review duties to focus on my new role. I am excited for the challenge, but I cannot tell a lie: I will miss the work of producing *LRTS*.

When *LRTS* debuted in 1957, Esther Piercy in her first editorial, described how the journal came into being, the offspring of two previous publications: *Serials Slants* and the *Journal of Cataloging and Classification*. She described *LRTS* as "an old friend in new dress"—a fitting phrase for this moment, as *LRTS* transitions to a purely electronic publication. The quality of *LRTS*, or *eLRTS* as some have come to call it, will be unaffected by this shift. Our journal will remain among the most read, cited, and respected in the library field.

Unlike many long-term relationships, the one I have had with *LRTS* has been consistently enjoyable. My first encounter with the journal was in library school, when I hunted down bound volumes in the stacks at the University of Rhode Island. I certainly had not heard of ALCTS back then, and would not until I started my second professional position—a scenario all too common, but one the ALCTS Board of Directors hopes to address soon with help from the Membership Committee and the New Members Interest Group (NMIG). After joining ALCTS, I enjoyed reading the outstanding work of *LRTS* contributors, many of whom I would come to know in the years to follow. Once active in the division, I pursued publication work. From 2003 to 2007, I had the privilege of serving as the Cataloging and Classification Section (now Cataloging and Metadata Management Section, or CaMMS) representative to the *LRTS* editorial board. Peggy Johnson was editor during this period, and watching her conduct a board meeting influenced the way I subsequently convened groups, both within and outside ALCTS. Peggy taught me, among other valuable things, the coercive power of chocolate—not that such savory treats were needed to motivate the editorial board. To the contrary, the engagement of board members was consistently strong, where it has remained under Mary Beth's leadership. There is a seriousness of purpose that accompanies one's editorial board duties; it is meaningful work with lasting impact.

As I completed my service as CCS representative, the editorial board discussed the prospect of digitizing and making publicly available the backfile of *LRTS*. I was delighted that my library provided this digitization on ALCTS' behalf. The backfile has been available for several years, and is a terrific source of professional and association history. Browse this collection and you will find that the

challenges and concerns of prior generations are not all that different from today.

Following the untimely passing of longtime *LRTS* book review editor Edward Swanson in 2010, Peggy asked me to assume responsibility for the column. Although I was uneasy of the time commitment involved, the lure of once again serving on the editorial board was too much to refuse. I have thoroughly enjoyed this role, and have tried to perform it at a high level—the hallmark of Edward's work—while at the same time providing opportunities to individuals new to publishing. I have come to know many ALCTS colleagues as a result of this editorship, among them Elyssa Sanner, to whom I am passing the reins. Elyssa is a talented writer, with the kind of boundless energy I vaguely remember possessing. I am excited that Elyssa will not be encumbered by page limits as she exercises her own vision for the *LRTS* book review column of the future.

The transition to an e-only journal comes at a time when ALCTS is recommitting *LRTS* as a "green" open access journal, which means authors who publish in *LRTS* can deposit the published PDF of their article in an institutional or disciplinary archive. Although we are not yet prepared to shift *LRTS* to "gold" open access—that is a freely available publication—the editorial board will not lose sight of this ideal, as it is an important principal for many ALCTS members. Meanwhile we hope authors will take advantage of ALCTS' liberal copyright policy to widely distribute their scholarship through self-deposit.

To say I have the benefit of following strong presidents is an understatement. There is hardly sufficient space within this column (there are those pesky page constraints again) to elaborate on the leadership of those presidents under whom I have served: Pamela Bluh, Dina Giambi, Mary Case, Cynthia Whitacre, Betsy Simpson, Carolynne Myall, Genevieve Owens, and our current president, Mary Page. Each has a unique leadership style. I have studied them, making mental notes about a characteristic or approach I would like to embody. I will be downloading this mental index in the months to come, and applying its rich contents during my presidential year.

One vital resource common to the aforementioned presidents has been Charles Wilt. Charles, ALCTS Executive Director since 2001, will be retiring in February 2015. As of this writing (June 2014) the early stages of a search for his successor are underway. Brian Schottlaender, 2003–4 ALCTS president and recent ALCTS division councilor, is leading this important process. Needless to say, we are in excellent hands. Although I know ALCTS will hire a very talented executive director, it is hard to imagine ALCTS without Charles. Equal parts good judgment and good cheer, Charles has helped guide the association in numerous and valuable ways. I sincerely hope he enjoys his retirement, and remembers that red wine, in moderation, is health promoting.

As I close, I want to recall the slogan Bruce Johnson adopted during his presidential year of 2006–7: "We are ALCTS." This simple phrase resonates with me because it reinforces the power we have to direct the future of ALCTS. It is our association, and it will succeed or fail because of us. The decision to move *LRTS* to e-only involved risk, particularly the prospect that some ALCTS members would cancel their memberships by virtue of no longer receiving the print quarterly. Yet I believe the vast majority of ALCTS members choose to belong to our association for reasons that transcend material benefit. I think it is particularly important to understand the value that ALCTS provides to the majority of members who do not regularly participate in committees or interest groups, or attend ALA conferences. I am excited that the ALCTS-sponsored emerging leaders are working on a strategy for improving ALCTS' social media utilization. I think this avenue will be profitable in gathering the input needed to ensure we are serving all members well. Moreover, applying social media to reach prospective members, especially library school students and new library workers, is critical for the well-being of the Association.

I hope you enjoy reading this final print issue of *LRTS*. This occasion, while notable, marks neither an end nor beginning, but rather a continuation of excellence for our official journal.

Selection for Preservation

A Survey of Current Practices in the Field of Preservation

Jennifer Hain Teper

Library preservation programs are at the precipice of transformation. With the increasing availability of digitized content, and the development of shared print repositories, our perceived obligation to the preservation of individual print copies at an institutional level is shifting to a more shared model. Library preservation professionals must now determine how this is influencing our day to day practices. This paper reviews the data collected from a 2012 survey and interprets that data to show how the availability of digital surrogates, libraries' increasing consideration of shared print holdings, and the perceived value of scarcely held content are all influencing preservation selection.

Many library preservation programs are considering the possible ways that national holdings, availability of digital copies, holdings in shared print repositories, and local use can and perhaps *should* influence the selection of materials for preservation actions such as reformatting, rehousing, and repair. In considering the many ways that these metrics could be incorporated and how they might be applied locally at her institution, the author determined that a survey of current practices in the field would help illuminate this issue. The goal of the survey was to show which general practices are being established among academic/research libraries and to answer the question: How are current preservation programs integrating availability of content outside of their own physical holdings into their preservation workflows? This paper reviews the data collected from the 2012 survey and interprets that data to show how the availability of digital surrogates, libraries' increasing consideration of shared print holdings, and the perceived value of scarcely held content are all influencing preservation selection in North American academic and research libraries.

Literature Review

Practicing librarians, scholars, and academics have been investigating the issues of print retention and digital surrogacy, and the possible positive or negative influences on long-term preservation and access for over just over a decade. While each of these areas frequently overlap and inform each other, within the published literature, the areas of research tend to be relatively distinct.

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Therefore, the following literature review is organized into three discrete subsections: digital surrogacy, print retention, and preservation programs in a changing word.

Digital Surrogacy

A great deal of attention has been paid to the trustworthiness of digital surrogates in the recent past. The first formal step in the endorsement of digitization as a preservation reformatting method was in the publication *Recognizing Digitization as a Preservation Reformatting Method*, prepared for the Association of Research Libraries (ARL) Preservation of Research Library Materials.[1] In this publication, which was quite controversial when it was issued in 2004, the authors state that though digitization for preservation had been happening in institutions for several years, there were still perceptions that it was not a trustworthy, long-term option. The report presents arguments for well-planned and structured digitization as a sound preservation option. One of the most cited works in this area was published by the Council for Library and Information Resources (CLIR) four years later.[2] In this seminal article, written only months before the founding of the HathiTrust, Reiger investigated the impact of large-scale digitization initiatives (LSDIs) such as the Google Book Search Project and the Open Content Alliance (OCA) on the way libraries viewed digitization, regarding both scale and long-term accessibility. She also investigated the need for preservation infrastructure in LSDIs, including minimum metadata requirements, quality control, technical and organizational infrastructure, and then considers the implications of LSDIs on physical collections and preservation programs. In closing, Reiger makes sound recommendations for next steps to improve quality and long-term access to LSDI content, which not only paved the way for the success of the HathiTrust, but also the increased importance of shared print repositories and investigations in quality control of LSDI digitized images.

Most recently, Conway has conducted research in the quality of digitized content and the role of digital content within preservation programs. One of his most recent research projects, funded by both the Andrew W. Mellon Foundation and the Institute for Museum and Library Services (IMLS), sought to investigate and quantify the quality of digitized content found in the HathiTrust. His first publication on the subject—a conference paper from the 2010 iPres conference—presents the research framework and method and is followed up by a more thorough presentation of his research plan and implications of the potential findings in *Archival Quality and Long-Term Preservation: A Research Framework for Validating the Usefulness of Digital Surrogates.*[3] This project, which concluded in 2013, has yet to release its formal findings, but the implications of the trustworthiness of digital surrogacy weigh heavily on how much faith preservation can place in third-party digitized content.

Print Retention

There are several schools of thought regarding the role of print retention in research libraries, and all affect preservation in some way. Lack of space has long been an issue for libraries, and many have moved large portions of their lesser-used materials to off-site or high-density storage facilities. However, as those facilities begin to fill, institutions have also investigated shared collection access to help alleviate space issues without dramatically decreasing access to titles. As libraries have considered shared collections, preservation has, by necessity, been part of the conversation from several perspectives. Preceding many and on a regional scale, the Five Colleges (Amherst College, Hampshire College, Mount Holyoke College, Smith College and UMass Amherst) collaborated in a shared print repository (SPR) for their lesser-used holdings where best available copies were selected and marked as copies of record for long-term retention, a model now replicated by many institutions especially for journal titles available electronically through major vendors or organizations such as JSTOR.[4] Looking beyond local and regional repositories, however, Payne examined the role of library storage facilities in the development of shared journal archives, last and single-copy facilities, and the potential for development of a distributed print repository network utilizing materials in these facilities.[5] The approach for such repositories has focused largely on serial publications, due to the more stable electronic resource infrastructure related to them. Monographs, however, have remained less of a focus. In response to these findings, a group of institutions and organizations, with IMLS funding, met to develop a framework to help guide shared monographic print retention policies.[6] Within this guideline, the preservation of an "adequate" number of copies plus the larger-scale preservation issues relating to monographs and their potential use were considered. While no concrete recommendations were provided, the paper presented the most promising scenarios for approaching this effort, which included focusing on materials already in library storage facilities, those materials also in the HathiTrust, or identifying materials by class range, subject and discipline. At the same time, the Maine Shared Collections Strategy project was implemented through an IMLS grant which has as one of its major goals the "Development and implementation of a policy for preservation of unique and rare print materials" in a shared print environment.[7] This project, due to end in 2014, has thus far released its first retention scenario and a memorandum of understanding (MOU) and may help to lay groundwork for other models to follow. Lastly, although no formal publications have yet been released, the HathiTrust is

also planning a distributed print monograph archive project, the proposal for which was voted upon at the 2011 Constitutional Convention.[8] While still in the planning phases, the scope of this project has the potential to have much more far-reaching effect on libraries than any of the other shared print projects to date.

Another perspective on print retention is the discussion of when to discard an item. Whereas the discard of duplicates has always been an option within preservation programs, some institutions have been pursuing this strategy more aggressively than others. First published online as a white paper in 2008, a statistical analysis through University of California Berkeley led to a suggested threshold for print survival over time.[9] This research directly supported the landmark publication by Schonfeld and Housewright of Ithaka S+R, which crafted explicit recommendations for national print journal retention strategies for US libraries incorporating the availability and preservability of electronic journals as part of those recommendations.[10] These two analyses were then incorporated into practice at the University of California Los Angeles, and now guide preservation treatment selection or discard decisions in their university library.[11]

Preservation Programs in a Changing World

Despite the many publications that focus on the relationships between shared print retention and preservation or digital content and preservation, few have offered more holistic publications on how both of these practices are impacting preservation programs. As mentioned above, parts of Reiger's *Preservation in the Age of Large-Scale Digitization* certainly begin to test these waters, but by far the most comprehensive of those available is Meyer's *Safeguarding Collections at the Dawn of the 21st Century*, which he wrote while serving as a visiting Program Officer at ARL.[12] Written just as the ARL was considering dropping the collection of ARL Preservation Statistics (www.arlstatistics.org/about/series/preservation), this paper asks the surprisingly difficult question "what is modern preservation?" and includes the considerations of digital content, the web, and shared storage among others, as necessary in current preservation programs. In his article *Preservation in the Age of Google: Digitization, Digital Preservation, and Dilemmas*, Conway reviews how the field of preservation has transformed due to the availability of immediate access to digitized content online and the requirements of digital preservation frameworks.[13] Little has been written in the three years since its publication. In 2013, however, the British Library released "Knowing the Need: Optimising Preservation for Library and Archive Collections."[14] This short report, much like Heritage Preservation's *Heritage Health Index* and the British Library's *Knowing the Need: A Report on the Emerging Picture of Preservation Need in Libraries and Archives in the UK* (National Preservation Office), summarizes the current state of the preservation of physical collections.[15] But, unlike its predecessors, the 2013 publication considers surrogate availability compared with condition and usability, and proposes preservation prioritization models utilizing this data.

Surveying the Field

To answer the question "How are current preservation programs in research libraries integrating availability of content outside of their own physical holdings into their preservation workflows?," the author developed a survey in the summer of 2012. A draft of the survey tool was tested on a select group of nine peer institutions willing to serve in that capacity and modifications were made based on feedback. An invitation to take the survey (available in the appendix) was distributed through various professional discussion lists and remained open from October 24 to November 14, 2012. The survey consisted of thirty questions seeking information grouped into seven general categories: (1) general information; (2) current preservation practices; (3) selection for preservation; (4) print replacement; (5) holdings; (6) digital surrogate; and (7) use.

Survey Results

General Information

There were forty-nine responses to the survey and there were no observable multiple responses from any single institution. While this was a respectable number of survey responses, no exact response rate can be drawn from this total, as the number of institutions undertaking these practices is unknown. The respondents were predominantly preservation (65 percent) and conservation (23 percent) professional staff, with smaller representation from preservation (6 percent) and conservation (2 percent) support staff, as well as four percent collection management staff or librarians. Responses represented practices at a variety of institutions of different sizes and types. Seventy-one percent reported from research libraries, while 27 percent were from non-research institutions (though most were academic)—all from the US and Canada. The size of library collections served by the preservation programs was evenly distributed between the various size ranges (represented by volume count, a common statistic gathered by the ARL), with 21 percent under 1 million volumes; 27 percent at 1–3 million volumes;18 percent at 3–5 million volumes;16 percent at 5–8 million volumes, and 16 percent at over 8 million volumes.

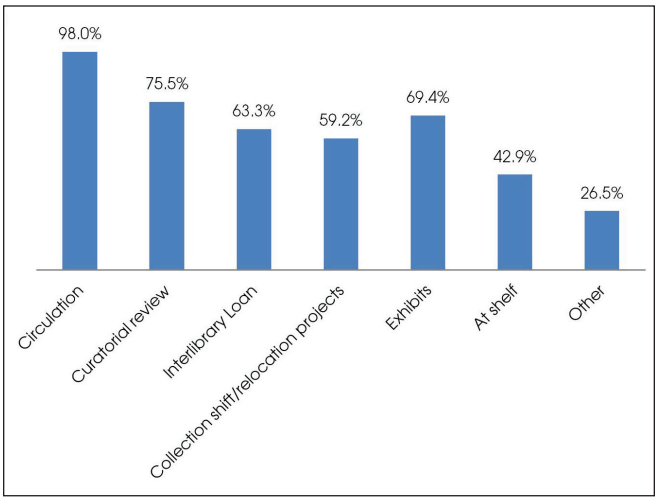

Figure 1. (Question II.4.) Selection of materials for preservation

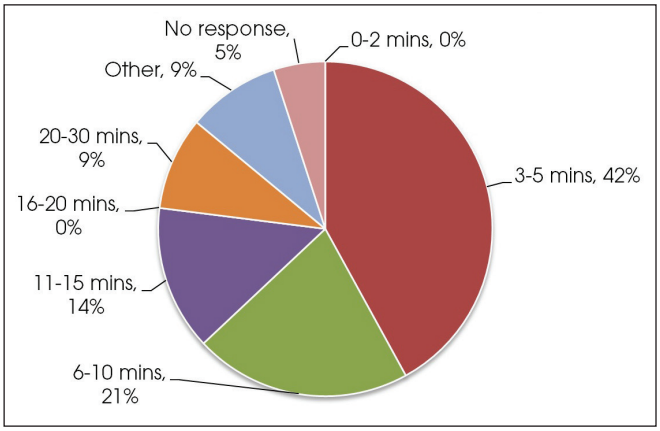

Figure 2. (Question III.4) How much time is spent, on average reviewing preservation metrics before making treatment decisions?

Preservation and Conservation Practices Represented

The size of preservation programs, measured in full-time equivalent (FTE) staff ranged from 0.33 to 103, with a mean of 8.4 FTE and a median of 5.5 FTE. Programs perform a full range of preservation and/or conservation treatments, including special collections conservation treatment (practiced by 80 percent of respondents); general collections conservation treatment/book repair (96 percent); pamphlet binding (94 percent); library binding (88 percent); construction of custom protective enclosures (in house or purchased) (94 percent); preservation reformatting of brittle paper materials through microfilm (33 percent); preservation reformatting of brittle paper materials through digitization (63 percent); and preservation reformatting of brittle paper materials through "preservation photocopy" replacements (67 percent). Seventy-one percent reported finding replacement copies of damaged materials through the used book market; and 63 percent of respondents replied that their program *will* discard damaged materials even if they are not replaced through reformatting or replacement copies, at least in some instances. Lastly, materials selected for preservation/conservation treatment are identified in a variety of ways, with most institutions (90 percent) reporting that they use combinations of three or more methods for identification. While circulation was by far the most popular method (98 percent of respondents utilized it as a method of selection), only shelf review and various "other" methods were used by less than 50 percent of respondents (see figure 1). "Other" responses included during acquisition, retrospective cataloging projects, transfer to storage, digitization, and through surveys.

Selection for Preservation Treatment

After basic institutional and program demographics, the survey gathered more specific information on preservation review and prioritization practices. Overall, most preservation and conservation programs spend some time reviewing shared metrics before making treatment decisions. The first questions of this portion of the survey asked if respondents do any one of the following: (1) search for print replacement copies; (2) search for the availability of national, regional, or consortial holdings; (3) search for the availability of digitized content; or (4) collect historical circulation/use statistics. Of the responses, only 10 percent replied that they did not utilize at least some of these metrics when evaluating one or more workflows in preservation. The majority (42 percent of respondents) spend only 3–5 minutes reviewing this data. However, some institutions take much more time for review and interpretations, ranging from 6 to 10 minutes (31 percent), 11 to 15 minutes (14 percent), 16 to 20 minutes (0 percent), to 20 to 30 minutes (9 percent). For the 9 percent that responded with "other," most offered that they had more than one workflow and that searching varied between those, ranging from no review to up to forty minutes per item (see figure 2). Although one might assume that institutions with more staff in preservation were more likely to do more in-depth searching, there was no correlation to support that assumption. Surprisingly, the total FTE for those taking more than ten minutes per item to search was just under 2.0 FTE *lower* (at 5.6 FTE total program staff) than those taking between 1 and 10 minutes (at 7.4 FTE).

Not all workflows utilize input from such searches, so institutions were asked which preservation/conservation workflows warranted searching metrics. While responses varied widely, the three most common responses were for select general collections conservation treatment (58

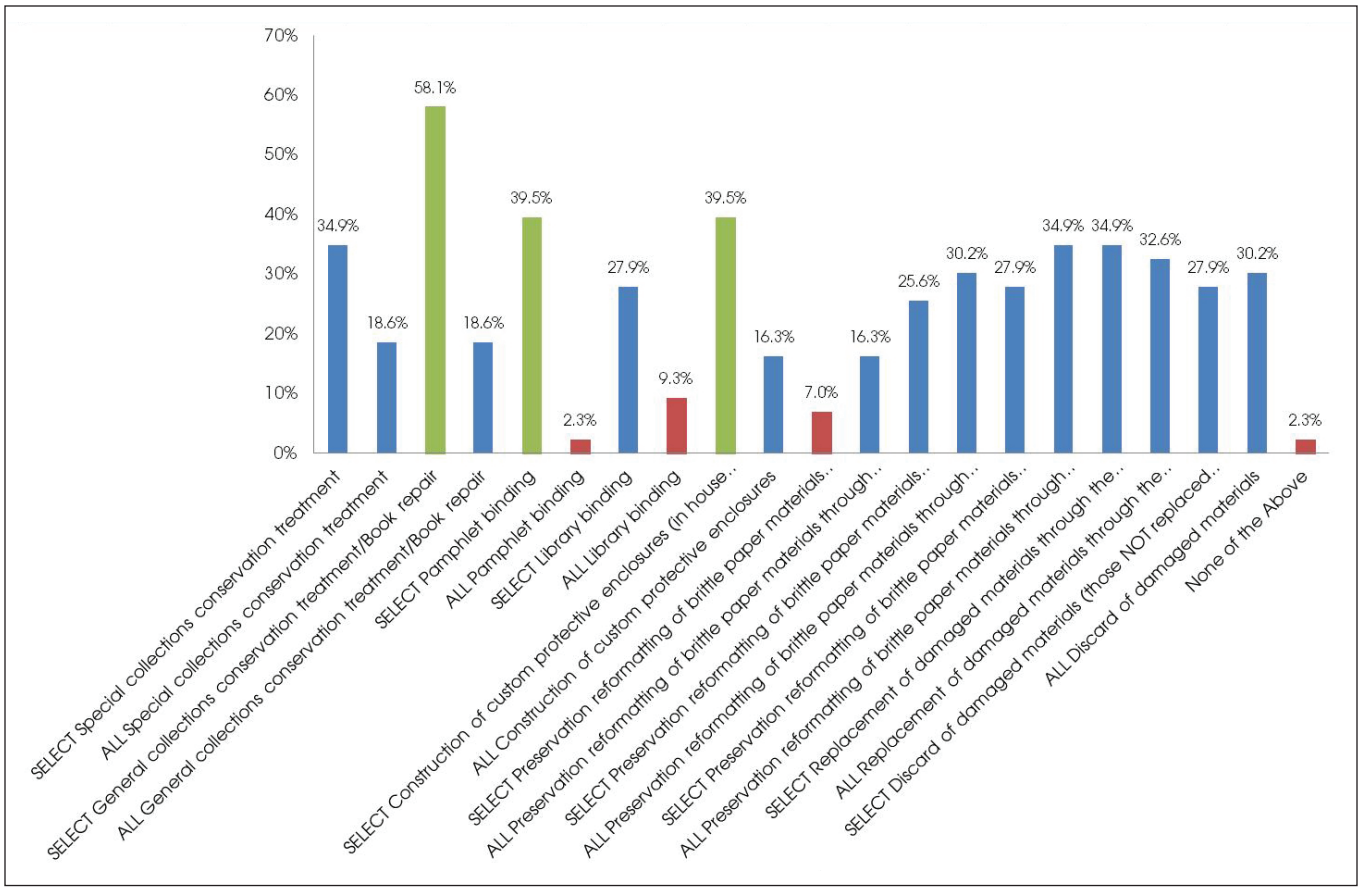

Figure 3. (Question III.5) What types of treatments get preservation metric review?

percent), select pamphlet binding (39.5 percent), and select custom enclosures (39.5 percent) (see figure 3). When putting these responses into perspective with the common approaches to library preservation, the responses are not all surprising. General collections conservation is perhaps the area that this sort of searching is most likely to affect (and many institutions wrap pamphlet binding into the same workflows). Since general collections are likely to be more widely held and therefore more likely to have been digitized by a large-scale digitization effort and/or now available electronically, the impact of these metrics would be much higher in general collections than in special collections. Additionally, treatments that are more time intensive (higher-end general collections repairs and construction of custom enclosures) might be more likely targets to remove from workloads to save staff time for other treatments on less accessible materials. Lastly, enclosures might be a target for the application of such metrics as they are not a total solution to a condition problem on an item, but often the only option for items too brittle or damaged be successfully repaired, and thus still pose some access and use challenges, perhaps better solved by steering patrons to alternative resources for that content.

Shared Print Repositories

Moving from general practices in selection and review, the survey next addressed specifically whether preservation programs consider items for possible incorporation into a SPR when making preservation decisions. This is of significant interest to Illinois, which is partnering in a developing SPR, and has not previously weighed the potential for the Illinois copy to be selected as a copy of record when making treatment decisions. From the data collected in the survey, it appears that Illinois is not alone in this respect—as only 16 percent of respondents answered that this potentiality is considered as part of their preservation review. Of the minority who responded affirmatively, about 2/3 of those (10 percent of the respondents) noted that they regularly perform a physical review of the materials in light of this possibility.

Print Replacements

The survey next asked respondents if they searched for print replacements before making treatment decisions. Libraries may utilize this method because print copies from the

resale market may be in better condition than the item being reviewed for preservation action. Additionally, searching for available print replacements is necessary, according to section 108 of US copyright law, before a preservation copy can be made. Survey respondents answered that about 55 percent of institutions look for print replacements in at least some of their workflows, but 36 percent do not. The remaining 9 percent either did not respond or did not know for certain. Of those who consider replacement copies, the majority (75 percent) review the condition of the replacement copy before replacement occurs and of those, most review for completeness (95.2 percent), but the majority also reviews paper strength (85.7 percent) and binding condition (85.7 percent).

Institutional Holdings

There has been much discussion in the preservation field about the significance of institutional holdings on preservation decision making. Most notably, this has been through Nadal and Peterson's white paper mentioned in the literature review. Nadal and Peterson believe libraries should consider whether individual copy preservation of widely held titles is cost-effective or necessary. In light of this, one of the main topics investigated by this survey was how often libraries are utilizing holdings data when making preservation decisions. Perhaps a bit surprisingly, only 50 percent of the institutions surveyed responded that they collected data on other institutional holdings before *any* preservation decisions. Forty percent reported that they do not gather this data, and an additional 10 percent thought that another department might do this sort of searching outside of the preservation program (i.e., collection managers may search for this information before sending an item to preservation). For those who evaluated holdings, the survey asked how (geographically) they considered the relevance of reported holdings. Seventy-two percent looked at holdings on a national level, while 48 percent considered holdings on a regional or consortial level (75 percent of these looked at this in addition to national holdings). The remaining 20 percent either did not respond, or responded with notes that did not directly tie into the focus of the question. The author was also interested in whether respondents searched monographs or journals, or both, since holdings for journals can be quite problematic due to the need to search individual institutional holdings for meaningful volume level data. Of those who perform such searches, 60 percent searched both monographs and journals, 20 percent searched monographs only, and the remaining 20 percent did not respond to the question. However, no one reported searching only journal holdings.

Lastly, the survey asked how the holdings data collected influenced preservation decision making. Of those who collected holdings data, less than half (48 percent) reported that if holdings were found over a certain threshold (that threshold was not asked to be reported), they would strongly consider discarding/withdrawing a damaged volume over repair. Thirty-six percent reported that if holdings were under a certain threshold, they would consider transferring the item to special collections, and 28 percent reported that if holdings data was over a certain threshold they would not treat the item, but return it to the library untreated. Eight percent of respondents reported "other," which included several responses of "it varies," and noted that holdings data also informs transfer to storage.

Overall, these findings were not surprising, but also not as conclusive as the author hoped. Half of the institutions that replied to the survey responded that they did not consider holdings for any repairs, and for the half that did consider this information at some level, most (as indicated by their responses to question five in section three) only consider the value of institutional holdings for small subsets of items coming in for treatment. While Nadal and Peterson's white paper was groundbreaking in 2011, only two years later, few institutions (less than 25 percent) have implemented any programmatic consideration for discarding a physical monograph or journal in light of broad institutional holdings. As the field adapts to the changing landscape of library print retention, and participation and trust in shared print repositories increases over time, the author anticipates that this number will dramatically increase in the not-so-distant future. Especially as trusted shared print repositories add unique OCLC symbols to indicate when items are held in such a facility, the impact and value of shared print holdings will undoubtedly increase and influence preservation decisions for local holdings.

Availability of Digitized Content

Another key area of the information the author hoped to gather was the influence of freely available, full-text digital content on preservation selection. Nearly all large and many small libraries have felt the pressure to digitize portions of their collections—either special or general collections or both—as patrons become increasingly reliant upon the ease of access provided by digital content. With that in mind, then, how much are preservation programs relying upon the availability of digitized content to lessen preservation workloads or better target limited resources? Of those surveyed, over half (57 percent) reported that they searched for online content, while only 26 percent did not. Of those remaining, 14 percent reported that they believed that this searching was done, but outside the preservation program (again, likely by collection managers or circulation staff), and an additional 3 percent responded that they only searched for availability of digitized content if an item was deemed unrepairable. The survey then delved deeper to see what

sort of digitized content was being considered for preservation surrogacy, with an assumption that trusted sources such as HathiTrust, JSTOR, and Portico titles would be more heavily regarded than smaller or commercial ventures with no preservation plan in place. Indeed, preservation did rely on these sources more heavily, but a surprisingly high proportion, 26 percent of respondents, relied on *any available* digitized content, while just 55 percent replied that they only considered openly available digitized content in trusted repositories. For licensed digitized content (predominantly journals), 32 percent replied that they considered the availability of e-resources associated with a third party preservation service (such as LOCKSS or Portico), whereas 36 percent replied that they considered such resources with a vendor supported print repository (such as JSTOR). Lastly, 13 percent replied that they considered the availability of e-resources that were associated with community supported print repositories (CRL being the longest-standing of these, but newer shared print repositories, such as Western Regional Storage Trust (WEST) and others being more recent programs). Only 6.5 percent of those who search for digitized content reported that they would consider digitized content that was not associated with any such preservation services, which is heartening. For those who do utilize digital content in their preservation decision-making, respondents followed a range of different approaches to ensuring the quality of the digital surrogate. Twenty-nine percent reported that they accepted the digital content identified without any review of the quality or completeness, while 22 percent performed cursory or "spot" reviews. Twenty-three percent performed a full review for quality and completeness, but only 3 percent performed a thorough, page-by-page level review of content. With the results of Conway's research on the quality of digitized content in the HathiTrust likely to be published soon, preservation practitioners may be swayed to trust or distrust the quality of such files more soon, and it would be an interesting comparison to revisit this practice in five years to see how the field's perceptions and practices have changed.

Responses to the survey question of how the availability of identified digital content affects preservation treatment decisions were quite diverse. Of those who gathered information on the availability of digitized content, 16 percent replied that if such is available they will return the original to the shelf untreated; 32 percent replied that they would only supply a protective enclosure for the piece (and would not repair it); 29 percent reported that they would withdraw the item; 22 percent reported that the availability of digital content has no bearing on their preservation decision making (though they do search for it); and 16 percent replied with "other" responses. Of those other responses, 80 percent replied that their practice varies depending on the circumstances, and 20 percent responded that they would move the object to storage (but did not say whether they would repair or box the item).

These findings on the utilization of digitized content are significant because a reasonably high percentage of respondents (57 percent) are now relying at least to some degree on the availability of the digitized content to serve a preservation and access function or inform treatment decisions, but less than half of those report performing any level of quality assurance of that content. Thirty nine percent of respondents replied that with the availability of such content, materials are either untreated or discarded. The correlation between these two is disheartening—42 percent of those replying that they will discard or not repair materials based on available digital content also reported that they do not perform a quality review of the content they have identified. A more positive perspective on this may be that these decisions are being made in concert with other data gathering about long-term preservation. Looking at the collected survey data, 69 percent of those who accept digitized content with little to no review are also checking for wider institutional holdings, while 31 percent are not doing thorough reviews of digital content nor checking for wider holdings. While this data may simply imply that if instructions are thorough in one area of preservation review, they tend to be more thorough in other areas as well, it may have other implications. Perhaps institutions that are *not* doing a thorough review of digitized content are not doing so because they are relying on the wider print holdings as preservation copies, whereas the available digitized content is considered only an access mechanism or as a preservation copy with an acceptable risk of it being of poor quality. More research in this area would help to clarify if this supposition is accurate.

Allied with the use of digitized content to inform preservation decision making is how institutions call attention to the availability of digital content vis-à-vis the original physical object in hand. Thirty percent of respondents replied that they note on the physical object (or its container) that digital content is also available. This practice does not, however, have a strong correlation between the type of treatment or lack thereof, indicated in the previous question (33 percent of those saying they return items to the shelf or create an enclosure also indicate that they mark the item). However, many more institutions do add notes to the electronic records for the items, with almost 42 percent adding notes in their local ILS and 29 percent adding it to the MARC 583 Action Note field (10 percent doing both), and 23 percent marking items as well as updating the records in some way.

Historic Use of Originals

When contemplating treatment options, many institutions may also take recorded use of an artifact into account. While all other factors such as national holdings and digital

surrogates may sway some institutions, many still place great value on the use of the book in question, as this most closely represents the value of that physical item to the institution's patrons. True to this assumption, just under half (49 percent) reported that they programmatically consider use when making preservation treatment decisions, while 7 percent replied that their institution considers this factor, but it is not considered within the preservation program (i.e., considered within other units, likely while selecting materials to send to preservation), while 35 percent of institutions replied that they did not consider use in their decisions. The 9 percent that replied "other" all replied that they do consider use in some occasions, but not systematically. Of course, as stated at the beginning, 98 percent of respondents use circulation (the most common form of use) as a method of selection for preservation action, so while *historical* use may be considered by 49 percent, *active* use plays a role for at least preliminary selection for almost all those surveyed. Of those responding that they did consider use on at least one level (65 percent of the total), exactly half replied that if they found use to be over a certain threshold (institutions were not asked to define this threshold within the scope of the survey), the physical item would be treated regardless of holdings or availability of digitized content.

Discussion and Conclusions

The information gathered from this survey is illuminating in many ways. While the strong trends that the author hoped to see are not as clearly defined as originally anticipated, it is clear from the data that the field of preservation is changing and being strongly influenced by the impact of shared resources, both physical and electronic. Trends in the data seem to indicate that while we as a field are becoming more comfortable with not treating an item if it is widely held or digitized (often times no matter the source), we are not as comfortable with withdrawing damaged materials from our collections. Perhaps this is due to our inherent reluctance to make such a "final" decision as withdrawal when our comfort with both digitized content and shared print repositories is still so new. However, what will become of our collections in the meantime? Will more libraries begin to accept the idea that not repairing an item but also not withdrawing it is an acceptable middle ground to managing shrinking budgets and "hedging our bets"? Or is this level of discomfort sitting not just with preservation, but with the larger academic library collection management approaches? Although the field of academic libraries is rife with discussions of shrinking physical collections, are many of us still feeling local pressures from faculty and our administration to keep books on the shelves? Or, are we still terrorized by the shadow of Nicholson Baker's *Double Fold,* the negative impact it had on the perceptions of preservation microfilming projects, and the management of brittle newspaper holdings?[16] Anecdotal discussions with the author's peers imply that these pressures and fears are still very real in many institutions, but further study in this area is necessary to draw any concrete assertions.

While discarding books is seen by many as a hard line approach, it may in the end be better service to our patrons and any future of shared collections. By continuing to provide physical access to poor condition copies, we appear as poor stewards of our physical collections. More importantly, by not discarding, are we considering that at some point in the future they *may* be repaired? If so, why and when? Will they be returning to our programs in the future for re-evaluation (meaning more staff time resulting in potential repeated inaction)? Or worse yet, being sent out of our circulating collections into storage collections? Whereas this final option may seem appealing as it takes the item out of the circulating collection, for many institutions this may open the damaged copy up to inclusion in future shared print repositories. While the utopian vision of a national "preservation collection" may not be a realistic near-term goal for many reasons, we must work collaboratively to ensure that those materials being included in our shared print repositories are at the very least complete and intact, and ideally in good physical condition. Clearly, generally agreed upon MARC record updates will be necessary to exclude such possibilities in the future, but this discussion is still occurring and libraries are by no means following widely agreed upon procedures. Although the Library of Congress published its *Preservation and Digitization Actions: Terminology for MARC 21 Field 583* (often referred to as PDA) in 2004, and discussions of its use and applications occurred at the American Library Association's Annual Conference as recently as 2011 and in McCann's recent article "Conservation Documentation in Research Libraries: Making the Link with MARC Data," no agreed upon procedure for record sharing in anticipation of share print holdings exists.[17]

Next Steps

The intent of this paper is to provide a snapshot into how broader access to content is currently affecting preservation selection. The results have illuminated a time of transition. A future survey in five years will likely show even greater reliance on shared access to both physical and digital content. Likewise, as our reliance on digital content develops, we will most likely see our understanding of the reliability of the quality of that content and the value of that quality increase as well.

Case studies, such as that published by Nadal and Peterson and research being undertaken by Conway, will be invaluable as library preservation programs begin to navigate

this sea of change. Further professional discussion of the use of shared MARC data and its role in share collection development is also necessary if libraries are to be able to consider the long-term effects of preservation decisions made soon.

References

1. Kathleen Arthur et al., *Recognizing Digitization as a Preservation Reformatting Method* (Washington, DC: Association of Research Libraries, 2004, accessed August 28, 2013, http://chnm.gmu.edu/digitalhistory/links/pdf/preserving/8_34a.pdf.
2. Oya Reiger, *Preservation in the Age of Large-Scale Digitization: A White Paper* (Washington, DC: Council on Library in Information Resources, 2008), accessed August 28, 2013, www.clir.org/pubs/reports/pub141/pub141.pdf.
3. Paul Conway, "Measuring Content Quality in a Preservation Repository: HathiTrust and Large-scale Book Digitization," in *Proceedings of 7th International Conference on Preservation of Digital Objects* (iPres 2010), 19–24 September, Vienna, Austria, ed. Andreas Rauber et al. (Vienna, Austria: Österreichische Computer Gesellschaft, 2010), 95–102, accessed August 28, 2013, http://hdl.handle.net/2027.42/85227; Paul Conway, "Archival Quality and Long-term Preservation: A Research Framework for Validating the Usefulness of Digital Surrogates," *Archival Science* 11, no. 3–4 (2011): 293–309. Project website available at http://hathitrust-quality.projects.si.umich.edu/.
4. Willis E. Bridegam, "Print Preservation at the Local Level—The Five College Experience," *Library Collections, Acquisitions & Technical Services* 28, no. 1 (2004): 29–38, dx.doi.org/10.1016/j.lcats.2003.11.005.
5. Lizanne Payne, *Library Storage Facilities and the Future of Print Collections in North America* (Dublin, OH: OCLC Program and Research, 2007), accessed August 28, 2013, www.oclc.org/research/publications/library/2007/2007-01.pdf.
6. Robert H. Kieft and Lizanne Payne, "A Nation-Wide Planning Framework for Large-Scale Collaboration on Legacy Print Monograph Collections," *Collaborative Librarianship* 2, no. 4 (2010): 229–33, accessed August 28, 2013, http://collaborativelibrarianship.org/index.php/jocl/article/viewFile/119/77.
7. "Maine Shared Collections," University of Maine, accessed February 4, 2014, www.maineinfonet.net/mscs.
8. HathiTrust, *HathiTrust Distributed Print Monographs Archive Proposal (August 23, 2011),* accessed September 3, 2013, www.hathitrust.org/constitutional_convention2011_ballot_proposals#proposal1.
9. Candace A.Yano, Z.J. Max Shen, and Stephen Chan, "Optimizing the Number of Copies for Print Preservation of Research Journals" *International Journal of Production Research*, 51 no. 23/24 (December 2013): 7456–69.
10. Roger Schonfeld and Ross Hoursewright, *What to Withdraw? Print Collections Management in the Wake of Digitization* (New York: Ithaka S+R Research and Consulting, 2009), accessed February 12, 2014, www.sr.ithaka.org/research-publications/what-withdraw-print-collections-management-wake-digitization
11. Jacob Nadal and Annie Peterson, "Scarce and Endangered Works: Using Network-level Holdings Data in Preservation Decision Making and Stewardship of the Printed Record" (preprint, accepted for publication in ALCTS Monographs, Los Angeles: University of California Los Angeles, 2011), accessed August 28, 2013, www.jacobnadal.com/wp-content/uploads/2011/05/Scarce%20and%20Endangered%20Works%28v19Sept2011%29.pdf.
12. Lars Meyer, *Safeguarding Collections at the Dawn of the 21st Century: Describing Roles & Measuring Contemporary Preservation Activities in ARL Libraries* (Bethesda, MD: ERIC Document Reproduction Service, ED 505512, 2009) accessed August 28, 2013, http://files.eric.ed.gov/fulltext/ED505512.pdf.
13. Paul Conway, "Preservation in the Age of Google: Digitization, Digital Preservation, and Dilemmas," *The Library Quarterly* 80, no. 1 (2010): 61-79, accessed August 28, 2013, www.jstor.org/stable/10.1086/648463.
14. Carline Peach and Julia Foster, *Knowing the Need: Optimising Preservation for Library and Archive Collections* (London: Preservation Advisory Centre, The British Library, 2013) accessed August 28, 2013, www.bl.uk/blpac/pdf/ktn.pdf.
15. *A Public Trust at Risk: the Heritage Health Index Report on the State of America's Collections* (Washington, DC: Heritage Preservation, 2005), accessed August 28, 2013, www.heritagepreservation.org/HHI/HHIfull.pdf; Alison Walker and Julia Foster, *Knowing the Need: A Report on the Emerging Picture of Preservation Need in Libraries and Archives in the UK* (London: National Preservation Office, British Library, 2006) accessed August 28, 2013, www.bl.uk/blpac/pdf/knowing.pdf.
16. Nicholson Baker, *Double Fold: Libraries and the Assault on Paper* (New York: Random House, 2002).
17. Network Development and MARC Standards Office, Library of Congress, *Preservation & Digitization Actions: Terminology for MARC 21 Field 583 (2004)*, accessed August 28, 2013, www.loc.gov/marc/bibliographic/pda.pdf; Laura McCann, "Conservation Documentation in Research Libraries: Making the Link with MARC Data," *Library Resources & Technical Services* 57, no. 1 (2013): 30–50.

Appendix. Copy of Survey Form

Online Consent

Prioritization for Preservation Treatment Decision Making in a Collaborative Library Environment

You are invited to participate in a research study to document current practices and trends in preservation and conservation decision making based on the availability of physical and digital surrogates as practiced in libraries. It is being conducted by Jennifer Hain Teper, Head of Preservation and Conservation at the University Library and Sylvie Rollason-Cass, graduate student, at the University of Illinois Urbana-Champaign.

This study will take approximately 10–20 minutes of your time. You will be asked to complete an online survey about your institutional practices in selecting materials for preservation action. Your decision to participate or decline participation in this study is completely voluntary and you have the right to terminate your participation at any time without penalty. You may skip any questions you do not wish to answer. If you want do not wish to complete this survey just close your browser. Your participation in this research will be completely confidential and data will be averaged and reported in aggregate. Possible outlets of dissemination may be peer reviewed journal articles and professional conference presentations.

Although your participation in this research may not benefit you personally, it will help us understand how the effects of available digital surrogacy and shared print repositories are changing the way preservation decisions are being made. There are no risks to individuals participating in this survey beyond those that exist in daily life.

If you have questions about this project, you may contact the Principal Investigator at 217-244-5689, or jhain@illinois.edu. If you have any questions about your rights as a participant in this study or any concerns or complaints, please contact the University of Illinois Institutional Review Board at 217-333-2670 (collect calls will be accepted if you identify yourself as a research participant) or via email at irb@illinois.edu.

Please print a copy of this consent form for your records, if you so desire.

I have read and understand the above consent form, I certify that I am 18 years old or older and, by clicking the submit button to enter the survey, I indicate my willingness voluntarily take part in the study.

- (Submit) I have read the description and agree to participate in this study
- (Decline) I have read the description and do not wish to participate in this study

Section I: General Information

1. What position do you currently hold? (select one answer that best describes your position)
   - ○ Preservation Professional
   - ○ Preservation Support Staff
   - ○ Conservation Professional
   - ○ Conservation Support Staff
   - ○ Collection Management Librarian
   - ○ Collection Management Staff
   - ○ Other
   - ○ Enter text:

2. What type of institution do you currently work in?
   - ○ US/Canada ARL institution
   - ○ US/Canada non-ARL institution
   - ○ Non-US research library
   - ○ Non-US non-research library
   - ○ Other
   - ○ Enter text

3. What is the total collection size in your institution?
   - ○ Under 1 million volumes
   - ○ 1–3 million volumes
   - ○ 3–5 million volumes
   - ○ 5–8 million volumes
   - ○ 8 or more million volumes
   - ○ Other

Section II: Current Preservation Practices

Please answer the following in FTE where one FTE = 40 hours/week for 50+ weeks per year. A less than full-time position appointed for less than a full year would be calculated as follows: 1 half time position working for 9 months would equal .5 (hrs/week) × .67 (months/year), or .33 FTE.

1. What is your current preservation and/or conservation staff in FTE (full-time equivalents). Please include any paid or volunteer labor you have within the preservation/conservation program currently, in aggregate. Please do NOT include other FTE outside of the formal preservation/conservation program or unit. answer must be numeric
2. Which preservation action(s) does your institution undertake? (select as many as apply)
   - ○ Special collections conservation treatment
   - ○ General collections conservation treatment/Book repair

- ○ Pamphlet binding
- ○ Library binding
- ○ Construction of custom protective enclosures (in house or purchased)
- ○ Preservation reformatting of brittle paper materials through microfilm
- ○ Preservation reformatting of brittle paper materials through digitization
- ○ Preservation reformatting of brittle paper materials through "preservation photocopy" replacements
- ○ Replacement of damaged materials through the purchase of available replacement copies (used book market)
- ○ Discard of damaged materials (those NOT replaced through reformatting or replacement copies)

3. Describe how your preservation staffing has changed (if at all) to meet the changing preservation needs of libraries, such as digital preservation, media preservation, and the effects of digital access to traditionally paper collections. If your preservation staffing has not changed, please select the default of «no change»

4. How are materials identified for preservation action? (select as many as apply)
   - ○ Circulation
   - ○ Curatorial review
   - ○ Interlibrary Loan
   - ○ Collection shift/relocation projects
   - ○ Exhibits
   - ○ At shelf
   - ○ Other
   - ○ Enter text:

Section III: Selection for Preservation

1. Do you consider the possibility of a piece being incorporated into a Shared Print Repository when evaluating items for repair?
   - ○ Yes (continue to question 2)
   - ○ No (skip to question 3)

2. If yes, have you implemented physical review procedures to ensure the completeness and/or soundness of the copy?
   - ○ Yes
   - ○ No
   - ○ If yes, please describe your review procedures briefly.
   - ○ Enter text:

3. Does your institution undertake any of the following procedures when considering treatment (repair, reformatting or boxing) of materials: Search for print replacement copies; Search for availability of national, regional, or consortial holdings; Search for availability of digitized content; or Collect historical circulation/use statistics?
   - ○ Yes
   - ○ No (No further responses are required—you may exit the survey)

4. If any of the above are selected, how much time, on average, do staff spend in aggregate for reviewing each item prior to making treatment decisions?
   - ○ 0–2 mins
   - ○ 3–5 mins
   - ○ 6–10 mins
   - ○ 11–15 mins
   - ○ 16–20 mins
   - ○ 20–30 mins
   - ○ Other
   - ○ Enter text:

Select all that apply.

5. If any of the above are selected, what types of treatments are given this level of review/consideration?
   - ○ SELECT Special collections conservation treatment
   - ○ ALL Special collections conservation treatment
   - ○ SELECT General collections conservation treatment/Book repair
   - ○ ALL General collections conservation treatment/Book repair
   - ○ SELECT Pamphlet binding
   - ○ ALL Pamphlet binding
   - ○ SELECT Library binding
   - ○ ALL Library binding
   - ○ SELECT Construction of custom protective enclosures (in house or purchased)
   - ○ ALL Construction of custom protective enclosures
   - ○ SELECT Preservation reformatting of brittle paper materials through microfilm
   - ○ ALL Preservation reformatting of brittle paper materials through microfilm
   - ○ SELECT Preservation reformatting of brittle paper materials through digitization
   - ○ ALL Preservation reformatting of brittle paper materials through digitization
   - ○ SELECT Preservation reformatting of brittle paper materials through "preservation photocopy" replacements
   - ○ ALL Preservation reformatting of brittle paper

materials through "preservation photocopy" replacements
- ○ SELECT Replacement of damaged materials through the purchase of available replacement copies (used book market)
- ○ ALL Replacement of damaged materials through the purchase of available replacement copies
- ○ SELECT Discard of damaged materials (those NOT replaced through reformatting or replacement copies)
- ○ ALL Discard of damaged materials

Section IV: Print Replacement

1. Does your institution search for print replacements prior to making treatment decisions?
   - ○ Yes
   - ○ No—Please advance to Section V: Holdings
   - ○ I think so, but don›t know any specifics (done in another department)—Please advance to Section V: Holdings
   - ○ Other
   - ○ Enter text:

2. When searching for availability of print replacement copies, do you: (check all that apply)
   - ○ Search only for exact replacements of the title (same publisher, edition, and year)
   - ○ Search for "similar" replacements of the title (different editions, publishers, etc)

3. Do you evaluate the physical condition of the replacement copy before bringing it into the collection?
   - ○ Yes
   - ○ No

4. 4 If yes, what are your criteria for evaluation before replacement? (check all that apply)
   - ○ Completeness
   - ○ Paper strength
   - ○ Binding condition
   - ○ Binding format (original cover vs. rebound)
   - ○ Other

Section V: Holdings

1. Does your institution search for the availability of other institutional holdings prior to making treatment decisions?
   - ○ Yes
   - ○ No—Please advance to Section VI: Digital Surrogates
   - ○ I think so, but don›t know any specifics (done in another department)—Please advance to Section VI: Digital Surrogates
   - ○ Other
   - ○ Enter text:

2. When searching for availability of other institutional holdings, do you search for: (select all that apply)
   - ○ Number of holdings on a national basis
   - ○ Number of holdings on a consortial, regional, and/or state-wide basis
   - ○ Other
   - ○ Enter text:

3. Do you search availability for monographs and journals?
   - ○ Monographs or monographic sets only
   - ○ Journals only
   - ○ Monographs and journals

4. How does the availability of holdings at other institutions affect your local preservation treatment decisions? (check all that apply)
   - ○ If over a certain number, will not treat (return to shelf untreated)
   - ○ If over a certain number, will discard/withdraw
   - ○ If under a certain number, will move to special collections
   - ○ Holdings have no bearing on treatment decisions
   - ○ Other
   - ○ Enter text:

5. Describe how holdings data influence your decision to discard (or retain) a damaged copy, for example: "to discard an item, we require at least 3 holdings in our state and 26 holdings nationally."

Section VI: Digital Surrogates

1. Does your institution search for the availability of digitized content prior to making treatment decisions?
   - ○ Yes
   - ○ No—Please advance to Section VII: Use
   - ○ I think so, but don›t know any specifics (done in another department)—Please advance to Section VII: Use
   - ○ Other
   - ○ Enter text:

2. When searching for availability of available digital content, do you search for: (select all that apply)
   - ○ Availability of ANY openly available digitized content
   - ○ Availability of openly available digitized content in a trusted digital repository, only.

- ○ Availability of licensed digitized content (such as many electronic journals) associated with a third-party preservation service (through Portico, LOCKSS, CLOCKSS)
- ○ Availability of licensed digitized content associated with known vendor supported print repository (such as JSTOR)
- ○ Availability of digitized content associated with known community supported print repositories (WEST or CRL, for instance)
- ○ Availability of digitized content NOT associated with a third-party preservation service, nor print repository
- ○ Other
- ○ Enter text:

3. If you use ANY of the above digital content for preservation purposes, do you:
   - ○ Accept the digitized content without review
   - ○ Perform cursory (spot) review of quality/completeness of digitized content
   - ○ Perform full review of legibility and completeness
   - ○ Perform extensive page-level examination

4. How does the availability (assuming it meets any quality review) of digital content affect your local preservation treatment decisions?
   - ○ If available, will not treat physical item (return to shelf untreated)
   - ○ If available, will provide protective enclosure only
   - ○ If available, will discard/withdraw
   - ○ Availability has no bearing on treatment decisions
   - ○ Other
   - ○ Enter text:

5. If you maintain the physical item, do you mark the item or enclosure in any way to indicate the availability of digitized content:
   - ○ Yes
   - ○ No
   - ○ Other
   - ○ Enter text:

6. Once digitized content is identified, do you add a link or note about the availability in any of the following?
   - ○ Local ILS
   - ○ MARC 583 field
   - ○ Other
   - ○ Enter text:

7. Are there any procedures in place for your library to scan and supplement an existing, externally managed digital file (for missing text, illustrations, foldouts or pocketed materials, for instance)?
   - ○ Yes
   - ○ No
   - ○ Other
   - ○ Enter text:

VII: Use

1. Does your institution search for history of use prior to making treatment decisions?
   - ○ Yes
   - ○ No—No further questions
   - ○ I think so, but don't know any specifics (done in another department)—no further questions
   - ○ Other
   - ○ Enter text:

2. If yes, please describe how and if a specific time interval (e.g. X circulations in the last 10 years) is utilized.
   - ○ If over a certain number of uses, item will be treated regardless of holdings or availability of digitized content.
   - ○ Other
   - ○ Enter text:

Survey Wrap-Up

1. Please add any additional comments either about your preservation practices or about your responses here:

2. Would you be willing to be contacted for further details regarding your responses to these questions?
   - ○ Yes
   - ○ No

3. If yes, please enter your contact information below, including name, institution, and preferred contact information (phone number or e-mail):

Positioning Libraries for a New Bibliographic Universe

A Review of Cataloging and Classification Literature 2011–12

Kristin E. Martin and Kavita Mundle

This paper surveys the English-language literature on cataloging and classification published during 2011 and 2012, covering both theory and application. A major theme of the literature centered on Resource Description and Access (RDA), as the period covered in this review includes the conclusion of the RDA test, revisions to RDA, and the implementation decision. Explorations in the theory and practical applications of the Functional Requirements for Bibliographic Records (FRBR), upon which RDA is organized, are also heavily represented. Library involvement with linked data through the creation of prototypes and vocabularies are explored further during the period. Other areas covered in the review include: classification, controlled vocabularies and name authority, evaluation and history of cataloging, special formats cataloging, cataloging and discovery services, non-AACR2/RDA metadata, cataloging workflows, and the education and careers of catalogers.

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Cataloging practice is undergoing enormous change as the library community responds to the development and adoption of a new cataloging code, Resource Description and Access (RDA); the Functional Requirements for Bibliographic Records (FRBR), which is a theoretical model upon which RDA is constructed; and is transitioning into linked data and the Semantic Web. General anxiety and concern about the impending adoption of RDA due to its economic, operational, and technical viability led the three US national libraries—the Library of Congress (LC), the National Library of Medicine (NLM), and the National Agriculture Library (NAL)—to commence a national test of RDA that officially ended in March 2011, and ultimately resulted in the decision to adopt and implement RDA no earlier than January 1, 2013.[1] This literature review period, 2011–12, thus covers the results of the test by the official RDA test participants who were involved in RDA testing, and the outburst of opinions and preparations regarding the library community's adoption and implementation of RDA. The literature is also full of articles highlighting theoretical and practical experiences with the FRBR family of models, considerations and prototype projects of applying linked data principles to library data, and explorations of data beyond Machine Readable Cataloging (MARC) syntax, which all form the overarching themes of this review. Comparisons between user-contributed

Table 1. Distribution of Articles in Literature Review

Area of Literature Review	Number of Articles
Cataloging Standards: RDA, FRBR, and BIBFRAME	136
Linked Data and Bibliographic Data Standards	127
Controlled Vocabularies and Authority Control	112
Classification	37
Bibliographic Control (contains evaluation and history of cataloging; special formats cataloging; discovery services; non-AACR2/RDA metadata; workflows and cooperative cataloging)	243
Catalogers: Education and Careers	30

metadata and subject vocabularies to enhance access to library resources made fine contributions to the existing literature on the topic. Articles related to cataloging as a profession, cataloging history, cataloging education, workflows, and discovery services are explored in a way that depict the developments in and current status of the field and are well represented in the review. Classification using established classification systems and adaptations of those systems continued to be present in the literature.

Method

The authors began the project by setting up accounts and a group project in Mendeley, a citation management software (www.mendeley.com). The service allows a group of authors to share a set of articles, notes, annotations, and tags. Search terms and tags assigned to articles were tracked using a spreadsheet shared in Google Drive. The authors hired a student to search and upload articles to the private group. Searching was done in *Library Literature and Information Science Full Text* and *Library, Information Science, and Technology Abstracts*, and limited to publication years 2011 and 2012 and English language material. The search terms used were: cataloging, bibliographic control, information organization, AACR2, RDA, MARC formats, authority control, classification, Dewey Decimal Classification (DDC), Library of Congress Classification (LCC), subject headings, Library of Congress Subject Headings (LCSH), FRBR, metadata, user contributed metadata, WorldCat, linked data, Dublin Core (DC), batch loading, vendor records, technical services and workflow, technical services and reorganization, and catalog records. The authors also reviewed tables of contents from selected journals that had a scope specific to library technical services to check for any missed articles, reviewed WorldCat for monographic material, and incorporated monographs from book reviews. A total of 1,421 deduplicated citations were entered into Mendeley. The authors read and reviewed the entries, tagged them in appropriate subject areas, and removed citations that were not considered within the scope of the review. Contributions were considered in scope if the focus was on the library practice or theory of bibliographic control, classification, or library standards for organization of information. The authors chose not to include literature on data curation, discovery tools (except as they specifically intersected with cataloging theory and practice), indexing and abstracting issues, and non-descriptive metadata. The authors excluded content with a serials focus because of the existence of a separate literature review on serials published within *Library Resources and Technical Services.* A total of 481 entries remained, with 267 published in 2011 and 213 published in 2012.

Clearly too many articles to describe within a single review, articles ultimately cited were those with particular significance to an area or representative of a theme in the literature. Many worthwhile contributions were omitted due to space constraints. The articles have been organized into six major categories. Table 1 details the number of articles tagged for each given area. Because many articles were assigned multiple tags, the sum exceeds 481.

Cataloging Standards: RDA and FRBR

The two most widely discussed topics in the cataloging and classification literature were the new cataloging code, RDA, and the conceptual framework upon which RDA is based, FRBR. Given the significant events that unfolded during the literature review period—the conclusion of the RDA test, revisions to RDA, the decision of the US national libraries to adopt RDA—the emphasis on RDA is not surprising. Papers on RDA included basic descriptions of RDA for the uninitiated, explorations of the differences between RDA and AACR2, results of the test, ideas for implementation, and opinions and concerns for the future. The FRBR family (which includes the Functional Requirements for Bibliographic Records, the Functional Requirements for Authority Data (FRAD), and the Functional Requirements for

Subject Authority Data (FRSAD)) was also a much debated topic due to its close connection with RDA. Despite FRBR dating to 1998, many articles still began with basic introductions to FRBR, especially for FRAD and FRSAD, which are more recent. FRBR Object Oriented (FRBRoo), first introduced in 2008, was explored in a group of articles. Articles tended to be either theoretical, examining the reasoning and underpinning of the conceptual model, or practical, with empirical articles providing case studies of applying FRBR principles to existing catalog data and practice.

Resource Description and Access (RDA)

Ever since RDA was released in draft form in 2008 and later online as the RDA Toolkit in 2010, it has received a lukewarm response from the library community due to concerns about its economic, operational, and technical feasibility.[2] The three US national libraries organized a national test of RDA and the RDA Toolkit from July 2010 to March 2011. In June 2011, they announced their plans to adopt RDA and implement it no sooner than January 2013 with specific recommendations regarding changes to RDA such as: rewording RDA in plain English, enhancing and improving functionality of the RDA Toolkit, and coordinating RDA training.[3] The literature published in 2011 is replete with reports of RDA testing by US academic libraries, public libraries, library schools, and informal testing by various ALCTS committees, of which only a small handful can be covered here. A special theme issue of *Cataloging and Classification Quarterly* edited by Hall-Ellis and Ellett on RDA testing captures the experiences of test participants, their perspectives on the implementation of RDA, and lessons learned during the process of creating bibliographic description according the new rules of RDA.[4] Kuhagen relates the details of the training undertaken by LC for the test participants and lessons learned that could be easily applied by other libraries implementing RDA.[5] Cronin describes the experiences of being an RDA test participant and strategies to fully implement RDA after the test period, emphasizing that at least a brief introduction to FRBR is necessary.[6] He highlights major issues in managing an RDA implementation, which include staff training, changes in cataloging procedures, preparing an integrated library system for RDA, merging AACR2 and RDA records, display challenges, and the cost effect on outsourced cataloging and authority control. Other articles describe the RDA testing experiences and results among different user communities and resource types, and testing performed by library information science educators.[7]

The RDA Toolkit is a web-based online product that provides RDA text and cataloging-related resources including AACR2, crosswalks between AACR2 and RDA, workflows, and links to Cataloger's Desktop (https://desktop.loc.gov). Strengths noted in the literature include easy navigation, a comprehensive table of contents, workflow features, and simple and advanced search features. Drawbacks include the ongoing expense of a subscription to the Toolkit, which is especially a concern for smaller libraries that are unsure about whether they will adopt RDA; problems synchronizing the table of contents to the current location of text in the Toolkit; and the need for multiple windows.[8] RDA test participants also expressed a lack of confidence in the Toolkit's navigation, searching, and workflow features, and complained that the Toolkit's structure is not intuitive and takes too much time to understand.[9]

Since the development of RDA, the cataloging community has expressed divided opinions on its perceived merits and flaws. Johnson reflects on the experiences of libraries when AACR2 was implemented.[10] She notes that AACR2 implementation was stressful due to changes in the rules for constructing headings for names and titles, closing the card catalog, and shifting to an online catalog. Randall approaches criticism about RDA, its implementation, and RDA testing optimistically, suggesting that both RDA and AACR2 faced similar economic constraints, technological challenges, and implementation issues.[11] RDA has been issued as libraries are experimenting with discovery layers to provide seamless access to library metadata while facing economic challenges, waiting for revisions to the wording of the text of RDA, and, most importantly, anticipating MARC's successor. Randall believes that if AACR2 was successfully implemented during its own challenges, the same will happen for RDA.

For catalogers with little or no prior RDA knowledge, Tillett's article sets the context of understanding RDA and FRBR and touches upon all major issues related to RDA.[12] She offers a general overview of FRBR, provides a history of why RDA was developed, and discusses how RDA can be used as linked data for the Semantic Web. She points out that RDA has an element-based approach that helps differentiate names and relationships that machines can easily use. Readers seeking an introductory book to the cataloging of all types of resources will benefit from reading Welsh and Batley's *Practical Cataloguing: AACR2, RDA and MARC 21*, and those wanting a focus on e-resources should review *Describing Electronic, Digital, and Other Media Using AACR2 and RDA* by Weber and Austin.[13] Both are valuable resources for cataloging materials in RDA and provide an introduction to the FRBR model with numerous examples of how records are created in AACR2 and RDA. Although RDA provides an overarching framework to create consistent bibliographic information, it also provides more flexibility for options and use of cataloger's judgment that could lead to loss of consistency in the catalog. According to McCutcheon, guidance in creating local "best practices" is important for copy catalogers.[14] He provides descriptions of field-by-field instructions

for copy catalogers to review MARC records in RDA, particularly monographs, to ensure consistency in the catalog.

FRBR Family

It has been over a decade since FRBR was developed yet the community is still struggling to grasp it as an acceptable model. A special issue of *Cataloging and Classification Quarterly* edited by Smiraglia on the "The FRBR Family of Models" contributes extensively to the debate, research, and analysis surrounding FRBR.[15] Papers in this issue explore the FRBR family of models including FRAD, FRSAD, and FRBRoo. The major themes are FRBR implementation studies; FRBR extension studies; FRBR and cataloging code; and the connection between FRBR, linked data, and the Semantic Web. These studies offer deeper interpretations and understandings of issues related to FRBR and attempt to answer the question: is FRBR still relevant today, especially in the world of linked data?

Smiraglia draws attention to some of the major problems or lacunae of FRBR—identification and definition of entities "work" and "expression."[16] He comments that the problem of inherent hierarchical sequence of work, expression, manifestation, and item in FRBR weakens the applicability of FRBR to the complex universe of bibliographic data. He questions whether it is pragmatic to construct future catalogs around the idea of "work." FRBR, when developed more than a decade ago as a conceptual model, was believed to provide structure and format to the library catalog. Technology now allows for the transfer of library records in RDF format and in linked data format without FRBRizing catalogs. Le Bouef, in the foreword to the special issue, urges the library community to consider the reformulation of FRBR with the object-oriented definition FRBRoo.[17] In 2009, an international working group harmonized two conceptual models, FRBR and the Comité International pour la Documentation Conceptual Reference Model (CIDOC-CRM—a model developed in 1996 by the museum community) into now what is known as FRBRoo.[18] Thus, in Le Bouef's estimation, in the last fourteen years FRBR has metamorphosed into the current pinnacle of FRBRoo, promising a new future for bibliographic data.

The use of FRBR principles in RDA has become a focal point of many debates. Taniguchi examined how RDA implements the FRBR and FRAD models and how it differs from FRBR while it specifies relationships between works and manifestations.[19] The author proposes a new model for FRAD to better reflect RDA. Riva and Oliver offer an in-depth review of the extent of RDA alignment and divergence with FRBR and FRAD with respect to user tasks, entities, attributes, and relationships.[20] RDA's treatment of names and identifiers as data elements is closer to the FRBR attributes than to the FRAD concept of them as separate entities. For those interested in exploring subject analysis within the context of the FRBR conceptual model (including FRAD and FRSAD) and RDA, Zavalina explores the history of subject analysis and its lack of prominence within cataloging codes, and also explores the FRSAD concepts of "thema" and "nomen."[21] For those interested in exploring authority control within the FRBR family, Doerr, Riva, and Žumer explain how conceptual models allow for the consistent use of identity, identification, and appellation that are crucial for authority control.[22]

Zhang and Salaba conducted three user studies for FRBRized catalogs.[23] Users preferred the FRBR-based catalogs rather than regular catalogs due to their superior organization and faceted display, and were better able to accomplish their tasks, especially with known author or title searches. Morse describes how cartographic materials and sheet maps fit into the entity-relationship model of FRBR.[24] Morse found that "the nontextual nature of sheet maps makes them difficult to fit into relationship taxonomies developed primarily for textual resources."[25]

One of the criticisms of FRBR is that it was developed fourteen years ago and that the library community is too late in adopting it. Rose points out that during that time, next generation catalogs have appeared and catalog design has moved away from FRBR, and so creating the FRBRized catalog now is a moot point.[26] Allison-Cassin offers an intellectual critique of how bibliographic data are organized in RDA and its underlying conceptual foundation of FRBR.[27] She argues that the FRBR model is complex, rigid, causes imbalance in defining certain relationships over others, and removes serendipity in finding library data. To make bibliographic data more accessible to outside web services and systems, she proposes a new model of cataloging using linked data. Additional limitations of FRBR as it relates to linked data are noted below.

The Future of Bibliographic Data Recording Formats: BIBFRAME

The probable move away from MARC as the main data recording format for resource description invites commentary within the literature. MARC is not seen as compatible with the Semantic Web. Lee and Jacob, in an exploration of an alternative data format for holding bibliographic information, note that "MARC's ability to represent relationships between bibliographic entities with multilayered characteristics also is problematic because of its linearity and its flat, single-layered structure."[28] They present an alternative approach to bibliographic data, creating a conceptual structure to identify core bibliographic elements and connect MARC elements to their related FRBR attributes and vice-versa. Whereas their proposed structure is conceptual, not

syntactic, the ideas are a step toward introducing relationships in catalogs.

During the period of this literature review, LC began research into developing a replacement for MARC and contracted with Zepheira to launch the Bibliographic Framework (BIBFRAME) Transition Initiative.[29] Within ALA, the Library and Information Technology Association (LITA) and the Association for Library Collections and Technical Services (ALCTS), with the support of the Reference and Users Services Association (RUSA), formed the ALCTS/LITA Metadata Standards Committee, which began work during the ALA Midwinter meeting in January 2013 to consider new metadata.[30] While the new committee could consider voting on issues related to MARC, MARC is not expected to be the its prevailing focus.

In early 2012, LC released a report on BIBFRAME.[31] The report provides details about four BIBFRAME classes: Creative Work, Instance, Authority, and Annotation. It is designed to represent the relationships between entities as outlined in FRBR, and is presented in an RDF serialization to be compatible with linked data. Ford, recognizing both the virtues of a new format and the need to manage MARC legacy data, states, "Transition away from MARC will not be revolutionary, but a gradual process that ensures data integrity, system stability, and that no group is unintentionally left behind, in so far as is manageable."[32]

Linked Data and Bibliographic Data Standards

Although the concept of linked data has existed since Berners-Lee coined the term "Semantic Web" in 2001, it has grown in importance to both the library community and the greater web world. For readers new to the concept, one of the most comprehensive introductions and foundational readings on the subject is Coyle's review and description of linked data and Semantic Web standards in *Library Technology Reports,* "Linked Data Tools: Connecting on the Web."[33] It is dedicated to explaining linked data, and provides an excellent starting point for understanding both what linked data are and their potential transformative power. Another excellent foundational article for understanding linked data and their potential for libraries is Schreur's "The Academy Unbound."[34] The current system of a master record in MARC format residing in a shared utility while individual libraries maintain their own copies is duplicative and inefficient, and MARC format does not interface well with the web environment. Pieces of a catalog record, though they make sense within the context of that record, have little meaning outside of the record, unlike a triple, which is self-contained. Catalogers need to let go of the concept of a bibliographic record and instead consider the individual triple statements that together make up a description of a resource, which Schreur labels a paradigm shift.

There is a growing body of literature that provides concrete examples of projects and prototypes using linked data. LOD projects of the British Library, Deutsche Nationalbibliothek, and OCLC, plus work-to-expression standards, including RDA and FRBR, in linked data terms are described in LC's paper introducing BIBFRAME.[35] The W3C's Library Linked Data Incubator Group presented recommendations for libraries to become more involved in linked data projects by identifying data sets that can be exposed as linked data, increasing library participation in Semantic Web standards development, creating URIs and policies for managing linked data vocabularies and URIs, and providing libraries the experience to curate and preserve linked data sets over the long term.[36] The Library Linked Data Workshop, held at Stanford University in 2011, sought to address the recommendations of the incubator group by building understanding and enthusiasm for linked data in libraries and presenting a value statement in support of linked data, with a list of potential linked data projects for libraries.[37]

The Oslo Public Library's Pode Project highlights how library catalog data can be transformed into linked data.[38] It uses an automated tool to FRBRize the display of MARC catalog records and uses linked data to connect to external sources of information such as DBpedia, Project Gutenberg, and the Virtual International Authority File (VIAF). *Information Standards Quarterly* featured a themed issue on linked data that cited many prominent linked data projects, including OCLC's use of schema.org to expose WorldCat to search engines.[39] The Europeana Linked Data Pilot uses the Europeana Data Model to allow institutions to contribute their data in a linked data format.[40] The Linked Open Copac and Archives Hub project of JISC uses linked data to connect biographical information to archival resources.[41] In one of the more practical articles for helping institutions take the first step toward linked data, Van Hooland, Verborgh, and Van de Walle describe how to use Open Refine as a tool to clean up messy and inconsistent data before transforming them into linked data.[42]

For a comprehensive description of the entire FRBR family's (FRBR, FRAD, FRSAD) representation in linked data, readers would be best served to study Dunsire's paper "Representing the FR Family in the Semantic Web," which describes the development of the FRBR namespace.[43] Baker critiques how the hierarchical structure within the FRBR Group 1 entities has been expressed in RDF using the Web Ontology Language (OWL) in such a way that there are four differentiated, non-overlapping entities.[44] Thus a triple can belong to only one of the four Group 1 entities, so a resource, for example, cannot be declared both a work and an expression. Murray and Tillett, in their paper, "Cataloging

Theory in Search of Graph Theory and Other Ivory Towers," consider how resource description is inherently limited by catalogers' viewpoints and biases, and suggest using graph theory from mathematics to consider multiple viewpoints and descriptions and link them together.[45] They consider a reworking of FRBR's representation in RDF, and rather than strict demarcation between the FRBR Group 1 entities, they recommend that the system of description recommended by FRBR be considered as interrelated building blocks describing the characteristics and relationships among the entities.

Both Howarth and LeBoeuf believe that FRBRoo, as an object-oriented model, will be better positioned than the traditional entity-relationship in FRBR to be exposed using RDF technologies.[46] Miller expressed concerns about using RDF as the data format for BIBFRAME and RDA data, and feels that like MARC, it is too complex and cumbersome to be adopted by the wider technology community beyond libraries; and the simpler schema.org, launched by Bing, Google, and Yahoo, would better serve libraries.[47] Yee expresses concern regarding the decomposition of records into triples, stating, "RDA seems to take it on faith that a huge increase in granularity is a good thing without any prior experimentation to demonstrate how these tinier and tinier bits of data will be reassembled into coherent displays and indexes."[48]

Controlled Vocabularies and Authority Control

Controlled vocabularies and authority control were popular topics in 2011 and 2012. Contributions in this area include the relationship of controlled vocabularies to the Semantic Web; projects to represent and improve the use of controlled vocabulary for retrieval; citations that focus on LCSH; user-contributed tags, including comparisons between them and traditional controlled vocabularies; and research related to name authority control.

The literature also addressed the creation of ontologies and the representation of controlled vocabularies in linked data. Coyle introduces many controlled vocabularies that are being made available in linked data format.[49] Allinson describes how the Tate Museum developed its own ontology as part of creating the linked data set in the OpenART project.[50] Nisheva-Pavlova and Pavlov provide another example with the description of subject ontology for access to a repository of Bulgarian folk songs.[51] Pattuelli describes a project to develop an ontology for a digital primary source collection, "Tobacco Bag Stringing," at the University of North Carolina at Chapel Hill, where instructors planning to use the material provided input into ontology creation and revision.[52]

There are tools available to find information about different vocabulary projects that can help determine when an existing vocabulary will meet a project's need or if a new vocabulary is necessary. Hlava describes TaxoBank, a collaborative site where users can search for and add information on controlled vocabularies of all types.[53] Another registry is the Open Metadata Registry (OMR), which grew out of the National Science Digital Library (NSDL) Registry.[54] Dunsire et al. believe that while there are challenges in reusing other metadata and in trying to align new metadata with existing vocabularies, this type of mapping and alignment will best serve the Semantic Web in the future.[55]

As a popular controlled vocabulary for subject terms, LCSH was frequently discussed in the literature. For a basic introduction, Broughton's book, *Essential Library of Congress Subject Headings,* provides an overview of LCSH and is geared toward UK catalogers who might be unfamiliar with the controlled vocabulary.[56] Several articles explore dissatisfaction over LCSH's coverage of terms used to describe certain populations. Essays by Greenblatt and Roberto complain that Lesbian, Gay, Bisexual, Transgender, Intersex, and Queer (LGBTIQ) populations are marginalized or misrepresented in LCSH.[57] In a survey distributed at five indigenous-related conferences and events in the US and Canada, respondents indicated dissatisfaction with current terminology in LSCH used to describe Native Americans, particularly in Canada.[58]

Strader examined the citation practices of 285 theses and dissertations at The Ohio State University (OSU) to compare citation patterns across disciplines and determine the effectiveness of LCSH in providing access across different meterial types.[59] The study revealed that LCSH is less effective in providing subject access to those material types that present new research such as proceedings and presentations, thus suggesting that LCSH, by relying on catalogers' proposals of new headings through literary warrant, lags behind.

User-contributed metadata to enhance access to resources was discussed frequently within the 2011–12 literature. Terms supplied by users can create a system of related terms and categories, sometimes called a folksonomy. Porter provides an overview of folksonomies and reviews the related literature through 2009.[60] Their main disadvantages, lack of semantic and linguistic control, are also their greatest strengths as they are not tied to particular terms, unlike traditional controlled vocabularies. Comparisons between user-contributed metadata and controlled vocabulary systems, particularly LCSH, frequently refer back to criticisms of traditional controlled vocabulary as too rigid and unable to represent the diversity of the users they are trying to serve. Alemu, Stevens, and Ross argue that "a social constructivist approach should be adopted by libraries and other cultural heritage institutions" and that collaborative metadata approaches, where users contribute metadata and there are terms assigned from a controlled vocabulary, will enhance

interoperability by allowing for the representation of multiple viewpoints.[61] As an example of the social constructivist approach, the Center for Colorado and the West at Auraria Library worked with members of Native American tribes and the Latino community to provide enhanced descriptions of digitized materials.[62] Other articles by Anfinnsen, Ghinea, and de Cesare, Lee and Schleyer, and Stvilia, Jörgensen, and Wu explore how user-generated tags and folksonomies can complement, but not replace, controlled vocabularies.[63]

LibraryThing for Libraries (LTFL) provides a corpus of social tags to incorporate into library catalogs. DeZelar-Tiedman compared the University of Minnesota's catalog of LCSH coverage of literary works and LibraryThing's tag clouds to evaluate the benefit of LTFL.[64] She suggests the service might benefit most a subset of a library's catalog, like popular fiction, but also questions if the cost is worthwhile, given that so many searches start outside of the library catalog. Through usability testing, Pirmann notes that LTFL tags show promise for enhancing subject access and discovery of items in the library catalog, but also notes some of their limitations, including the lack of system support for tag-based searches, lack of controlled vocabulary structures, and questionable relevancy of some tags.[65]

A major area of research has been exploring the use of identifiers to disambiguate names. For those unfamiliar with VIAF, Loesch provides an introduction that describes its creation and its contributing partners, including the Program for Cooperative Cataloging's (PCC) Name Authority Cooperative (NACO), Die Deutsche Bibliothek (German National Library), and the Bibliothèquenationale de France.[66] The International Standard Name Identifier (ISNI), an ISO standard, uses VIAF data, along with industry data, to create what Nuttall and Oh describe as a "party identifier," which is a rigorous number designed to identify parties responsible for content, both for discovery purposes and for tracking royalties.[67] ISNI allows information to be shared across different domains without revealing sensitive information and, by using a unique identifying number, allows information to be used in linked data applications and to be identified as FRBR Group 2 entities.

Thomas believes that currently, information in authority records displayed to users in the catalog does not provide enough assistance to users to allow them to correctly identify a person.[68] He examines how different web resources, such as the Internet Movie Database (IMDB) and Wikipedia disambiguate names, and suggests that libraries add short descriptive phrases to authority records. Bainbridge, Twidale, and Nichols offer a method for user feedback to improve authority control and assist in name disambiguation.[69] They created a prototype that allows users to confirm or deny potential authority matches, and enables the system to use this feedback to update authority records.

Classification

The literature published in 2011–12 highlights classification practices of libraries using both standard and custom classification systems. DDC is in its 135th year of publication and its 23rd edition was published in 2011. The 23rd edition is available online as WebDewey, and incorporates the abridged DDC 15th edition.[70] This edition introduces minor changes in terminology, adds more languages in table 6, and relocates numbers within a few classes.[71] Trickey provides an overview of the full 23rd edition of DDC.[72] A series of new topics such as cloud computing, bullying, and Pilates have been added, and the recent edition has increased subject specificity. Using a randomly selected sample of 100 DDC classes, Green studied see-also relationships within DDC that are intended to help catalogers distinguish and select the relevant class, and suggests steps to improve the use of these relationships.[73]

Lösch et al. created a bilingual text corpus using DC metadata collected through the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) and aggregated for the Bielefeld Academic Search Engine (BASE).[74] Each record is annotated with at least one DDC classification number that provides subject mapping of the corpus. Joorabchi and Mahdi propose a prototype software system for automatic classification of scientific documents according to DDC.[75] The authors applied DDC to references in research articles, papers, and reports from CiteSeer, a scientific digital repository.

For readers interested in LCC, Higgins offers a historical account of LCC's development and its relationship to LCSH.[76] Although LCC is often used in large academic libraries, it reflects "a superannuated American viewpoint" and "systemic problems inherited from the scheme's founding principles."[77] Higgins cites examples to illustrate LCC's inherent quirks and problems, and argues that it fails to meet the needs of the twenty-first century.

Class N or Fine Arts in the LCC is the schedule used the most by fine art libraries. Clarke delves into the history, organization, new editions, and current structure of the Class N schedule, noting some challenges specialized libraries may have, particularly in relation to country of origin and photography.[78] Lee illustrates an example of customizing the N schedule for art libraries by describing the Courtauld Classification System (CCS), used at the Courtauld Institute and adapted from the third edition of the LCC's N schedule.[79] Customization allows it to fit the library's collection, but entails a continuing commitment for the library to stay current with modifications to ensure that it reflects the library's collection and new forms of resources.

Other forms of classification were covered in the literature, including Colon Classification (CC), a faceted classification system developed by Ranganathan and used in

Indian libraries. Bianchini analyzed how FRBR entities can be mapped to call numbers in CC.[80] He illustrates how the different units that compose a full CC call number can be mapped to different attributes within the FRBR family. The Tate Library uses Universal Decimal Classification (UDC) to classify its art materials, with an in-house extension to UDC developed to accommodate materials published in 20th-century art.[81] Mages presents the history and inspiration behind the construction of the Bellevue Classification System (BCS), created by nursing instructor Ann Doyle during the 1930s for use in the Bellevue School of Nursing Library.[82] The BCS allowed Doyle to represent topics closely related to nursing and to "portray nursing as an intellectual and professional discipline."[83]

Bibliographic Control

The literature was replete with material the authors have grouped under the broad rubric of "Bibliographic Control." This section contains analyses, case studies, thought pieces, pedagogical material, and experiments that relate to the theory and practice of library cataloging and bibliographic control. The diverse topics under this heading are further grouped into the following subheadings: Evaluation and History of Cataloging, Special Formats Cataloging, Discovery Services, Cataloging beyond RDA/AACR2 and MARC, and Workflows and Cooperative Cataloging.

Evaluation and History of Cataloging

"Assessing the Cost and Value of Bibliographic Control," a paper by Cronin and Stalberg, grew out of the 2009 Association for Library Collections and Technical Services Heads of Technical Services in Large Research Libraries Interest Group Task Force on Cost/Value Assessment of Bibliographic Control.[84] The task force was charged to explore the cost and value of bibliographic control, driven by recommendation 5.1.1.1 of *On the Record: Report of the Library of Congress Working Group on the Future of Bibliographic Control*, which focused on developing measures for costs, benefits, and value of bibliographic control.[85] Because definitions for the value of bibliographic control were largely missing, the task force chose to define seven operational definitions of value and provided recommendations for a research agenda and strategies for advancing that research.

The articles on the history of cataloging provide background and context to current standards, data formats, and cataloging practice, and frequently speculate on how past practice and ideas can help shape the future. Genetasio explores the genesis of the Statement of International Cataloguing Principles (ICP), published in February 2009.[86] The ICP broadens the scope of the earlier Paris Principles to include all types of materials and all aspects of bibliographic and authority data, along with references to ISBD, FRBR, and FRAD. Genetasio criticizes the ICP for its lack of an overall theoretical vision, specificity in bibliographic description, subject cataloging, and general vagueness about the convenience of users.

Seikel and Steele take the reader on a historical journey of MARC starting with the development of MARC I in 1965 and concluding with MARC 21 in the late 1990s.[87] The article provides a thorough discussion of how MARC 21 will change with the adoption of RDA, including what new fields and tags will be added to MARC 21 bibliographic and authority formats.

In "The Legacy of the Library Catalogue for the Present," Miksa elucidates the evolution of the catalog from the middle of the 19th century to the present by discussing four historical themes related to the library catalog to measure its legacy: the dictionary catalog, catalog users and use, developments occurring outside of the library catalog world, and the idea of the objects of the library catalog.[88] He traces evolution of the environment for the twenty-first century catalog to explore how change in the catalog may guide the development of present and future library catalogs.

Special Formats Cataloging

Contributions to the literature focusing on issues of cataloging and bibliographic control often revolved around issues related to the type of item or format being cataloged. Representative articles in this section include non-Roman scripts, music materials, and Electronic Theses and Dissertations (ETDs). Biella and Lerner examined how RDA would affect the cataloging of Hebraica.[89] Their article details the various challenges encountered during the RDA testing period, including determining appropriate dates, recording the statement of responsibility, and Romanization issues. Kudo details problems in the transliteration of Japanese characters due to conflicting policies regarding the Modified Hepburn Romanization system, which result in inconsistencies in the recording of specific sounds and syllables.[90] Cataloging works in Romani, a language lacking a governmentally sanctioned "official orthography," presents a series of distinct challenges, described by Husic, who provides suggestions for transcribing characters that are not part of the Unicode subset used in WorldCat.[91]

Directions in Music Cataloging, a Festschrift to honor music cataloger Arsen Ralph Papakhian, covers a wide range of issues related to music cataloging, including a history of the Music OCLC User group, the LC Genre/Form Terms for Library and Archival Materials (LCGFT), cataloging music on iTunes, consideration of how RDA and FRBR will change cataloging practices, and cataloging practices related to ethnographic field recordings.[92] Thornburg and Oskins

examine the use of Global Library Manifestation Identifier (GLIMIR) identification numbers in the OCLC Extended WorldCat set to collocate records on music materials.[93] Riley describes Variations/FRBR, an IMLS grant-funded project at Indiana University, and covers lessons learned in implementing the FRBR conceptual model for existing data in a music digital library and the work done to identify FRBR Works from MARC and roles for FRBR Group 2 entities as part of the FRBRization process.[94] A special issue of *Fontes Artes Musicae* was devoted to music cataloging and RDA.[95] Harden outlines the development of RDA, FRBR, genre/form and medium terms to be used as "subjects," and a possible development of a new encoding standard to replace MARC.[96] Cato's article outlines different cataloging practices in various European countries, how they might change if RDA is adopted, and how IFLA may help in shaping various cataloging practices.[97] McKnight describes the work of the LC Music Genre/Form Project Group to create a thesaurus of genre and form terms to develop a prototype thesaurus.[98]

Maurer, McCutcheon, and Schwing describe Kent State University Library's ETD cataloging process that combines contributions from authors, catalogers and a systems application.[99] The researchers found that "authors can supply accurate and findable metadata, that the ETDcat application can transmit and manipulate that metadata in ways that improve findability, and that catalogers' contributions improve findability."[100] In a similar exploration of workflow and record enhancement, Howard and Goldberg detail how they transformed metadata from the simpler DC to the more granular MARC using the WorldCat Digital Collection Gateway.[101]

Discovery Services

In recent years, the library community has focused attention on "next-generation" catalogs (NGCs) and web-scale discovery tools. Both are designed to help library catalogs break away from traditional OPACs by incorporating more search features, providing interface enhancements, and, particularly for web-scale tools, bringing article content together with traditional library catalog data for a single unified search index. This review includes articles on the intersection of discovery services and bibliographic control, with topics covering theoretical considerations, implementation decisions, and user studies. A theoretical article by Schultz-Jones et al. considers how the quality of cataloging choices and cataloger judgment will affect NGCs.[102] The authors synthesize studies that highlight quality of cataloging in the past few years and pose the question that if catalogers did not use resources or tools to make good cataloging decisions, then "what assurance is there that they will understand how an NGC provides the user with more layers of discovery based on the data already present in the system?"[103] Barton and Mak consider the prospect of NGCs and the consolidation of access to all library collections through a single search box.[104] While the authors are hopeful that the ideal next generation catalogs will weave silos of information together with enhanced navigation and usability in one portal for access, they wonder how libraries will manage the vast amounts of metadata from diverse sources, and how RDA/FRBR implementation of catalogs will be affected by the influx of external data.

Case studies of discovery service implementation were common. Han describes the implementation and integration of VuFind and Easy Search at the University of Illinois at Urbana-Champaign, Graves and Dresselhaus detail work done at the Old Dominion University Library to implement WorldCat Local, and Daniels and Roth share their experiences of implementing Summon at Grand Valley State University in 2009.[105] These articles detail the steps taken at each library during the migration, including clean-up work, MARC-mapping processes, and ensuring accurate representation of library holdings in the services.

The single search box option to search a broad range of library materials and ease of use offered by discovery tools has revolutionized the end user's search and discovery experience, but unexpectedly changed cataloging functions. Surveying and interviewing libraries implementing NGCs, Wynne and Hanscom determined that catalogers were actively involved in the implementation process and in data maintenance and clean-up activities, and worked with vendors to correct data.[106] This allowed catalogers to become active participants to improve access, collaborate with other units, and to demonstrate their value to the community. Harpel-Burke's article reports on the results of a survey of academic libraries that implemented discovery systems, both NCG and web-scale.[107] The respondents were split in opinion on whether discovery systems exposed errors or suppressed OPAC data, indicating that libraries are unsure about the future of catalog maintenance and authority control activities while using discovery systems.

User studies on the effects of cataloging decisions, enhancements to data, and bibliographic control processes were also represented in the literature. Studies by Walsh, Denton and Coysh, and Skinner evaluated NGCs.[108] Their findings report that although enhanced catalog records or NGCs offered better search experiences for users, they posed challenges in the discovery of known titles or items in a series or journal and displayed cataloging errors and problems in the legacy records. Bauer and Peterson-Hart did usability testing of two catalog interfaces for the use of subject headings in YuFind (faceted) and Orbis (non-faceted), running side-by-side at Yale University.[109] Subject heading facets did not increase the use of subject headings as users discovered YuFind records in Google and followed the link to YuFind. The authors speculate that "the usefulness

of YuFind may lie more in its ability to provide records to Google than its faceted navigation."[110]

Metadata Beyond RDA/AACR2 and MARC

Exploration of metadata in a library setting beyond "traditional" cataloging using AACR2/RDA and MARC occupies a substantial portion of the literature. The articles covered here relate exclusively to descriptive metadata. Readers looking for a practical guide to metadata beyond AACR2/RDA and MARC will find Miller's book, *Metadata for Digital Collections: A How-To-Do-lt Manual,* to be an excellent place to start.[111] It covers basic concepts like controlled vocabularies, resource description, and XML encoding, and provides in-depth coverage of three commonly used metadata schemes: DC, Metadata Object Description Schema (MODS), and Visual Resources Association (VRA) Core.

Workflow, metadata management, and transformation were frequent topics in the literature. Laursen, Christiansen, and Olsen describe the workflow for working with metadata for digital heritage collections developed at the State and University Library in Denmark.[112] They recommend considering any available sources of metadata before choosing a scheme, and basing the workflow on the sources available. Both Martin, and Southwick and Lampert, note the utility of a data dictionary to clearly define metadata elements, provide guidelines and training for metadata creation.[113] Walsh describes two projects at the OSU Library to create DC records for the university's institutional repository: OSU Press' open-access monographs and the oral history collections of the OSU Byrd Polar Research Center Archival Program.[114] She describes the use of EXtensible Stylesheet Language Transformation (XSLT) to transform MARC into DC.

Several articles describe the work performed at different institutions to select standards and cleanup existing metadata. Guza applies Greene and Meissner's archival principle of "more product, less process" to encourage the appropriate balance between expediency and completeness in developing a metadata strategy for the digitization of the Century 21 Expositions Digital Collection at the Seattle Public Library.[115] McBride describes the efforts at the University of North Carolina at Chapel Hill to clean up and standardize the metadata of an older digital sheet music collection.[116] However, Brodsky, interviewed by Tobar, rejects the importance of mapping and sharing metadata for a large multimedia digital collection of scores, concert programs, and videos used by the New York Philharmonic.[117] Brodsky states, "The metadata is very specific and well-structured, so we don't see the point in mapping it all to some other system that doesn't mean anything to us."

Reviews of metadata quality and consistency also appeared in the literature. Westbrook et al. describe an audit of DC metadata for digital collections in the University of Houston Digital Library, in which metadata were reviewed for completeness and inconsistencies to improve search and discovery.[118] In a similar study, Lim and Liew examined images from sixteen institutions in New Zealand, reviewed metadata records and interviewed staff regarding their practices.[119] They found that metadata was inconsistently applied across the organizations, hampering interoperability and cross-institutional access.

Some activities commonly described in metadata work—namely, transformation and harvesting—may no longer be necessary within a future of linked data and RDF. As Baker states, RDF provides "a linguistic basis for expressing and linking data . . . RDF provides a common second language into which local data formats can be translated and exposed . . . RDF triples do not require additional out-of-band information for their interpretation. In this sense, RDF data can be said to 'speak for itself.'"[120] While DC is already described using RDF, exactly how RDF triples will interact with each other is yet to be determined. As with the switch to RDA and the investigation of a replacement for MARC, metadata beyond RDA and MARC are also in flux.

Workflows and Cooperative Cataloging

The literature on workflows related to technical services falls into various areas, including batch processing of records and migration to new systems, clean-up projects for existing resources, digital resources workflows, and workflows developed through cooperative cataloging. Libraries are increasingly using batch processes to load bibliographic records and provide access to large collections of materials. Mugridge and Edmunds report on a survey by the ALCTS Directors of Large Research Libraries Interest Group that gauges how members managed batchloading activities.[121] The responses detail the staffing, management processes, and frustrations over current workflows for getting the records into the catalog, and point out challenges, such as poor record quality or library systems that cannot manage the volume of records. Young performed a survey of batchloading practices that included a wider range of respondents from three different email discussion lists, and found similar frustrations with the batchload process.[122] Both surveys indicate that respondents believe that batchloading will increase in the future. Mugridge and Edmunds' article notes two areas for further research that may affect the future amount of batchloading: how discovery systems will impact the need to batchload records, and identifying the kinds of assessment necessary to ensure that batchloading has improved the discovery of library materials.

Collaborations among various departments within the library appear to be a trend in developing new workflows

to offer better discovery experiences to users. The Special Collections Department and Access Services Unit at the University of North Carolina-Charlotte's J. Murrey Atkins Library undertook a project in which Access Services staff were trained to create DC descriptive metadata records for digital photographs, maps, and oral histories.[123] Evans and Tilton describe how academic libraries can work with satellite units on campus to provide access to specialized collections without overwhelming existing cataloging staff.[124] In their example, the University Libraries at Bowling Green State University, rather than attempting to incorporate the material directly into the catalog, provided their knowledge and expertise to the design of a separate lightweight system for a collection of VHS cassettes and DVDs for the Dr. Ralph H. Wolfe Viewing Center.

In recent years, the integration of non-MARC metadata into traditional cataloging workflows has gained momentum. The University of Montana cataloging department created metadata for a digital project, Natives of Montana Archival Project (NOMAP).[125] Keenan discusses some of the problems of integrating metadata creation into the department, and notes that new skills such as "graphic design, data structure, and experience with relational databases are becoming just as important to potential catalogers as are attention to detail and an understanding of cataloging and indexing."[126]

A catalog at the regional level can reduce redundancy in work, especially when a bibliographic record serves more than one library. Preston provides an account of workflows and challenges in a case study of cooperatively cataloging e-book collections by OhioLink libraries.[127] Martin et al. present a case study of managing cataloging guidelines for e-resources for the Consortium of Academic and Research Libraries in Illinois (CARLI) shared catalog, I-Share.[128] In the aptly named article, "10% Wrong for 90% Done: A Practical Approach to Collection Deduping," Hamby discusses the challenge of identifying and merging duplicate records in a new open-source consortial integrated library system for the South Carolina Library Evergreen Network Delivery System (SC LENDS).[129] The consortium developed an algorithm that matched bibliographic records 90 percent of the time. Other consortiums using the Evergreen ILS have been able to use and expand upon the same code developed by SC LENDS.

Cataloging Education and Careers in Cataloging

The role of catalogers and cataloging are in a state of flux with the introduction of a new cataloging code and cataloging syntax, although with long-term trends toward less cataloger-specific education and fewer cataloging positions in libraries. The debates over whether libraries need catalogers, the necessity of cataloging education, and the future of cataloging continue. Joseph Miller, interviewed by Marcus, stresses his belief that ALA should include a cataloging component as an accreditation requirement: "Not every librarian needs to know how to do original cataloging, but every librarian needs to know the basics of data structure, bibliographic description, and subject analysis."[130] In the book, *Conversations with Catalogers in the 21st Century,* essays by Hill and Hall-Ellis underscore the importance of including cataloging in the broader context of information organization courses in LIS programs and suggest how education can be improved for catalogers.[131] Hill reasons that lack of exposure, lack of required cataloging courses in LIS programs, and reliance upon adjuncts instead of full-time faculty to teach cataloging courses are some of the reasons why fewer students are drawn to cataloging. However, Hall-Ellis is optimistic about the offerings of LIS programs that include fundamental information organization as a core course, and specialized courses in description, classification, authority control, indexing, and thesaurus construction.

Technology has changed the method of LIS education from more didactic face-to-face education to online courses, webinars, and reading or writing blogs and wikis. *Cataloging and Classification Quarterly* published a special issue on "Online Delivery of Cataloging and Classification Education and Instruction" that explored how to deliver cataloging and classification instruction effectively in the online environment.[132] Articles cover the range of developing appropriate curriculum, learning technologies, and methods for teaching online courses; assessment of course material; and online methods for on-the job-training.[133]

As technical services departments experience changes in functions and daily operations due to shrinking budgets the merging of acquisitions and cataloging departments, and increasing use of vendor records, support staff have started assuming more original cataloging responsibilities and are undergoing significant training. This is evident in Gelber and Kandarasheva's case study of how copy catalogers at Columbia University Library were trained in the Name Authority Cooperative Program (NACO) to catalog belles lettres materials, including the creation of the associated name headings and call numbers.[134]

Finally, there were essays on the future of the cataloging profession that are worth mentioning. Hoffman writes very thoughtfully on the future of cataloging using Abbott's theory of "The System of Professions," which considers how technology can create or destroy new work and compel competing professions to fight for the same work.[135] Hoffman uses this theory to show how technology has created and destroyed cataloging work and believes that e-resources and metadata librarians compete with catalogers for new areas of professional work such as institutional repositories or electronic collections. Similarly, in "Is There a Future for

Library Catalogers?" Cerbo implies that catalogers need to extend their professional cataloging skills to accommodate e-resources and digital initiatives to keep themselves relevant.[136]

Conclusion

The cataloging and classification literature published in 2011–12 reveals that the cataloging community is preparing for a major shift, with a new cataloging code to be implemented, an impending new syntax for holding catalog data, and potentially a complete paradigm shift moving away from thinking about individual records to triples of information that can be linked together on the fly. The anxiety of the library community over the adoption and learning of RDA and its underlying model FRBR is apparent. The explosion of literature on RDA indicates that it is an area of utmost importance and relevance to the cataloging community as it prepares to embrace challenges of learning the new code and principles of FRBR, which will lead to significant changes in cataloging practices. LC's new proposed framework, BIBFRAME, begins the transition away from MARC, which libraries have used for more than forty years.

The application of the FRBR family of models, including FRAD and FRSAD, to unfold relationships between flat and linear bibliographic data, various FRBR exploration studies, and studies FRBRizing library catalogs demonstrates that libraries are continuing to explore and experiment with the conceptual model. The FRBR family has received criticism for being too hierarchical within the Group One entities, and too long in the making. A new object-oriented approach, FRBRoo, has been proposed, which some view as a better fit for linked data.

Linked data projects have allowed bibliographic data to move beyond the library catalog and to be more accessible to the wider web and through the Linked Open Data Cloud. Extensive education is needed regarding linked data and the Semantic Web, though the principles of linked data and the Linked Open Data movement have gained a firm foothold. European libraries have been actively testing projects and developing prototypes following a linked data model, but one would expect to see more reports on US projects in coming years. As Scheuer says, linked data will expand discoverability, and create a host of possibilities for libraries to reuse their data to improve services and reach their users in new locations: "a linked data environment has no bounds."[137]

Controlled vocabularies and authority control continued to play a prominent role in the literature during the review period, and perhaps even have gained in stature as libraries consider how to open their data to the wider world. Identifiers and contextual information about authors have grown in importance, as libraries share authority data through global projects such as VIAF, and pursue linked data solutions. While user-contributed terms and tags are not seen as a replacement for controlled vocabularies, studies in the literature acknowledge the complementary role that user-contributed metadata can provide to improve resource discovery. The coming years should see improvements in library systems to better take advantage of both traditional controlled vocabularies and user-contributed metadata.

Evaluation of cataloging was a small area of research in the literature published during 2011–12. A seminal contribution by Cronin and Stalberg offers seven operational definitions of the value of bibliographic control to help institutions measure and justify its cost. In the future, more research into this area on how and whether people measure the value and cost of bibliographic control is eagerly anticipated.

The evolution of the library catalog over the last few decades from card catalogs to OPACS to NGCs to web scale discovery services is evident in the literature. The library community appreciates the enhancements to the user discovery experience while at the same time grapples with the problems of diverse metadata and missing content. The impact of discovery systems on the need to batchload records for e-resources in the catalog will invite discussion at individual institutions. Finally, an upcoming trend is increased collaboration among various departments within the library to improve and develop new workflows both to gain efficiencies and to improve discovery.

Cataloging education and careers remains a well-represented subject in the literature. With the shifts in the catalog code and a movement toward linked data, the education of future catalogers and even what exactly a future cataloger will be, are likely to remain topics of genuine interest. As external data from library systems beyond the catalog and from vendor sources are incorporated into discovery systems and transformed into linked data, catalogers' work and responsibilities have the potential to broaden. The future of cataloging remains uncertain, but these changes can also present an enormous opportunity. As Hoffman says, "Cataloging has the power to secure a place in the functional future; catalogers just need to claim the work."[138]

References

1. United States RDA Test Coordinating Committee, *Report and Recommendations of the U.S. RDA Test Coordinating Committee* (May 2011, revised for public release June 20, 2011), accessed May 9, 2014, www.loc.gov/bibliographic-future/rda/source/rdatesting-finalreport-20june2011.pdf.
2. Library of Congress, *Testing Resource Description and Access: U.S. National Libraries RDA Test Partners,* accessed May 9, 2014, www.loc.gov/bibliographic-future/rda/about.html.
3. United States RDA Test Coordinating Committee, *Report and Recommendations*.
4. Sylvia D. Hall-Ellis and Robert O. Ellett, "Introduction," *Cataloging & Classification Quarterly* 49, no. 7–8 (September

2011): 567–71, dx.doi.org/10.1080/01639374.2011.618377.

5. Judith A. Kuhagen, "Training for the U.S. RDA Test," *Cataloging & Classification Quarterly* 49, no. 7–8 (September 2011): 572–81, dx.doi.org/10.1080/01639374.2011.616924.
6. Christopher Cronin, "From Testing to Implementation: Managing Full-Scale RDA Adoption at the University of Chicago," *Cataloging & Classification Quarterly* 49, no. 7–8 (September 2011): 626–46, dx.doi.org/10.1080/01639374.2011.616263.
7. Jennifer B. Young and Valerie Bross, "Results of the CRCC Informal RDA Testing Task Force," *Cataloging & Classification Quarterly* 49, no. 7–8 (September 2011): 600–606, dx.doi.org/10.1080/01639374.2011.620223; Marjorie E. Bloss, "Testing RDA at Dominican University's Graduate School of Library and Information Science: The Students' Perspectives," *Cataloging & Classification Quarterly* 49, no. 7–8 (September 2011): 582–99, dx.doi.org/10.1080/01639374.2011.616264; Kathryn La Barre et al., "Perspectives from the University of Illinois at Urbana-Champaign; Participants in the U.S. National Libraries RDA Test," *Cataloging & Classification Quarterly* 49, no. 3 (2011): 243–53.
8. Megan Kettner, "RDA Toolkit," *Theological Librarianship* 4, no. 1 (2011): 105–6, accessed May 9, 2014, journal.atla.com/ojs/index.php/theolib/article/view/175/464; Megan Curran, "RDA Toolkit – http://access.rdatoolkit.org/," *Technical Services Quarterly* 28, no. 2 (February 28, 2011): 251–52, dx.doi.org/10.1080/07317131.2011.546301.
9. Bloss, "Testing RDA at Dominican University's Graduate School"; La Barre et al., "Perspectives from the University of Illinois at Urbana-Champaign."
10. Peggy Johnson, "From the Editor's Desk," *Technicalities* 32, no. 1 (2012): 2–3.
11. Kevin M Randall, "RDA: End of the World Postponed?," *Serials Librarian* 61, no. 3–4 (2011): 334–45, dx.doi.org/10.1080/0361526X.2011.617297.
12. Barbara B Tillett, "Keeping Libraries Relevant in the Semantic Web with Resource Description and Access (RDA)," *Serials*: *The Journal for the Serials Community* 24, no. 3 (2011): 266–72, dx.doi.org/10.1629/24266.
13. Anne Welsh and Sue Batley, *Practical Cataloguing: AACR, RDA and MARC21* (Chicago: Neal-Schuman, 2012); Mary Beth Weber and Fay Angela Austin, *Describing Electronic, Digital, and Other Media Using AACR2 and RDA : A How-To-Do-It Manual and CD-ROM for Librarians* (New York: Neal-Schuman Publishers, 2011).
14. Sevim McCutcheon, "Designing Policy for Copy Cataloging in RDA," *Library Collections, Acquisitions, and Technical Services* 36, no. 3–4 (2012): 69–78, dx.doi.org/S1464905512000255.
15. *Cataloging & Classification Quarterly* 50, no. 5–7 (special issue, 2012), accessed May 15, 2014, www.tandfonline.com/toc/wccq20/50/5-7#.U3UFQBC04lI.
16. Richard P. Smiraglia, "Be Careful What You Wish For: FRBR, Some Lacunae, A Review," *Cataloging & Classification Quarterly* 50, no. 5–7 (June 2012): 360–68, dx.doi.org/10.1080/01639374.2012.682254.
17. Patrick Le Boeuf, "Foreword," *Cataloging & Classification Quarterly* 50, no. 5–7 (June 2012): 355–59, dx.doi.org/10.1080/01639374.2012.682001.
18. Patrick Le Boeuf, "A Strange Model Named FRBRoo," *Cataloging & Classification Quarterly* 50, no. 5–7 (June 2012): 422–38, dx.doi.org/10.1080/01639374.2012.679222.
19. Shoichi Taniguchi, "Viewing RDA from FRBR and FRAD: Does RDA Represent a Different Conceptual Model?," *Cataloging & Classification Quarterly* 50, no. 8 (November 2012): 929–43, dx.doi.org/10.1080/01639374.2012.712631.
20. Pat Riva and Chris Oliver, "Evaluation of RDA as an Implementation of FRBR and FRAD," *Cataloging & Classification Quarterly* 50, no. 5–7 (2012): 564–86, dx.doi.org/10.1080/01639374.2012.680848.
21. Oksana L. Zavalina, "Subject Access: Conceptual Models, Functional Requirements, and Empirical Data," *Journal of Library Metadata* 12, no. 2–3 (2012): 140–63, dx.doi.org/10.1080/19386389.2012.699829.
22. Martin Doerr, Pat Riva, and Maja Žumer, "FRBR Entities: Identity and Identification," *Cataloging & Classification Quarterly* 50, no. 5–7 (2012): 517–41, dx.doi.org/10.1080/01639374.2012.681252.
23. Yin Zhang and Athena Salaba, "What Do Users Tell Us about FRBR-Based Catalogs?," *Cataloging & Classification Quarterly* 50, no. 5–7 (2012): 705–23, dx.doi.org/10.1080/01639374.2012.682000.
24. Tami Morse, "Mapping Relationships: Examining Bibliographic Relationships in Sheet Maps from Tillett to RDA," *Cataloging & Classification Quarterly* 50, no. 4 (2012): 225–48, dx.doi.org/10.1080/01639374.2012.657292.
25. Ibid., 245.
26. Mary Z. Rose, "The Ship Has Sailed and We Aren't On It: How Catalogers Could Support User Tasks and Why We Won't," *Journal of Library Metadata* 12, no. 2–3 (2012): 127–39, dx.doi.org/10.1080/19386389.2012.699828.
27. Stacy Allison-Cassin, "The Possibility of the Infinite Library: Exploring the Conceptual Boundaries of Works and Texts of Bibliographic Description," *Journal of Library Metadata* 12, no. 2–3 (2012): 294–309, dx.doi.org/10.1080/19386389.2012.700606.
28. Seungmin Lee and Efin K Jacob, "An Integrated Approach to Metadata Interoperability Construction of a Conceptual Structure between MARC and FRBR," *Library Resources & Technical Services* 55, no. 1 (2011): 17–32, dx.doi.org/10.5860/lrts.55n1.17.
29. Matt Enis, "LC Announces Linked Data Modeling Initiative," *Library Journal* 137, no. 11 (2012): 20.
30. Cynthia Hodgson, "MARBI Disbanded; New ALCTS/LITA Metadata Standards Committee Formed," *Information Standards Quarterly* 24, no. 2/3 (2012): 53, dx.doi.org/10.3789/isqv24n2-3.2012.11.
31. Library of Congress, *Bibliographic Framework as a Web of Data: Linked Data Model and Supporting Services* (Washington, DC: Library of Congress, 2012), accessed May 10, 2014,

www.loc.gov/bibframe/pdf/marcld-report-11-21-2012.pdf.
32. Kevin Ford, "LC's Bibliographic Framework Initiative and the Attractiveness of Linked Data," *Information Standards Quarterly* 24, no. 2/3 (2012): 48, dx.doi.org/10.3789/isqv24n2-3.2012.09.
33. Karen Coyle, "Metadata Elements," *Library Technology Reports* 48, no. 4 (2012): 15–26, dx.doi.org/10.5860/ltr.48n4.
34. Philip Evan Schreur, "The Academy Unbound," *Library Resources & Technical Services* 56, no. 4 (2012): 227–37, dx.doi.org/10.5860/lrts.56n4.227.
35. Library of Congress, "Bibliographic Framework as a Web of Data."
36. "W3C Library Linked Data Incubator Group Issues Final Report," *Information Standards Quarterly* 23, no. 4 (2011): 28, dx.doi.org/10.3789/isqv23n4.2011.08.
37. Michael A. Keller et al., *Be Part of the Web, Not Just On It: Report of the Stanford Linked Data Workshop, 27 June–1 July 2011* (Stanford, 2011), accessed May 10, 2014, lib.stanford.edu/files/Stanford_Linked_Data_Workshop_Report_FINAL.pdf.
38. Anne-Lena Westrum, Asgeir Rekkavik, and Magnus Enger, "The Key to the Future of the Library Catalog Is Openness," *Computers in Libraries* 31, no. 3 (2011): 10–14; Anne-Lena Westrum, Asgeir Rekkavik, and Kim Talleras, "Improving the Presentation of Library Data Using FRBR and Linked Data," *Code4Lib Journal*, no. 16 (2012): 1–7, accessed May 10, journal.code4lib.org/articles/6424.
39. Ted Fons, Jeff Penka, and Richard Wallis, "OCLC's Linked Data Initiative: Using Schema.org to Make Library Data Relevant on the Web," *Information Standards Quarterly* 24, no. 2/3 (January 2012): 29, dx.doi.org/10.3789/isqv24n2-3.2012.05.
40. Antoine Isaac, Robina Clayphan, and Bernhard Haslhofer, "Europeana: Moving to Linked Open Data," *Information Standards Quarterly* 24, no. 2/3 (January 2012): 34, accessed May 10, 2014, www.niso.org/publications/isq/2012/v24no2-3/isaac.
41. Jane Stevenson, "Linking Lives: Creating An End-User Interface Using Linked Data," *Information Standards Quarterly* 24, no. 2/3 (January 2012): 14-23, dx.doi.org/10.3789/isqv24n2-3.2012.03.
42. Seth Van Hooland, Ruben Verborgh, and Rik Van de Walle, "Joining the Linked Data Cloud in a Cost-Effective Manner," *Information Standards Quarterly* 24, no. 2/3 (January 2012): 24–28, dx.doi.org/10.3789/isqv24n2-3.2012.04.
43. Gordon Dunsire, "Representing the FR Family in the Semantic Web," *Cataloging & Classification Quarterly* 50, no. 5–7 (June 2012): 724–41, dx.doi.org/10.1080/01639374.2012.679881.
44. Thomas Baker, "Libraries, Languages of Description, and Linked Data: A Dublin Core Perspective," *Library Hi Tech* 30, no. 1 (2012): 116–33, dx.doi.org/10.1108/07378831211213256.
45. Ronald J. Murray and Barbara B. Tillett, "Cataloging Theory in Search of Graph Theory and Other Ivory Towers," *Information Technology & Libraries* 30, no. 4 (2011): 170–84, acessed May 10, 2014, ejournals.bc.edu/ojs/index.php/ital/article/view/1868.
46. Lynne C. Howarth, "FRBR and Linked Data: Connecting FRBR and Linked Data," *Cataloging & Classification Quarterly* 50, no. 5–7 (2012): 763–76, dx.doi.org/10.1080/01639374.2012.680835; Le Boeuf, "A Strange Model Named FRBRoo."
47. Dick R. Miller, "Identities and Relationships: Parallels Between Metadata and Professional Relevance," *Journal of the Medical Library Association* 100, no. 2 (2012): 83–86, dx.doi.org/10.3163/1536-5050.100.2.003.
48. Martha Yee, "The Single Shared Catalog Revisited," in *Conversations with Catalogers in the 21st Century*, ed. Elaine R. Sanchez (Santa Barbara California: Libraries Unlimited, 2011), 129.
49. Karen Coyle, "Vocabularies: Term Lists and Thesauri," *Library Technology Reports* 48, no. 4 (2012): 27–36, dx.doi.org/10.5860/ltr.48n4
50. Julie Allinson, "OpenART: Open Metadata for Art Research at the Tate," *Bulletin of the American Society for Information Science & Technology* 38, no. 3 (2012): 43–8, dx.doi.org/10.1002/bult.2012.1720380311.
51. Maria Nisheva-Pavlova and Pavel Pavlov, "Ontology-Based Search and Document Retrieval in a Digital Library with Folk Songs," *Information Services & Use* 31, no. 3/4 (2011): 157–66.
52. M. Cristina Pattuelli, "Modeling a Domain Ontology for Cultural Heritage Resources: A User-Centered Approach," *Journal of the American Society for Information Science and Technology* 62, no. 2 (2011): 314–42, dx.doi.org/10.1002/asi.21453.
53. Marjorie Hlava, "Developing an Eclectic Terminology Registry," *Bulletin of the American Society for Information Science & Technology* 37, no. 4 (2011): 19–22, dx.doi.org/10.1002/bult.2011.1720370406.
54. Jon Phipps and Diane Hillmann, "The Open Metadata Registry: An Update," *Bulletin of the American Society for Information Science & Technology* 37, no. 4 (2011): 35–7, dx.doi.org/10.1002/bult.2011.1720370410.
55. Gordon Dunsire et al., "Linked Data Vocabulary Management: Infrastructure Support, Data Integration, and Interoperability," *Information Standards Quarterly* 24, no. 2/3 (2012): 4, dx.doi.org/10.3789/isqv24n2-3.2012.02.
56. Vanda Broughton, *Essential Library of Congress Subject Headings*, U.S. Editi (New York: Neal-Schuman Publishers, 2012).
57. Helen Greenblatt, "The Treatment of LGBTIQ Concepts in the Library of Congress Subject Headings," in *Serving LBGTIQ Library and Archives Users*, ed. Helen Greenblatt (Jefferson, N.C.: McFarland, 2011), 212–28; K. R. Roberto, "Inflexible Bodies," *Journal of Information Ethics* 20, no. 2 (September 01, 2011): 56–64, dx.doi.org/10.3172/JIE.20.2.56.
58. Deborah Lee, "Indigenous Knowledge Organization: A Study of Concepts, Terminology, Structure and (Mostly) Indigenous Voices," *Partnership: The Canadian Journal of Library & Information Practice & Research* 6, no. 1 (2011): 1–33.
59. C. Rockelle Strader, "Citation Analysis," *Library Resources & Technical Services* 56, no. 4 (2012): 238–53, dx.doi.org/10.5860/lrts.56n4.238.

60. John Porter, "Folksonomies in the Library: Their Impact on User Experience, and Their Implications for the Work of Librarians," *Australian Library Journal* 60, no. 3 (2011): 248–55, dx.doi.org/10.1080/00049670.2011.10722621.
61. Getaneh Alemu, Brett Stevens, and Penny Ross, "Towards a Conceptual Framework for User-Driven Semantic Metadata Interoperability in Digital Libraries: A Social Constructivist Approach," *New Library World* 113, no. 1/2 (2012): 38–54, dx.doi.org/10.1108/03074801211199031.
62. Mary M. Somerville and Dana Echohawk, "Recuerdos Hablados/Memories Spoken: Toward the Co-Creation of Digital Knowledge with Community Significance," *Library Trends* 59, no. 4 (2011): 650–62, dx.doi.org/10.1353/lib.2011.0018.
63. Svein Anfinnsen, Gheorghita Ghinea, and Sergio de Cesare, "Web 2.0 and Folksonomies in a Library Context," *International Journal of Information Management* 31, no. 1 (February 2011): 63–70, dx.doi.org/10.1016/j.ijinfomgt.2010.05.006; Danielle H. Lee and Titus Schleyer, "Social Tagging Is No Substitute for Controlled Indexing: A Comparison of Medical Subject Headings and CiteULike Tags Assigned to 231,388 Papers," *Journal of the American Society for Information Science and Technology* 63, no. 9 (September 17, 2012): 1747–57, dx.doi.org/10.1002/asi.22653; Besiki Stvilia, Corinne Jörgensen, and Shuheng Wu, "Establishing the Value of Socially-Created Metadata to Image Indexing," *Library & Information Science Research* 34, no. 2 (April 2012): 99–109, dx.doi.org/10.1016/j.lisr.2011.07.011.
64. Christine DeZelar-Tiedman, "Exploring User-Contributed Metadata's Potential to Enhance Access to Literary Works," *Library Resources & Technical Services* 55, no. 4 (2011): 221–33, dx.doi.org/10.5860/lrts.55n4.221.
65. Carrie Pirmann, "Tags in the Catalogue: Insights From a Usability Study of LibraryThing for Libraries," *Library Trends* 61, no. 1 (2012): 234–47, dx.doi.org/10.1353/lib.2012.0021.
66. Martha Fallahay Loesch, "The Virtual International Authority File," *Technical Services Quarterly* 28, no. 2 (2011): 255–56.
67. F. X. Nuttall and Sam G. Oh, "Party Identifiers," *Cataloging & Classification Quarterly* 49, no. 6 (2011): 528–37, dx.doi.org/10.1080/01639374.2011.603075.
68. Bob Thomas, "Name Disambiguation—Learning From More User-Friendly Models," *Cataloging & Classification Quarterly* 49, no. 3 (2011): 223–32, dx.doi.org/10.1080/01639374.2011.560834.
69. David Bainbridge, Michael B. Twidale, and David M. Nichols, "Interactive Context-Aware User-Driven Metadata Correction in Digital Libraries," *International Journal on Digital Libraries* 13, no. 1 (2012): 17–32, dx.doi.org/10.1007/s00799-012-0100-5.
70. Mohindar Partap Satija, "Brief Communication: Abridged Dewey-15 (2012) in Historical Perspectives," *Knowledge Organization* 39, no. 6 (2012): 466–68.
71. Mohindar Partap Satija, "The DDC 23rd Edition (2011): An Appraisal," *SRELS Journal of Information Management* 49, no. 1 (2012): 1–4.
72. Keith Trickey, "Maddeningly Dynamic," *CILIP Update* 10, no. 11 (2011): 44–5.
73. Rebecca Green, "See-Also Relationships in the Dewey Decimal Classification," *Knowledge Organization* 38, no. 4 (2011): 335–41.
74. Mathias Lösch et al., "Building a DDC-Annotated Corpus from OAI Metadata," *JODI: Journal of Digital Information* 12, no. 2 (2011): 1–9, accessed May 10, 2014, journals.tdl.org/jodi/index.php/jodi/article/view/1765.
75. Arash Joorabchi and Abdulhussain E. Mahdi, "An Unsupervised Approach to Automatic Classification of Scientific Literature Utilizing Bibliographic Metadata," *Journal of Information Science* 37, no. 5 (2011): 499–514, dx.doi.org/10.1177/0165551511417785.
76. Colin Higgins, "Library of Congress Classification: Teddy Roosevelt's World in Numbers?," *Cataloging & Classification Quarterly* 50, no. 4 (2012): 254, dx.doi.org/10.1080/01639374.2012.658989.
77. Ibid., 254.
78. Sherman Clarke, "Class N, or, Classifying the Fine Arts Using the Library of Congress Classification," *Art Libraries Journal* 36, no. 4 (2011): 22–5.
79. Deborah Lee, "Dealing with Adaptation: The Courtauld Classification Scheme," *Art Libraries Journal* 36, no. 4 (2011): 26–33.
80. Carlo Bianchini, "Arrangement of FRBR Entities in Colon Classification Call Numbers," *Cataloging & Classification Quarterly* 50, no. 5–7 (2012): 473–93, dx.doi.org/10.1080/01639374.2012.679877.
81. Maria White, "Brackets and Flying Commas: UDC in Tate Library," *Art Libraries Journal* 36, no. 4 (2011): 13–17.
82. Keith C. Mages, "The Bellevue Classification System: Nursing's Voice Upon the Library Shelves," *Journal of the Medical Library Association* 99, no. 1 (2011): 40–50, dx.doi.org/10.3163/1536-5050.99.1.008.
83. Ibid., 48.
84. Erin Stalberg and Christopher Cronin, "Assessing the Cost and Value of Bibliographic Control," *Library Resources & Technical Services* 55, no. 3 (2011): 124–37, dx.doi.org/10.5860/lrts.55n3.124.
85. Library of Congress Working Group on the Future of Bibliographic Control, *On the Record: Report of the Library of Congress Working Group on the Future of Bibliographic Control, 2008*, accessed May 10, 2014, www.loc.gov/bibliographic-future/news/lcwg-ontherecord-jan08-final.pdf.
86. Giuliano Genetasio, "The International Cataloguing Principles and Their Future," *Italian Journal of Library & Information Science* 3, no. 1 (2012): 4936.1–17, dx.doi.org/10.4403/jlis.it-4936.
87. Michele Seikel and Thomas Steele, "How MARC Has Changed: The History of the Format and Its Forthcoming Relationship to RDA," *Technical Services Quarterly* 28, no. 3 (2011): 322–34, dx.doi.org/10.1080/07317131.2011.574519.
88. Francis Miksa, "The Legacy of the Library Catalogue for the Present," *Library Trends* 61, no. 1 (2012): 7–34, dx.doi.org/10.1353/lib.2012.0023.

89. Joan C. Biella and Heidi G. Lerner, "The RDA Test and Hebraica Cataloging: Applying RDA in One Cataloging Community," *Cataloging & Classification Quarterly* 49, no. 7–8 (2011): 676–95, dx.doi.org/10.1080/01639374.2011.616450.
90. Yoko Kudo, "Modified Hepburn Romanization System in Japanese Language Cataloging: Where to Look, What to Follow," *Cataloging & Classification Quarterly* 49, no. 2 (2011): 97–120, dx.doi.org/10.1080/01639374.2011.536751.
91. Geoff Husic, "Romani Language: Cataloging Ramifications for a Language in the Process of Standardization," *Slavic & East European Information Resources* 12, no. 1 (2011): 37–51, dx.doi.org/10.1080/15228886.2011.556076.
92. Peter H. Lisius and Richard Griscom, eds., *Directions in Music Cataloging* (Middleton, WI: Music Library Association, 2012).
93. Gail Thornburg and W. Michael Oskins, "Matching Music: Clustering Versus Distinguishing Records in a Large Database," *OCLC Systems & Services* 28, no. 1 (2012): 32–42, dx.doi.org/10.1108/10650751211197059.
94. Jenn Riley, "Leveraging the FRBR Model for Music Discovery and Data Sharing: Autobiographical Note," *OCLC Systems & Services* 27, no. 3 (2011): 175–89, dx.doi.org/10.1108/10650751111164551; Jenn Riley, "Scherzo Music Discovery System at Indiana University," *Cataloging & Classification Quarterly* 49, no. 2 (2011): 144, dx.doi.org/10.1080/01639374.2011.544054.
95. *FontesArtisMusicae* 59 no. 3 (2012, Special Issue).
96. Jean Harden, "Cataloguing in 2012: On the Cusp of RDA," *Fontes Artis Musicae* 59, no. 3 (2012): 253.
97. Anders Cato, "Music Cataloguing in Europe and RDA: Current Practises Challenged by New Rules," *Fontes Artis Musicae* 59, no. 3 (2012): 270-85.
98. Mark McKnight, "Are We There Yet? Toward a Workable Controlled Vocabulary for Music," *Fontes Artis Musicae* 59, no. 3 (2012): 286–92.
99. Margaret Beecher Maurer, Sevim McCutcheon, and Theda Schwing, "Who's Doing What? Findability and Author-Supplied ETD Metadata in the Library Catalog," *Cataloging & Classification Quarterly* 49, no. 4 (2011): 277–310, dx.doi.org/10.1080/01639374.2011.573440.
100. Ibid., 306.
101. Rachel I. Howard and Tyler Goldberg, "Facilitating Greater Access to ETDs Through CONTENTdm," *OCLC Systems & Services* 27, no. 2 (2011): 113–23, dx.doi.org/10.1108/10650751111135418.
102. Barbara Schultz-Jones et al., "Historical and Current Implications of Cataloguing Quality for Next-Generation Catalogues," *Library Trends* 61, no. 1 (2012): 49–82, dx.doi.org/10.1353/lib.2012.0028.
103. Ibid., 78.
104. Joshua Barton and Lucas Mak, "Old Hopes, New Possibilities: Next-Generation Catalogues and the Centralization of Access," *Library Trends* 61, no. 1 (2012): 83–106, dx.doi.org/10.1353/lib.2012.0030.
105. Myung-Ja Han, "New Discovery Services and Library Bibliographic Control," *Library Trends* 61, no. 1 (2012): 162–72, dx.doi.org/10.1353/lib.2012.0025; Tonia Graves and Angela Dresselhaus, "One Academic Library—One Year of Web-Scale Discovery," Serials Librarian 62, no. 1–4 (2012): 169–75; Jeffrey Daniels and Patrick Roth, "Incorporating Millennium Catalog Records into Serials Solutions' Summon," *Technical Services Quarterly* 29, no. 3 (2012): 193–99, dx.doi.org/10.1080/07317131.2012.681283.
106. Susan C. Wynne and Martha J. Hanscom, "The Effect of Next-Generation Catalogs on Catalogers and Cataloging Functions in Academic Libraries," *Cataloging & Classification Quarterly* 49, no. 3 (2011): 179–207, dx.doi.org/10.1080/01639374.2011.559899.
107. Pamela Harpel-Burke, "Catalog Maintenance in the Discovery System: Opinions of Early Adopters," *College & Undergraduate Libraries* 19, no. 2–4 (2012): 246–63, dx.doi.org/10.1080/10691316.2012.693363.
108. Larisa Walsh, "The Faceted Catalog as a Tool for Searching Monographic Series: Usability Study of Lens," *Cataloging & Classification Quarterly* 50, no. 1 (2012): 43–59, dx.doi.org/10.1080/01639374.2011.610433; William Denton and Sarah J. Coysh, "Usability Testing of VuFind at an Academic Library," *Library Hi Tech* 29, no. 2 (2011): 301–19, dx.doi.org/10.1108/07378831111138189; Debra G. Skinner, "A Comparison of Searching Functionality of a VuFind Catalogue Implementation and the Traditional Catalogue," *Library Trends* 61, no. 1 (2012): 208–17, dx.doi.org/10.1353/lib.2012.0031.
109. Kathleen Bauer and Alice Peterson-Hart, "Does Faceted Display in a Library Catalog Increase Use of Subject Headings?," *Library Hi Tech* 30, no. 2 (2012): 347–58, dx.doi.org/10.1108/07378831211240003.
110. Ibid., 354.
111. Steven J. Miller, *Metadata for Digital Collections: A How To Do It Manual* (New York: Neal-Schuman, 2011).
112. Ditte Laursen, Kåre Fiedler Christiansen, and Lars Lundegård Olsen, "Management of Metadata for Digital Heritage Collections," *Microform & Digitization Review* 41, no. 3–4 (2012): 151–58, dx.doi.org/10.1515/mir-2012-0024.
113. Kristin E. Martin, "Marrying Local Metadata Needs With Accepted Standards: The Creation of a Data Dictionary at the University of Illinois at Chicago," *Journal of Library Metadata* 11, no. 1 (2011): 33–50, dx.doi.org/10.1080/19386389.2011.545006; Silvia B. Southwick and Cory Lampert, "Metadata Dictionary Database: A Proposed Tool for Academic Library Metadata Management," *Journal of Electronic Resources Librarianship* 23, no. 4 (2011): 339–60, dx.doi.org/10.1080/1941126X.2011.627053.
114. Maureen P. Walsh, "Repurposing MARC Metadata for an Institutional Repository: Working with Special Collections and University Press Monographs," *Library Resources & Technical Services* 55, no. 1 (2011): 33–44.
115. Tracy Guza, "The Seattle Public Library Century 21 Collection:

Balancing Metadata Complexity, Processing Expediency, and User Experience," *PNLA Quarterly* 75, no. 3 (2011): 92–104; Mark A. Greene and Dennis Meissner, "More Product, Less Process: Revamping Traditional Archival Processing," *American Archivist* 68, no. 2 (2005): 208–63.

116. Renée McBride, "Look What We Got! How Inherited Data Drives Decision-Making: UNC-Chapel Hill's 19th-Century American Sheet Music Collection," *Code4Lib Journal*, no. 13 (2011): 1–20, accessed May 10, 2014, journal.code4lib.org/articles/4916.
117. Cynthia Tobar, "Music to My Ears: The New York Philharmonic Digital Archives," *D-Lib Magazine* 17, no. 7/8 (2011), dx.doi.org/10.1045/july2011-tobar.
118. R. Niccole Westbrook et al., "Metadata Clean Sweep: A Digital Library Audit Project," *D-Lib Magazine* 18, no. 5/6 (2012), dx.doi.org/10.1045/may2012-westbrook.
119. Shirley Lim and Chern Li Liew, "Metadata Quality and Interoperability of GLAM Digital Images," *Aslib Proceedings: New Information Perspectives* 63, no. 5 (2011): 484–98, dx.doi.org/10.1108/00012531111164978.
120. Baker, "Libraries, Languages of Description, and Linked Data: A Dublin Core Perspective, 128."
121. Rebecca L. Mugridge and Jeff Edmunds, "Batchloading MARC Bibliographic Records: Current Practices and Future Challenges in Large Research Libraries," *Library Resources & Technical Services* 56, no. 3 (2012): 155–70, dx.doi.org/10.5860/lrts.56n3.155.
122. Philip Young, "A Survey of Batch Cataloging Practices and Problems," *Technical Services Quarterly* 29, no. 1 (November 18, 2012): 22–41, 10.1080/07317131.2012.624450.
123. Kristy L. Dixon and Lisa T. Nickel, "MetaWHAT?: Training Access Services Staff to Partner in Digital Projects Metadata Creation," *College & Research Libraries News* 73, no. 2 (2012): 74–82, accessed May 10, 2014, crln.acrl.org/content/73/2/74.
124. Gwen Evans and Kellie Tilton, "Creating an Un-Library Catalog: A Case Study in Managing Satellite Collections," *Library Resources & Technical Services* 55, no. 1 (2011): 45–53, dx.doi.org/10.5860/lrts.55n1.45.
125. Teressa M. Keenan, "Charting a Course With NOMAP: Integrating Metadata Workflows Into a Traditional Cataloging Unit," *Journal of Library Metadata* 12, no. 2–3 (2012): 199–212, dx.doi.org/10.1080/19386389.2012.699842.
126. Ibid., 210.
127. Carrie A. Preston, "Cooperative E-Book Cataloging in the OhioLINK Library Consortium," *Cataloging & Classification Quarterly* 49, no. 4 (2011): 257–76, dx.doi.org/10.1080/01639374.2011.571147.
128. Kristin E. Martin et al., "Consortial Cataloging Guidelines for Electronic Resources: I-Share Survey and Recommendations," *Cataloging & Classification Quarterly* 49, no. 5 (June 2011): 361–86, dx.doi.org/10.1080/01639374.2011.588996.
129. Rogan Hamby, "10% Wrong for 90% Done: A Practical Approach to Collection Deduping," *Computers in Libraries* 32, no. 4 (2012): 17–21.
130. Sara Rofofsky Marcus, "An Interview with Joseph Miller," *Cataloging & Classification Quarterly* 49, no. 2 (2011): 136–37, dx.doi.org/10.1080/01639374.2011.545343.
131. Steven J. Miller et al., "Online Cataloging Education at the University of Wisconsin–Milwaukee," *Cataloging & Classification Quarterly* 50, no. 2–3 (February 2012): 110–26, dx.doi.org/10.1080/01639374.2011.651193.; Kathryn La Barre, K. R. Roberto, and Faye Leibowitz, "The Common Gaze: Conversations with Cataloging Instructors about Teaching Online at the Graduate School of Library and Information Science, University of Illinois at Urbana-Champaign," *Cataloging & Classification Quarterly* 50, no. 2–3 (February 2012): 127–43, dx.doi.org/10.1080/01639374.2011.650840; Janet Swan Hill, "The Brick Wall: Attracting People to a Career in Cataloging," in *Conversations with Catalogers in the 21st Century*, ed. Elaine R. Sanchez (Santa Barbara, CA: Libraries Unlimited, 2011), 209–18; Sylvia D. Hall-Ellis, "Cataloging/Metadata and Library Science Education Programs for Catalogers and Metadata Specialists: Challenges for the Twenty-First Century," in *Conversations with Catalogers in the 21st Century*, ed. Elaine R. Sanchez (Santa Barbara, CA: Libraries Unlimited, 2011), 226–54; *Cataloging & Classification Quarterly* 50, no. 2–3: (special issue, 2012).
132. *Cataloging and Classification Quarterly* 50, no. 2–3 (2012).
133. "The Common Gaze: Conversations with Cataloging Instructors about Teaching Online at the Graduate School of Library and Information Science, University of Illinois at Urbana-Champaing," *Cataloging & Classification Quarterly*, 50, no. 2-3 (2012): 127–43, dx.doi.org/10.1080/01639374.20111.650840; Gretchen L. Hoffman, "Using the Quality Matters Rubric to Improve Online Cataloging Courses," *Cataloging & Classification Quarterly* 50, no. 2–3 (2012): 158-71, dx.doi.org/10.1080.01639372.2011.651194; Morag Boyd,"From the Comfort of Your Office: Facilitating Learner-Centered Continuing Education in the Online Environment," *Cataloging & Classification Quarterly* 50, no. 2–3 (2012): 189–203, dx.doi.org/10.1080/01639374.2011.651195.
134. Natalia Gelber and Irina Kandarasheva, "PCC Training for Copy Catalogers: Is It Worth the Investment? The Columbia University Libraries Experience," *Library Resources & Technical Services* 55, no. 3 (2011): 163–71, dx.doi.org/10.5860/lrts.55n3.163.
135. Gretchen L. Hoffman, "Could the Functional Future of Bibliographic Control Change Cataloging Work? An Exploration Using Abbott," *Journal of Library Metadata* 12, no. 2–3 (2012): 111–26, dx.doi.org/10.1080/19386389.2012.699825.
136. Michael A. Cerbo, "Is There a Future for Library Catalogers?," *Cataloging & Classification Quarterly* 49, no. 4 (2011): 323–27, dx.doi.org/10.1080/01639374.2011.571504.
137. Schreur, "The Academy Unbound," 232.
138. Hoffman, "Could the Functional Future of Bibliographic Control Change Cataloging Work?," 124.

Ready for STEM?

A Leading Commercial Multimedia Database as a Source for Media-Rich Science, Technology, Engineering, and Mathematics Assets for K–12 Library Collections

Marcia A. Mardis

National emphases on STEM learning and digital textbooks have highlighted the importance of high quality digital instructional materials. Because teachers often lack the time and expertise to find, assess, and organize multimedia, school librarians can support STEM learning by providing media-rich, current, curriculum-linked library collections. To determine whether Discovery Education Streaming, a leading commercial database is a viable source of school library STEM resources, the researcher analyzed its multimedia assets by media, grade, category, and copyright. Results suggested that the database's extensive content was comprised mainly of video segments, complete videos, and images but that this content was outdated, had uneven grade coverage, and addressed limited topics. While the results raise concerns about Discovery Education Streaming as an enhancement to library collections, careful use of these sources may allow school librarians opportunities to integrate high quality digital assets into their collections through specific strategies for policy, research, and practice.

Effective science, technology, engineering, and mathematics (STEM) learning experiences center on two variables: high quality learning resources and high quality pedagogy; deeply intertwined, neither variable alone is sufficient to improve student achievement.[1] The role of resources in K–12 education is so crucial that the ability to locate instructional information is a significant driver of teacher quality, and confidence in the ability to integrate available resources can be used as a proxy measure of educator effectiveness.[2] For these reasons, the school library collection matters. The school librarian is the sole educator tasked with building and maintaining a collection of diverse, high quality, current resources that support curriculum, complement adopted texts, enable professional learning, and pique student interest. Despite the pleas of school library researchers, policymakers, and educators for making instructional collaboration and leadership the defining elements of the school librarian's role, three decades of scholarly researchers have consistently concluded that a well-curated collection

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of learning resources assembled and maintained by a qualified school library professional has a measurable relationship with student achievement.[3]

Current educational initiatives may give the school library collection an even greater role in student learning. The US Department of Education is urging school administrators to focus on two main reform issues: STEM education and digital textbooks.[4] Policymakers have noted that "the world today's students will inherit will be one defined to an even greater degree by science and technology," "mastery of mathematics, science, and technology is no longer only for future scientists and engineers; it is essential preparation for all students," and that technology tools and digital content are essential components of fostering STEM learning.[5]

Promoting district and state level adoption of digital textbooks, or collections of high quality, interactive digital multimedia learning content, has been at the forefront of federal education initiatives.[6]

Florida has enacted the Digital Learning Now Act (Senate Bill 2120/House Bill 7917) that mandates that public schools will use at least 50 percent digital instructional materials by the 2015–16 school year.[7] This move was significant not only because Florida is a textbook adoption benchmark state, but also since the law is the first of its kind. Two other states have similar laws. California's legislation encourages, but does not mandate, digital textbooks in public schools by 2020. In 2010, Illinois passed legislation redefining textbooks to include digital formats. The Florida law is the most ambitious measure, requiring full implementation of digital textbooks by 2015, and it is anticipated that other states are soon to follow.[8]

Problem Statement and Significance

Because STEM is a national priority and is well supported by existing digital materials, digital textbooks will likely first be implemented to support STEM learning.[9] While many schools make use of free, open education resources (OERs) for STEM learning available through providers like the National Science Foundation's National Science Digital Library (NSDL) (http://nsdl.org), market researchers estimate that over 50 percent of schools rely on commercial content providers.[10] Discovery Education, the educational programming division of the cable television network Discovery Channel, is attempting to expand its role in the STEM instructional and supplementary materials market.[11]

In July 2013, parent company Discovery Communications, reported that over half of US schools subscribed to and over one million teachers use Discovery Education Streaming products.[12] At 2013 enrollment levels, these subscription numbers suggest that Discovery Education Streaming users also included more than 15 million students and approximately 15,000 school librarians.[13] With annual subscription costs starting at approximately $2,000–$5,000 per school, this content provider has a great stake in the digital resource market. Therefore, Discovery Education Streaming's ability to provide high quality STEM education resources has significant implications for educators and learners. To this point, the study was guided by the research question: "To what extent can a leading multimedia database complement a school library STEM collection?" After exploring this research question, the paper concludes with an examination of how school librarians might optimize their involvement in the promotion of these and other digital resources.

Literature Review

Students are expected to use multimedia, particularly video, for STEM learning; accordingly, well over half of classroom teachers reported using digital video daily and that content is commonly recommended by their school librarian.[14] In many ways, STEM teachers and school librarians are struggling with common reform issues and with documenting their positive impacts within school systems. Nationally, educational policymakers point to faltering STEM reform initiatives and low test scores as trends that will culminate in a population illiterate in science with few students pursuing STEM careers.[15] As pressure increases to expand data-driven decisions in schools, every component of the learning environment must show a measurable effect.[16] Yet national STEM learning and teaching standards producing organizations (i.e., National Science Teachers' Association, American Association for the Advancement of Science) seem to fail to recognize the promise of school librarians to support their improvement efforts, nor do school librarians seem to be effective in building needed relationships with STEM educators.[17] The missions of effective school librarians and STEM teachers have many common and mutually reinforcing elements.[18] Similarly, the components of contemporary media and information literacy (also known as 21st Century Skills) and STEM literacy have substantial crossover. As table 1 shows, STEM literacy centers on understanding the interrelated nature of scientific content and processes.[19]

Likewise, twenty-first century skills embody multiple literacies (e.g., textual, visual, numerical, media, information), complex thinking, deep conceptual understanding, and analytical decision-making.[20] The National Research Council affirmed that scientific understanding is dependent on the interplay of broad cognitive skills and domain-specific learning.[21] Despite this common ground, close coordination between STEM teachers and school librarians does not frequently occur.[22]

Table 1. Definitions of Science, Technology, Engineering and Mathematics Literacy

Scientific Literacy	The ability to use scientific knowledge and processes to understand the natural world as well as the ability to participate in decisions that affect it in three main areas—science in life and health, science in Earth and environment, and science in technology.
Technological Literacy	Students should know how to use new technologies, understand how new technologies are developed, and have the skills to analyze how new technologies affect our nation, the world, and us.
Engineering Literacy	The understanding of how technologies are developed via the engineering design process using project-based lessons in a manner that integrated lessons across multiple subjects.
Mathematical Literacy	The ability of students to analyze, reason, and communicate ideas effectively as they pose, formulate, solve, and interpret problems in a variety of situations.

STEM Collections in Secondary School Libraries

Building STEM collections has proven particularly challenging for school librarians. Many school librarians struggle with collection development in STEM fields as they often lack formal education in these disciplines.[23] STEM information changes quickly and content in published books becomes outdated before they can be placed on library shelves. As a result, staying abreast of developments in STEM to maintain a current collection may be one of the most daunting tasks a school librarian faces.[24] As a participant in a study pointed out, "In science, anything past seven years old is practically worthless."[25]

A good resource base can be a point of departure to a richer set of integrative activities and leadership opportunities. The potential for positive impacts on student engagement and achievement through school library collections and from school librarian-teacher collaboration have been demonstrated in previous studies.[26] School librarians provide collaborative instruction, professional development, and direct student assistance with the use of learning resources in schools with high student achievement.[27] Some studies have concluded that student science test scores had a statistically significant positive correlation with many specific features of the school library collection such as digital resources and current periodical subscriptions.[28]

Mardis and Hoffman found that STEM books as old as forty years were on many school library shelves.[29] In a later study, Mardis also found that since school librarians have typically been educated as English or social studies teachers, they were not confident in selecting STEM materials and tolerated old STEM collections. This lack of confidence affected school librarians' willingness to forge relationships with STEM teachers. Despite this reluctance, many school librarians expressed the desire, which was often unrealized due to budget constraints, to add more current journals, databases, and multimedia resources to their collections.[30] Adding nonbook media seems to have the potential to address deficiencies in STEM book collections with current, dynamic, and affordable digital materials, but many school librarians are unsure where to begin.[31]

STEM Digital Resources in School Libraries

School librarians are increasingly interested in including digital resources, especially video and audio, in their recommendations to teachers. The 2,025 librarians reflected in the 2012 annual national SpeakUp! longitudinal survey report of educators, parents, and students administered by the independent educational consulting company Project Tomorrow stated selection priorities of

- content accuracy;
- ease of use by teacher and student;
- alignment with state and national curriculum standards;
- credibility of the organization producing materials; and
- flexibility of content for a variety of uses.[32]

Indeed, fostering visual literacy, particularly in relationship to building interdisciplinary understanding is gaining profile as an important function of the school librarian.[33]

Digital Video

Research on digital video in US schools is an emerging area of study in K–12 education, to date characterized by research limited to specific sites, funded by video-producing companies, or proprietary and released only in summary form.[34] For example, highlights from a study conducted by the Grunwald Associates research firm for the Public Broadcasting Service (PBS) in 2010 are only included in a PBS press release.[35] Highlights from this study indicated the benefits of the use of video derived from PBS television programming in the classroom but information about the study sample, questionnaire, or analysis process was not available. Earlier studies emphasized the power of video to facilitate science and mathematics learning.[36] However, many of these studies were conducted ten years or more years ago, and

curriculum standards, educational technology, and content providers have changed dramatically in the ensuing years. Research has not kept pace with the advancement of streaming video adoption and use.

This paucity body of research on the use of educational digital streaming video is problematic considering the prevalence of teachers' streaming media use and the instructional differentiation afforded by video technology. With the current growth of freely available web-based video services such as YouTube and TeacherTube (www.teachertube.com/) plus web 2.0 tools for content creation and manipulation, digital video use in the classroom is poised for rapid expansion in ways that may not yet be easily predicted.

Discovery Education Streaming (formerly United Streaming) is a leading subscription multimedia database used by more than 1 million educators and 30 million students in US schools.[37] Commissioned studies in Virginia and California have suggested positive relationships between the frequency of use of Discovery Education Streaming and grades 3–8 student achievement in state test results for mathematics and reading. Similar positive relationships have been observed with science learning in Virginia. In Florida, 2009 state test scores were 7.4 percent higher in schools that used Discovery Education Streaming.[38]

Not all users felt that Discovery Education streaming benefits were easy to attain. Statewide users in Michigan appreciated the tool's potential as a strong means to introduce new concepts or to allow students to work independently, especially in science. However, educators reported that they found video segments and videos to be outdated, often of poor quality, and the use of the system placed an undue bandwidth usage and network traffic burden on the district or school. Educators listed lack of time to find and preview videos, equipment to project videos to classes, and implementation support as barriers to unfettered use of Discovery Education Streaming. Despite the fact that school librarians are commonly left out of adoption decisions, many serve on the front lines of implementation, assisting teachers with bandwidth capacity management and hardware troubleshooting.[39]

The use of nonprint and visual resources as learning tools has been underemphasized in science curricula and, even when included, unless the resources are accompanied with sufficient metadata to allow them to be adequately indexed by search engines and described in sufficient detail for users to assess their relevance, can be difficult to find and organize.[40] School librarians have a professional imperative to lead and facilitate the integration of multimedia, including subscription databases, into teaching and learning.[41] Research led by Mardis suggests that school librarians and STEM teacher collaboration has the potential to enhance the science curriculum using digital video, audio, and applications to teachers but did not systematically integrate digital resources from subscription databases into their collections, thus complicating teachers' and learners' attempts to find and use them.[42]

School Librarian Collaboration with STEM Teachers

While the potential exists for positive outcomes in school librarian-STEM teacher collaborations, previous research has identified persistent barriers. In studies of middle school STEM teachers, Mardis reported that educators struggled to find high quality digital resources and lacked both the time and experience to adequately evaluate the results of their own Internet searches for quality and appropriateness of content to match curriculum and standards.[43] Despite teachers' strong desire to include digital resources in their curriculum, researchers have documented teachers' lack of information searching and digital resources quality assessment skills for nearly a decade. Further, teachers recognize the need for on-site assistance to better integrate open content and engage their computer-savvy students with interactive, visual, and up-to-date STEM resources.[44]

Mardis and Perrault showed that in schools where the school librarian collaborated with STEM teachers, there was a significant, positive relationship with student achievement and that strong STEM collections were the key to building relationships with STEM learners. When the STEM teacher and the school librarian provided learning opportunities with digital content to students, those students mastered course content and sustained interest in the STEM topic.[45] Accordingly, a national report concluded that the more teachers and administrators see the school librarian as a leader in technology integration, the more likely their perceptions will change and their expectations will increase, thus improving instruction and student learning.[46]

In situations where collaboration with STEM teachers occurred on a minimal level, school librarian interactions with STEM teachers took place through information resource provision and teaching STEM students information skills to complete their assignments. These interactions, with the school librarian primarily acting as a resource provider and an instructor of information skills, affirm previous findings.[47] Empowering the school librarian to focus on current and dynamic sources of STEM information may be the key to promoting those resources to STEM teachers and students and to effective collaboration.

Research Method

The goal of this study was to explore the extent to which Discovery Education Streaming could enhance school library

collections. The sample, data collection procedure, and analysis process for each data set is detailed below.

Description of the Sample

Data were collected on July 7 and 9, 2012, when the Discovery Education Streaming K–12 digital media library database contained approximately 148,000 multimedia assets accessible through browsing categories for Careers/Workplace Skills; English/Language Arts; Health; Mathematics; Research/Study Skills; Science; Social Studies; Teaching Practices; Visual and Performing Arts; and World Languages. From these categories, the researcher selected for analysis the following three categories: Science, Health, and Mathematics. Discovery Education Streaming developers assigned Science assets into seven subcategories: Earth/Space Science; History and Nature of Science; Inquiry; Life Science; Physical Science; Science and Technology; and Science in Personal and Social Perspectives. The researcher treated the Science and Technology subcategory as a proxy for a Technology category. Mathematics assets were assigned to subcategories of Algebra; Calculus; Data Analysis and Probability; Geometry; Measurement; Numbers and Operations; Problem Solving; and Trigonometry. Health assets were subcategorized in Alcohol and other Drugs; Growth and Development; Mental Health; Nutrition; Physical Activity; Safety; The Body; Tobacco; and Violence.

Engineering assets, which do not have their own dedicated browsing category or subcategory in Discovery Education Streaming, were retrieved by the researcher through a keyword search of the entire database for the word of "engineering." Engineering assets were not analyzed in subcategories because Discovery Education Streaming does not organize assets on this topic into browsing categories. Engineering assets (N = 600) were located through a keyword search of the term "engineering in the entire Discovery Education Streaming database."

Data Collection

To mimic the typical Discovery Education Streaming user experience, the researcher used the subscriber interface to collect data on July 7 (Health), July 8 (Mathematics and Engineering), and July 9 (Science), 2012. Due to additions to and withdrawals from the resource collection, database asset counts change daily. Therefore, to aid analysis precision and study replication, data for each category were collected on a single day. The researcher reviewed the Discovery Education Streaming database and recorded asset counts by subject, asset type, and grade level. Local content was excluded from asset counts and the range of possible media types is illustrated in table 2 below.

For each subcategory, the researcher narrowed the view display to the five copyright date ranges available: 1988 or older, 1989–93, 1994–98, 1999–2003, or 2004 or newer. Within each copyright date range, the researcher narrowed the display four times to display the results from only one grade level band, i.e., to K–2, 3–5, 6–8, and 9–12, at a time. For each data collection point, the researcher marked the results and exported the results as comma separated value (CSV) files.

Table 2. All Media Types for Discovery Education Streaming Science, Technology, Engineering, and Mathematics Assets

Activity	Image
Assignment	(Math) Overview
(Content) Collection	Quiz
Encyclopedia Entry	Reading Excerpt
(Math) Explanation	Segment (of a Video)
Exploration	(Interactive) Simulation
Fun-Damental	Skill Builder
Game	Song (Music with Singing
Guide	(Full) Video

Data Analysis

Data were initially analyzed using the Statistical Package for the Social Sciences (SPSS). Case summary reports reflecting descriptive and frequency statistics were generated for each of the four subject category areas. The case reports were also exported to Excel to create the tables and charts displayed in the Results section of this paper. Within the case summary reports, Science and Health results were analyzed by grade level, copyright date, and subcategory. Technology is included in the Science subcategory of "Science and Technology." Mathematics assets were analyzed by grade level and subcategory. Because the Engineering category was not subcategorized, no results could be obtained from browsing. All Engineering results were obtained via keyword search of the Discover Streaming database.

Results

This section presents frequency analyses of Discovery Education Streaming assets in separate subsections for science, engineering, mathematics, and health.

Science Assets

On the date of data collection (July 9, 2012), Discovery Education Streaming contained 71,702 science assets assigned to eight subcategories. First, all assets in the Science category

Table 3. Science Assets by Grade Level, Media Type, Copyright Date, and Subject Classification (*N* = 71,702)

Grade Level	Media Type	1988 or older										1989-1993										1994-1998										1999-2003										2004 or newer										Total
		Earth Science	History & Nature of Science	Inquiry	Life Sciences	Physical Sciences	Science & Technology	Personal & Social Perspectives	Earth Science	History & Nature of Science	Inquiry	Life Sciences	Physical Sciences	Science & Technology	Personal & Social Perspectives	Earth Science	History & Nature of Science	Inquiry	Life Sciences	Physical Sciences	Science & Technology	Personal & Social Perspectives	Earth Science	History & Nature of Science	Inquiry	Life Sciences	Physical Sciences	Science & Technology	Personal & Social Perspectives	Earth Science	History & Nature of Science	Inquiry	Life Sciences	Physical Sciences	Science & Technology	Personal & Social Perspectives													
K-2	Content Collection	3	4		1	4	1	1																																												14
	Exploration	1																																																		1
	Fun-Damental				1	1																																															2
	Image	203	1		2098	13		9																						382	14	4	1219	19	98	5	128	6	1	397	14	98	5								4714
	Video Segment	12	4	1	66		1	33	34	220	7	149	19	2	21	96	52	51	193	57	18	57	210	14	80	421	267	8	81	67	3	4	180	64	2	46														2540
	Song	20	8	1	49	10		5															6			5	3		2	6			5	3		2														125
	Full Video	4	2	1	18			6	16	77	6	59	7	2	14	17	13	11	37	18	7	16	53	7	16	142	48	4	29	18	2	1	69	17	1	13														751
	Total K-2	243	19	3	2233	28	2	54	50	297	13	208	26	4	35	113	65	62	230	75	25	73	651	35	100	1787	337	110	117	219	11	6	651	98	101	66														8147
3-5	Content Collection	1	3			1	4	1	1																																											11
	Exploration	1				2		1																																												4
	Fun-Damental				1	1																																														2
	Image	248	1	2	2145	16		19															522	8	5	1345	52	117	25	382	8	5	452	41	117	25														5535
	Quiz				1																																															1
	Reading Excerpt					1																																														1
	Video Segment	23	3	6	107	23		4	104	544	23	309	52	2	192	361	81	87	719	347	37	81	757	168	302	1089	503	116	254	264	80	45	643	102	38	135														7601
	Skill Builder																						1			1				1			1																		4
	Song	19	13	2	45	21		4															6			4	3		2	6			4	3		2														134
	Full Video	5	3	3	15	3		54	33	109	11	75	13	2	34	63	25	19	124	58	12	27	155	27	67	228	102	54	86	64	31	12	99	25	20	51														1709
	Total 3-5	297	23	13	2314	68	4	83	138	653	34	384	65	4	226	424	106	106	843	405	49	108	1441	203	374	2667	660	287	367	717	119	62	1199	171	175	213														15002
6-8	Assignment						1																																													1
	Content Collection						1																																													1
	Exploration	3	4		1	4	1	1																										3	4																21
	Fun-Damental	1				5		1																										1																		8
	Image	310	1	5	2214	27	12	23															933	49	8	1568	114	750	49	8	580	98	177	310	1	5														7242
	Quiz		1		1																														1																	3
	Reading Excerpt	2			1	3																												2																		8
	Video Segment	28	9	4	63	24		39	153	642	62	374	98	11	76	490	148	72	913	340	77	237	1843	1325	784	2409	1295	1098	1152	597	1279	1042	965	28	9	4														17690
	Simulation					2																																														2
	Skill Builder					2																																														2
	Song																						1			1		1			1																					4
	Full Video	8	5	1	4	18																												8	5	1															50
	Total 6-8	352	20	10	2284	85	15	64	153	642	62	374	98	11	76	490	148	72	913	340	77	237	2777	1374	792	3978	1409	1849	1201	605	1860	1140	1142	352	20	10														25032
9-12	Content Collection	3	4		1	4		1																																												13
	Guide																														1																					1
	Image	313	1		2117	29		24															1521	90	10	1581	119	235	44	1342	90	10	597	103	235	44														8505
	Quiz		1		1																																															2
	Video Segment	1		5	35	1	2	26	18	47		18	3	1	14	84	188	85	784	569	50	128	826	651	258	1330	1098	764	465	788	564	184	1038	925	886	481														12317
	Song	1			2	6																																														9
	Full Video	1		1	6	1	2	3	6	11		3	4	1	4	45	72	43	110	152	24	38	175	137	79	200	185	161	173	183	117	58	174	166	174	165														2674
	Total 9-12	319	6	6	2162	41	4	54	24	58	0	21	7	2	18	129	260	128	894	721	74	166	2522	878	347	3111	1402	1160	682	2313	772	252	1809	1194	1295	690														23521

were analyzed. Table 3 illustrates the distribution of these resources across media type, grade level, and subcategory. As table 3 shows, assets are not distributed equally across subjects and media types.

The majority of Discovery Education Streaming assets are assigned types of video segment (*n* = 40,148 or 55 percent), image (*n* =25,996 or 36 percent), and/or full video (*n* =5,184 or 7 percent). The remaining media types represented about 2 percent of assets. Records for the Science category's assets were examined by grade level, and subcategory. Table 2 illustrates the results. The distribution of assets across grade bands was 25,032 (34 percent) assigned to grades 6–8; 23,521 (32 percent) to grades 9–12; 15,002 (20 percent) to grades 3–5; and 8,147 (11 percent) to grades K–2. It should be noted that the remaining 3 percent difference possibly reflects rounding and asset assignment to multiple grade bands. Figure 1 further illustrates the distribution of science assets across grade levels and categories.

As figure 1 indicates, most asset records were assigned to the Life Sciences subcategory with 29,204 (40 percent) records, followed by Earth/Space Sciences with 13,977 (19 percent), Physical Science with 7,582 (10 percent) and History and Nature of Science with 7,549 (10 percent). The least number of records were assigned to the Science and Technology subcategory with 5,268 (7 percent); Science in Personal and Social Perspectives with 4,540 (6 percent); and Inquiry with 3,582 (4 percent). Total percentages reflect rounding and asset assignment to multiple subcategories.

Engineering Assets

Engineering assets (*N* = 600) were examined by media type and grade level. Discovery Education Streaming does not provide browsing subcategories in the Engineering category,

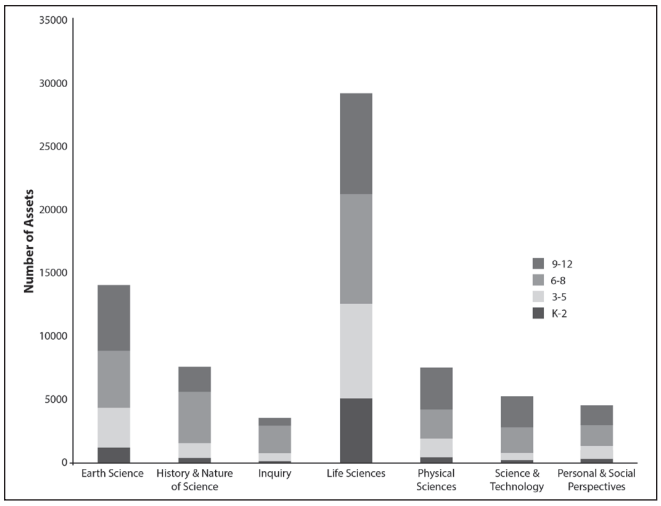

Figure 1. Science Assets by Subcategory and Grade Level (*N* = 71,702)

so results were obtained via keyword search. Table 4 illustrates the asset distribution across media type, grade level, and copyright date.

As table 4 shows, the most predominant media types were Video Segment (*n* = 317 or 52 percent) and Full Video (*n* = 214 or 35 percent). The remaining assets were comprised of Images (*n* = 49 or 8 percent), Encyclopedia Entries (n = 14 or 2 percent). Activity (*n* = 2 or 1.5 percent) and Content Collection (*n* = 2 or 1.5 percent) account for the remaining 3 percent of media types. Most engineering resources were for grades 6–8 (*n* = 388 or 64 percent) and grades 9–12 (*n* = 168 or 28 percent). The remaining forty-four assets (8 percent) were for students in grades K–5. The majority of the assets had copyright dates 1999–2003 (*n* = 340 or 56 percent) and 2004 or newer (*n* = 260 or 43 percent).

Mathematics Assets: Media Type, Grade Level, and Subcategory

Discovery Education Streaming included 13,743 assets in the Mathematics category on the date of data collection (July 8, 2012). Table 5 illustrates the distribution of assets in the Mathematics browsing category across grade level, media type, and subcategory.

As table 5 shows, assets are not distributed equally across media types. The majority of Discovery Education Streaming assets are assigned types of "segment" (an edited portion of a video) (*n* = 10,906 or 79 percent), full video (*n* = 2,112 or 15 percent), and song (recorded music and lyrics) (*n* = 491 or 3 percent). The remaining 234 (3 percent) assets represented other media types. Media types are listed and defined in table 2.

Records for Mathematics assets were then examined by grade level, and subcategory. The distribution of assets across grade bands was 4,547 (33 percent) to grades 9–12; 3,812 (27 percent) assigned to grades 6–8; 2,695 (19 percent) to grades K–2; and 2,689 (19 percent) to grades 3–5. It should be noted that the remaining 2 percent difference perhaps reflects rounding and asset assignment to multiple grade bands (see figure 2).

Assets were assigned to eight subcategories. Most asset records were assigned to Numbers and Operations with 4,031 (29 percent), followed by Problem Solving with 2,915 (21 percent) records Algebra with 1,875 (13 percent), Geometry with 1773 (12 percent), Data Analysis and Probability with 1,429 (10 percent), and Measurement with 1,217 (8 percent). The fewest records were assigned Calculus and Trigonometry accounted for 2 percent. Total percentages reflect rounding and asset assignment to multiple subcategories.

Health Assets

On the date of data collection (July 8, 2012), Discovery Education Streaming included 14,603 assets in the Health category. Table 6 illustrates the distribution of assets in the Health browsing category across grade level, media type, subcategory, and copyright date.

Table 6 shows that the number of assets varies across media types, grade levels, and subcategories. The majority of Discovery Education Streaming Health assets were assigned types of video segment (*n* = 7786 or 53 percent), image (*n* = 4,507 or 30 percent), and/or full video (*n* = 2,048 or 14 percent). The remaining media types represented about 3 percent of assets.

Records for Health assets were then examined by grade level, and subcategory. Table 6 illustrates the results. The distribution of assets across grade bands was 5,001 (34 percent) assigned to grades 9–12; 4,770 (32 percent) to grades 6–8; 2,646 (18 percent) to grades K–2; and 2,186 (14 percent) to grades 3–5. It should be noted that the remaining 2 percent difference possibly reflects rounding and asset assignment to multiple grade bands. Figure 4 further illustrates the distribution of science assets across grade levels and categories.

Figure 3 shows that most asset records were assigned Nutrition with 3,408 (23 percent); Growth and Development with 3,406 (23 percent); The Body (1,592 or 10 percent); Physical Activity with 1,490 (10 percent); and Mental Health with 1,430 (9 percent) followed by Safety with 1,390 (9 percent); and Alcohol with 1,236 (8 percent). The fewest records were assigned Violence (486 or 3 percent) and Tobacco (165 or 1 percent). Total percentages reflect rounding and asset assignment to multiple subcategories.

Table 4. Engineering Assets for K–12 by Grade Level, Media Type, and Copyright Date (*N* = 600)

Grade Level	Media Type	1988 or older	1989-1993	1994-1998	1999-2003	2004 or newer	Total
K-2	Content Collection	1					1
	Image					5	5
	Video Segment				2		2
	Full Video				1		1
	Total K-2	1	0	0	3	5	9
3-5	Content Collection	1					1
	Image				2	6	8
	Video Segment			4	2	3	9
	Full Video			1	11	5	17
	Total 3-5	1	0	5	15	14	35
6-8	Content Collection	1					1
	Image				6	15	21
	Video Segment			6	93	143	242
	Full Video			2	55	67	124
	Total 6-8	1	0	8	154	225	388
9-12	Activity					2	2
	Content Collection	1					1
	Encyclopedia Entry					14	14
	Image				15		15
	Video Segment		2	8	54		64
	Full Video		1	18	53		72
	Total 9-12	1	3	26	122	16	168
Total All Grade Levels		4	3	39	294	260	600

All STEM Assets: Media Type and Copyright Date

Assets were analyzed in aggregate for an overall impression of media type, grade level, subcategory, and copyright date distribution. Figure 4 reflects media types across all categories and grade levels.

As the figure shows, video segments (*n* = 59,157 or 59 percent) and images or (*n* = 30,608 or 30 percent), full videos (*n* = 9,558 or 9 percent), and songs (1,003 or 1 percent) comprised the majority of Discovery Education Streaming STEM assets. The final 1 percent of assets was comprised of the remaining media types listed in table 2.

Figure 5 illustrates a comparison of copyright dates for all subject categories, which reflect that the majority (75,636 or 83 percent) of assets are older than seven years. As demonstrated by figure 5, science is the category with the most assets (71,702 or 71 percent) and most of the science assets (54,440 or 79 percent) are older than seven years. Health assets are the second largest STEM category with nearly 14 percent (14,603) and 73 percent (10,646) of those assets seven years or older. Math assets comprised almost another 14 percent (13,743) and 73 percent of them were older than seven years. The remaining 1 percent of assets related to engineering topics and 57 percent (340) had copyright dates older than 2003.

Discussion

With a national move toward digital textbooks driving an imperative for greater integration of STEM digital content, the researcher for this study sought to determine the extent to which Discovery Education Streaming could function as a source of high quality, readily available multimedia learning assets. National digital textbooks and STEM learning focuses create a unique opportunity for school librarians to upgrade and expand their collections, demonstrate technology leadership, and show themselves to be effective and relevant instructional partners with STEM teachers. In pursuit of an answer to the question of whether the Discovery Education Streaming database is a viable source of STEM content, its assets in science and technology, engineering, mathematics, and health were analyzed by media type, grade level, subject category and subcategory, and copyright date to address a research question relating to extent and quality of the collection.

To What Extent Can a Leading Multimedia Database Complement a School Library STEM Collection?

Research has demonstrated that teachers benefit from support in identifying high quality instructional materials but that school librarians are often frustrated in their attempts to support STEM learning and promote digital materials into school library collections. This analysis revealed that Discovery Education Streaming could be a potential source of multimedia content for school library collections because it contains more than 100,000 assets in science, technology, engineering, mathematics, and health. Science was the largest category, followed by health; technology and engineering topics represented the smallest number of STEM-related assets. Topically, Discovery Education Streaming appeared to be a good source of content for life sciences, algebra, numbers and operations, and nutrition. Discovery Education streaming also appeared to be a better source for assets for grades 3 and higher, with a concentration on upper elementary and middle grades. While assets in the Health category were plentiful, they were lacking in the Tobacco and Violence subcategories, and these topics are important aspects of learning about healthy lifestyles. Mathematics also appeared to be short on support for important advanced topics such as Trigonometry and Calculus. Science was astonishingly low on assets in the Inquiry category—an important topic to which school librarians can definitely contribute content and process.

The modest asset counts in the Science and Technology and Engineering subcategories are a concern because proponents of STEM education reform advocate increasing the visibility of technology and engineering in the standard K–12 curriculum. Technology and engineering relate to the ways that humans modify the natural environment and therefore it is essential that STEM learning be "expanded to include all kinds of devices, instruments, and tools that can be applied in both domains of science and engineering."[48]

As its name suggests, Discovery Education Streaming contains a significant amount of streaming video segments and full videos. It also contains a large number of images. Given that content providers range from broadcast sources including the Discovery Channel and PBS and governmental organizations such as NASA and Smithsonian, it is likely that

Table 5. Mathematics Assets for K–12 by Grade Level, Media Type, and Copyright Date (*N* = 13,743)

Grade Level	Media Type	1988 or older								1989-1993								1994-1998								1999-2003								2004 or newer								Total
		Algebra	Calculus	Data Analysis & Probability	Geometry	Measurement	Numbers & Operations	Problem Solving	Trigonometry	Algebra	Calculus	Data Analysis & Probability	Geometry	Measurement	Numbers & Operations	Problem Solving	Trigonometry	Algebra	Calculus	Data Analysis & Probability	Geometry	Measurement	Numbers & Operations	Problem Solving	Trigonometry	Algebra	Calculus	Data Analysis & Probability	Geometry	Measurement	Numbers & Operations	Problem Solving	Trigonometry	Algebra	Calculus	Data Analysis & Probability	Geometry	Measurement	Numbers & Operations	Problem Solving	Trigonometry	
K-2	Content Collection				1	1	1																																			3
	Game																														1								1			2
	Image																												1		2						1		2			6
	Video Segment			30			15	1					1	14	6	2		2		12	26	26	52	22		31		80	225	166	705	409		10		30	17	38	77	41		2038
	Song				3	8	77	3																						2	56							2	97			248
	Full Video			6			4	1					1	2	2	1		2		8	13	13	20	16		6		19	28	31	102	96		1		6	2	5	8	5		398
	Total K-2	0	0	36	4	9	97	5	0	0	0	0	2	16	8	3	0	4	0	20	39	39	72	38	0	37	0	99	254	199	866	505	0	11	0	36	20	45	185	46	0	2695
3-5	Content Collection				1	1	1																																			3
	Math Explanation																												3		5	5					3		5	5		26
	Game																														2								2			4
	Image																														2						1		2			5
	Math Overview																												1		1	1					1		1	1		6
	Video Segment											3	32	27	83			1		2	4	9	48	16		126		111	251	128	519	235		35		84	34	58	147	94		2047
	Song				2		78	3																						2	54							2	69			210
	Full Video											2	10	10	26	2		3		8	11	15	35	17		19		18	36	29	64	38		2		9	4	10	10	10		388
	Total 3-5	0	0	0	3	1	79	3	0	0	0	5	42	37	109	2	0	4	0	10	15	24	83	33	0	145	0	129	291	159	647	279	0	37	0	93	43	70	236	110	0	2689
6-8	Content Collection				1	1	1																																			3
	Math Explanation																									1			14		2	0		1			1		2			21
	Image																										1	9	1		2				1	4	1		2			21
	Math Overview																												1								14					15
	Video Segment									48		16	35	27	92	53		10		3	45	19	71	37	15	317		146	299	165	531	431		88		121	65	111	139	268		3152
	Song	5			1		5																							2								2	1			16
	Full Video									13		5	10	10	24	22		5	1	2	11	9	26	13	4	45	2	44	47	37	82	59		6	2	37	12	22	16	18		584
	Total 6-8	5	0	0	2	1	6	0	0	61	0	21	45	37	116	75	0	15	1	5	56	28	97	50	19	363	3	199	362	204	617	490	0	95	3	162	93	135	160	286	0	3812
9-12	Content Collection				1	1	1																																			3
	Math Explanation																									8				6	21	3		8	2	2		6	21	5		82
	Image																										1	5	2	2	2				1	5	2	2	2			24
	Math Overview																													1	2	1			1	1		1	2	1		10
	Video Segment							2	4	19			1	1	10	5		178	1	53	71	14	30	85	63	410	104	261	205	71	255	390	63	323	70	189	142	53	203	352	41	3669
	Song	9			1		3	3																															1			17
	Full Video							1	1	5			1	1	5	4		43	1	17	18	11	16	33	14	59	28	69	36	24	48	61	15	36	18	52	22	19	31	44	9	742
	Total 9-12	9	0	0	2	1	4	6	5	24	0	0	2	2	15	9	0	221	2	70	89	25	46	118	77	477	133	335	243	104	328	455	78	367	92	249	166	81	260	402	50	4547

the content of those visual assets reflects accurate science and good quality production. However, the age of the assets in Discovery Education Streaming exceeded seven years, a collection development threshold for STEM resources. In particular, science, engineering, technology and health are highly dynamic fields with rapid advances in knowledge and application occurring constantly. Older or dated resources in these areas run the risk of containing inaccurate or incomplete information and potentially misleading learners.

Limitations and Future Research

This study has limitations, including the fact that Discovery Education Streaming asset counts change daily. While efforts were made to analyze all assets in a particular category, the constantly changing asset counts may undermine efforts to replicate the study using the most current database contents. Additionally, neither engineering nor technology were topics represented in Discovery Education Streaming with browsing categories, and using keyword searches of the database to identify assets related to engineering topics may have resulted in the exclusion of relevant assets. Other concerns relate to whether the subject areas with lower numbers reflect of a lack of available K–12 resources in general or whether they are disproportionately underrepresented in

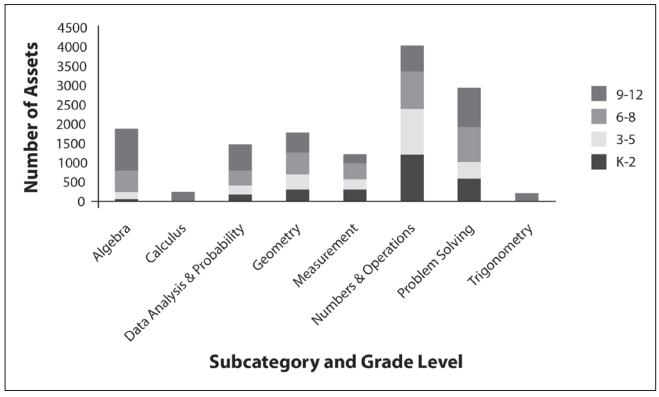

Figure 2. Mathematics Assets by Subcategory and Grade Level (*N* = 13,743)

Table 6. Health Assets for K–12 by Grade Level, Media Type, and Copyright Date (*N* = 14,603)

		1988 or older								1989-1993									1994-1998								1999-2003								2004 or newer								
Grade Level	Media Type	Alcohol	Growth & Development	Mental Health	Nutrition	Physical Activity	Safety	The Body	Tobacco	Violence	Alcohol	Growth & Development	Mental Health	Nutrition	Physical Activity	Safety	The Body	Tobacco	Violence	Alcohol	Growth & Development	Mental Health	Nutrition	Physical Activity	Safety	The Body	Tobacco	Violence	Alcohol	Growth & Development	Mental Health	Nutrition	Physical Activity	Safety	The Body	Tobacco	Violence	Alcohol	Growth & Development	Mental Health	Nutrition	Physical Activity	Safety	The Body	Tobacco	Violence	Total
	Content				1	1																																								2
	Collection																																														
	Image		1		7	18																							4	9	1	311	61	14	5	2		4	337	1	251	54	23	5	2	1110
K-2	Video Segment	13	21	11	13	77	20	16			5	61	29	5	10	26	14	3	2	11	82	16	5	19	60	15		2	14	102	21	47	45	58	35		3		110		37	27	23	8		1066
	Song	1	22	11	6	8	16	1	1																							6	3		1				24		6	14		4		124
	Full Video	2	5	3	2	16	6	7			2	13	6	4	4	9	5	1	1	3	20	9	4	3	13	5	1	2	2	34	11	23	15	14	13	1	3		37	9	14	9	7	2		4	344
	Total K-2	16	49	25	29	120	42	24	1	0	7	74	35	9	14	35	19	4	3	14	102	25	9	22	73	20	1	4	20	145	33	387	124	86	54	3	6	4	508	10	308	104	53	19	2	4	2646
	Content				1	1																																								2
	Collection																																														
	Image		1		7	18																							4	9	1	327	62	14	13	2		4	352	1	264	55	13	7	2	1156
3-5	Video Segment		3	1	4	13		68			3	61	23		1	3	17		5	2	76	32	9	9	22	9		10		29	10	28	32	43	24				66	1	34	31	8	8		685
	Song	1	14	10	2	5	13	1	1																							4	2		1				21		4	13		4		96
	Full Video		3	1	2	4		8			2	13	4	1	2	1	8		1	1	14	6	2	4	5	4		3	1	17	8	13	12	13	9	1	2		39	22	8	10	2	1		247
	Total 3-5	1	21	12	16	41	13	77	1	0	5	74	27	1	3	4	25	0	6	3	90	38	11	13	27	13	0	13	5	55	19	372	108	70	47	3	2	4	478	24	310	109	23	20	2	0	2186
	Activity	1	1		1	1																																								4
	Content		1	1	1	1				1																																				5
	Collection																																														
	Image		1		7	19	1	16																					5	272	2	360	77	17	43	2		5		2	280	70	14	26	2	1221
6-8	Quiz				1																																									1
	Video Segment	12	29	29	11	1	21	7			73	115	27	5	5	24	41		5	148	352	201	4	9	103	62	26	98	218	20	201	117	63	134	135	46	161	21	38	44	40	41	17	37	1	38	2780
	Song		1	2			3																																			11		3			20
	Full Video	3	5	5	3	1	3	4		1	14	18	9	2	2	4	14		1	33	67	42	1	4	23	32	6	20	36	49	42	25	28	37	58	10	25	7	4	38	13	17	10	18	1	4	739
	Total 6-8	16	38	37	24	23	28	27	0	2	87	133	36	7	7	28	55	0	6	181	419	243	5	13	126	94	32	118	259	341	245	502	168	188	236	58	186	33	42	84	333	139	41	84	4	42	4770
	Activity	1			1	1																																								3
	Content		1	1	1	1				1																																				5
	Collection																																														
9-12	Image		4		7	19	1	21																					8	37	4	356	82	17	55	3		8		4	274	75	14	28	3		1020
	Video Segment	17	25	15		2	23	16		5	66	81	30	15	1	112	9		10	131	121	61	14	11	75	54	6	24	219	429	227	215	126	152	295	27	13	37	11	107	121	90	77	170	4	11	3255
	Full Video	2	3	3		1	3	3		1	13	16	10	6	2	11	6		3	21	35	12	6	8	17	24	2	11	45	72	41	45	37	35	65	7	13	13	2	22	24	26	16	32	2	2	718
	Total 9-12	20	33	19	9	24	27	40	0	7	79	97	40	21	3	123	15	0	13	152	156	73	20	19	92	78	8	35	272	538	272	616	245	204	415	37	26	58	13	133	419	191	107	230	9	13	5001

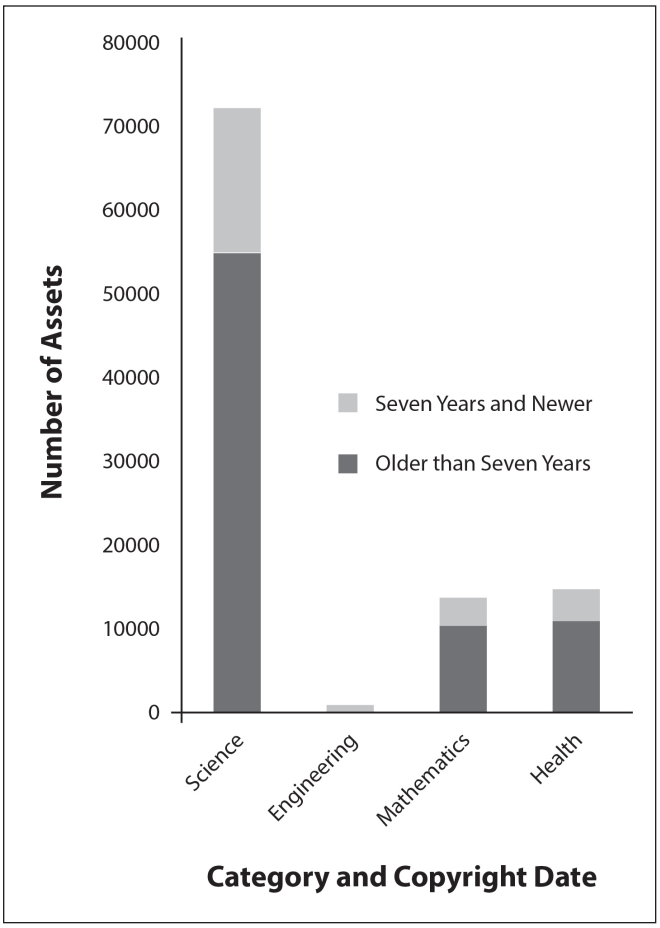

Figure 3. Health Assets by Subcategory and Grade Level (*N* = 14,603)

the database. It is possible that there are there competing databases that differ substantially from Discovery Education Streaming in the scope of their content. However, considering Discovery Education Streaming's domination of the market, the researcher chose not to focus on possible resources, but on the most readily available resources to teachers, librarians, and students in US schools.

Ultimately, asset quantity differs from asset quality, and to gauge the true value of Discovery Education Streaming multimedia assets to a school library collection, one may need to do more than count them. This study was an attempt to gain an idea of the extent of the Discovery Education streaming's collection and a starting point for further research. For example, researchers may wish to use a similar descriptive approach to characterize the contents of other resource databases or delve further into which Discovery Education Streaming resources are actually use by educators and learners.

Conclusion

For school librarians, focusing on STEM education and digital instructional materials may provide tremendous opportunities to work closely with teachers and to bring attention to the school library collection. While the collection development activities of the school librarian may be downplayed in professional guidelines and policy discussions, it is nonetheless a powerful and versatile role. With teachers trying to determine how to find and integrate high quality digital resources through digital textbook and STEM reform initiatives, school librarians can provide important

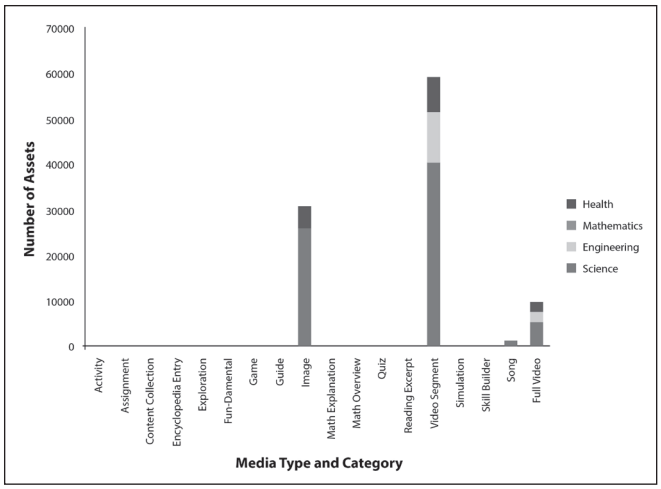

Figure 4. Comparison of All Media Types Across Category (*N* = 100,649)

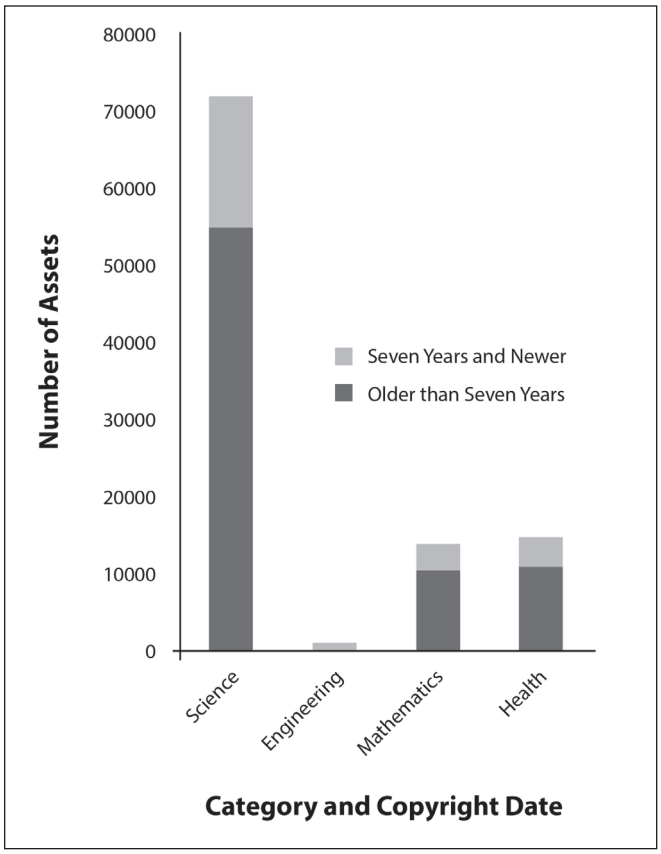

Figure 5. Comparison of All Categories by Copyright Date (*N* = 100,649)

input on instructional materials selection. By definition, the school library collection is a source of supplementary curriculum materials and unless those resources are linked to the classroom curriculum, they will not be visible and will be of little or no use to the teaching process.

Aside from obvious actions such as taking part in discussions of instructional materials selection, school librarians may benefit from an awareness of the various ways their stakeholders encounter library resources: through outreach to administrators, teachers, parents, and students; through their library websites, pathfinders, and newsletters; and importantly, through library catalogs. Discovery Education Streaming resources, carefully reviewed by school librarians for topical relevancy and currency, can be promoted through these vehicles along with other learning assets available in the school.

Popular library management systems like Follett Library Software's Destiny and COMPanion's Alexandria products include federated search functions and execute a single search to be executed across library resources and databases, including Discovery Education Streaming. Library catalog records can be created for individual Discovery Education Streaming resources with free tools similar to Web2MARC (http://dl2sl.org/web2marc).

School librarians may help their school administrators to determine whether an investment in Discovery Education Streaming is worthwhile by surveying teachers about their use and their needs. Web analytics can track traffic to the Discovery Education Streaming website and provide school librarians with data about time and extent of access that can inform technology policies and future expenditures. Greater use of streaming video requires investments in network infrastructure and training for support professionals and this falls under the leadership aegis of a strong school librarian.

Instructional partnering and teaching are additional ways that school librarians can use Discovery Education Streaming to facilitate the integration of the school library collection and programs. School librarians can foster skills as provided by the American Association of School Librarians' (AASL) *Standards for the 21st Century Learner* by working cooperatively with students to download, edit, and remix Discovery Education Streaming's multimedia assets. These new assets can then become part of the Discovery Education Streaming's local content and serve as examples for other students and learning resources that can be shared with school administrators, teachers, and parents. These student-created works can serve as starting points for other students pursuing the same subject of study by integrating them with the library catalog. Students can improve their progress toward the AASL *Standards*' emphases on multimedia literacy and communication skills by investigating scientific advances that have occurred since the creation of some older assets and sharing those discoveries through annotations included in the local Discovery Education Streaming collection.

Discovery Education Streaming and other multimedia databases offer school librarians opportunities to participate in the improvement of STEM education and the transition

to digital learning materials. Increasingly, definitions of STEM reference an interdisciplinary approach that aims to cultivate a deeper understanding of each subject through an emphasis on the interrelated nature of science, technology, engineering, and math. STEM education also includes process-oriented skills such as scientific inquiry and problem solving. By enhancing these skills, STEM education seeks to build STEM literacy, or "an individual's ability to apply his or her understanding of how the world works within and across four interrelated domains."[49] The integration of Discovery Education Streaming assets into the existing media of the school library collection can help build these interrelationships and promote STEM literacy by allowing students to encounter concepts via multiple media types and observe the relationships of scientific concepts to one another in the context of the school library collection.

References

1. Keith E. Maull, Manuel Gerardo Saldivar, and Tamara Sumner, "Observing the Online Behavior of Teachers: From Internet Usage to Personalization for Pedagogical Practice," Paper presented at the ACM SIGCHI Conference on Human Factors in Computing Systems, Atlanta, GA, 2010, accessed May 20, 2013, www.academia.edu/366835/Observing_the_Online_Behavior_of_Teachers_From_Internet_Usage_to_Personalization_for_Pedagogical_Practice; Anne K. Morris and James Hiebert, "Creating Shared Instructional Products: An Alternative Approach to Improving Teaching," *Educational Researcher* 40, no. 1 (2011): 5–14, accessed July 1, 2014, http://edr.sagepub.com/content/40/1/5.full.pdf; Kursat Arslan, "Evaluation of Learning Objects from Different Aspects of Effectiveness: Learning, Learning Object Benefit, and Learning Object Quality," in *Proceedings of Society for Information Technology & Teacher Education International Conference 2010*, ed. David Gibson, Bernie Dodge (Chesapeake, VA: Association for the Advancement of Computing in Education, 2010), 2143–49.
2. *No Dream Denied: A Pledge to America's Children* (Washington, DC: National Commission on Teaching and America's Future, 2003); Michael Spaulding, "The Influence of Technology Skills on Preservice and Inservice Teachers' Perceived Ability to Integrate Technology," in *World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* 2010, no. 1, ed. Jaime Sanchez and Ke Zhang (Chesapeake, VA: Association for the Advancement of Computing in Education, 2010) 2193–202.
3. Patricia Montiel-Overall, "Toward a Theory of Collaboration for Teachers and Librarians," School *Library Media Research* 8, (2005), accessed June 1, 2013, www.ala.org/aasl/sites/ala.org.aasl/files/content/aaslpubsandjournals/slr/vol8/SLMR_TheoryofCollaboration_V8.pdf; *Empowering Learners: Guidelines for School Library Media Programs* (Chicago: American Association of School Librarians, 2009); Nancy Everhart and Eliza T. Dresang, "School Library Media Specialist for the 21st Century: Leaders in Education Make a Difference," Paper presented at the Association for Library and Information Science Education National Conference, San Antonio, TX, January 17, 2006; *School Libraries Work!* (Danbury, CT: Scholastic Library Publishing, 2008), accessed May 24, 2013, www2.scholastic.com/content/collateral_resources/pdf/s/slw3_2008.pdf.
4. Digital Textbook Collaborative, *The Digital Textbook Playbook* (Washington, DC: Federal Communications Commission, 2012), accessed June 2, 2013, http://transition.fcc.gov/files/Digital_Textbook_Playbook.pdf.
5. United States Department of Education, *Supporting Science, Technology, Engineering, and Mathematics Education: Reauthorizing the Elementary and Secondary Education Act*, accessed May 24, 2013, www2.ed.gov/policy/elsec/leg/blueprint/faq/supporting-stem.pdf.
6. Ibid.
7. State of Florida, "Senate Bill (SB) 2120: K–12 Education Funding," accessed July 11, 2014, www.flsenate.gov/Session/Bill/2011/2120.
8. Kathy Mickey and Karen Meaney, *Simba Information's 2011 National Textbook Adoption Scorecard and 2012 Outlook* (Stamford, CT: Simba Information, 2011).
9. Kathy Mickey et al., *K–12 Technology Tools & Trends 2012* (Stamford, CT: Simba Information, 2012).
10. Lecia Barker, "Science Teachers' Search Behaviors, Resource Preferences, and Classroom Technology," in *Proceedings of Society for Information Technology & Teacher Education International Conference 2010*, ed. David Gibson and Bernie Dodge (Chesapeake, VA: Association for the Advancement of Computing in Education, 2010), 1340–45; Henry Braun et al., *Exploring What Works in Science Instruction: A Look at the Eighth-Grade Science Classroom* (Princeton, NJ: Educational Testing Service, 2009); Richard A. Duschl, Andrew W. Shouse, and Heidi A. Schweingruber, "What Research Says About K-8 Science Learning and Teaching," *Education Digest* 73, no. 8 (2008): 46–50; Geoffrey Fletcher, Dian Schaffhauser, and Douglas Levin, *Out of Print: Reimagining the K–12 Textbook in a Digital Age* (Washington, DC: State Educational Technology Directors Association, 2012); Delia R. Duffey and Christine Fox, *National Educational Technology Trends 2012: State Leadership Empowers Educators, Transforms Teaching and Learning* (Washington, DC: State Educational Technology Directors Association, 2012), accessed July 15, 2013, www.setda.org/wp-content/uploads/2013/12/SETDANational_Trends_2012_June20_Final.pdf.
11. Discovery Education, *Enhance Your Classroom with Discovery Education Streaming*, accessed May 24, 2013, http://discoveryeducation.com/pdf/DEstreaming_BROCHURE.pdf.
12. Discovery Communications, *At a Glance: As Reported July 30, 2013*, accessed July 15, 2014, http://media.corporate.discovery.com.s3.amazonaws.com/uploads/pdf/at-a-glance-2q13-final.pdf.

13. Thomas D. Snyder and Sally A. Dillow, *Digest of Education Statistics, 2012* (Washington, DC: National Center for Education Statistics, Institute of Education Sciences, US Department of Education, 2013).
14. Raymond J. McNulty, "Student Expectations Unmet: Where Are the Electronics?" *School Administrator* 67, no. 1 (2010): 13; Project Tomorrow, *Mapping a Personalized Learning Journey: K–12 Students and Parents Connect the Dots with Digital Learning* (Irvine, CA: Project Tomorrow, 2012), accessed July 15, 2013, www.tomorrow.org/speakup/pdfs/SU11_PersonalizedLearning_Students.pdf; Project Tomorrow, *The New 3 E's of Education: Enabled, Engaged and Empowered: How Today's Students Are Leveraging Emerging Technologies for Learning*, accessed July 15, 2014, www.tomorrow.org/speakup/pdfs/SU10_3EofEducation(Students).pdf
15. Ibid.; Project Tomorrow, *Personalizing the Classroom Experience—Teachers, Librarians and Administrators Connect the Dots with Digital Learning*, accessed July 15, 2014, www.tomorrow.org/speakup/SU11_PersonalizedClassroom_EducatorsReport.html.
16. United States Department of Education, *Supporting Science, Technology, Engineering, and Mathematics Education*, accessed May 24, 2013, www2.ed.gov/policy/elsec/leg/blueprint/faq/supporting-stem.pdf.
17. Lawrence Lanahan, "Beyond School-Level Internet Access: Support for Instructional Use of Technology," *Education Statistics Quarterly* 4, no. 2 (2002), 35–38; Luli Stern and Jo Ellen Roseman," Can Middle-School Science Textbooks Help Students Learn Important Ideas? Findings from Project 2061's Curriculum Evaluation Study: Life Science," *Journal of Research in Science Teaching* 41, no. 6 (2004): 538–68.
18. Marcia A. Mardis, "School Libraries and Science Achievement: A View from Michigan's Middle Schools," *School Library Media Research* 10 (2007); Marcia A. Mardis, "Science-Related Topics in School Library Media Periodicals: An Analysis of Electronic Citation Content from 1998–2004," *School Libraries Worldwide* 12, no. 2 (2006): 1–15.
19. Marcia A. Mardis, "Science Teacher and School Library Media Specialist Roles: Mutually Reinforcing Perspectives as Defined by National Guidelines," in *Educational Media and Technology Yearbook*, ed. Michael Orey, Vivian McClendon and Robert Maribe Branch (Westport, CT: Libraries Unlimited, 2006): 169–78.
20. Mega Subramaniam et al., "Crosswalk between the 'Framework for K–12 Science Education' and 'Standards for the 21st-Century Learner': School Librarians as the Crucial Link," *School Library Research* no. 16, accessed July 15, 2014, www.ala.org/aasl/sites/ala.org.aasl/files/content/aaslpubsandjournals/slr/vol16/SLR_CrosswalkbetweenFrameworkStandards_V16.pdf; Hanover Research Council, "K–12 STEM Education Overview," accessed June 2, 2013, www.hanoverresearch.com/wp-content/uploads/2011/12/K-12-STEM-Education-Overview-Membership.pdf; Office of Educational Technology; United States Department of Education, Office of Technology Education, *Transforming American Education: Learning Powered by Technology. National Educational Technology Plan 2010*, accessed July 15, 2014, www.ed.gov/sites/default/files/netp2010.pdf
21. National Research Council, *Successful K-12 Stem Education: Identifying Effective Approaches in Science, Technology, Engineering, and Mathematics* (Washington, DC: National Academies Press, 2011).
22. Marcia A. Mardis, "Unpacking the Baggage of Collaboration: Some Factors to Consider," *Media Spectrum* 33, no. 3 (2007): 10–11; Patricia Montiel-Overall, and Kim Grimes, "Teachers and Librarians Collaborating on Inquiry-Based Science Instruction: A Longitudinal Study," *Library & Information Science Research* 35, no. 1 (2013): 41–53; Barbara Schultz-Jones and Catherine Ledbetter, "Building Relationships in the School Social Network: Science Teachers and School Library Media Specialists Report Key Dimensions," *School Libraries Worldwide* 15, no. 2 (2009): 23–48.
23. Ibid.
24. Kay Bishop and Phyllis Van Orden, *The Collection Program in Schools: Concepts, Practices, and Information Sources* (Westport, CT: Libraries Unlimited, 2007); W. Bernard Lukenbill, *Collection Development for a New Century in the School Library Media Center* (Westport, CT: Greenwood, 2002).
25. Kathryn L. Bonnell, "Assessing the Use of the Print Collections of Three Suburban High Schools: Implications for Collection Development" (doctoral dissertation, Walden University, 2008).
26. *School Libraries Work*!, accessed May 1, 2013, www2.scholastic.com/content/collateral_resources/pdf/s/slw3_2008.pdf.
27. Ibid; Nancy Everhart, Marcia A. Mardis, and Melissa Johnston, "National Board Certified School Librarians' Leadership in Technology Integration: Results of a National Survey," *School Library Media Research* 14 (2011), accessed July 16, 2014, www.ala.org/aasl/sites/ala.org.aasl/files/content/aaslpubsandjournals/slr/vol14/SLR_NationalBoardCertified_V14.pdf.
28. Mardis, "School Libraries and Science Achievement."
29. Marcia A. Mardis and Ellen S. Hoffman, "Collection and Collaboration: Science in Michigan Middle School Media Centers," *School Library Media Research* 10, (2007), accessed May 22, 2013, www.ala.org/aasl/aaslpubsandjournals/slmrb/slmrcontents/volume10/mardis_collectionandcollaboration.
30. Mardis, *School libraries and science achievement*, accessed May 22, 2013, www.ala.org/ala/aasl/aaslpubsandjournals/slmrb/slmrcontents/volume10/mardis_schoollibrariesandscience.cfm.
31. Ibid.
32. Project Tomorrow, *Unleashing the Future: Educators "Speak up" About the Use of Emerging Technologies for Learning. Speak up 2009 National Findings from Teachers, Aspiring Teachers, and Administrators*, accessed May 14, 2013, www.tomorrow.org/speakup/pdfs/SU09UnleashingTheFuture.pdf.
33. Debbie Abilock, "Visual Literacy: Reading a Documentary Photograph," *Knowledge Quest* 36, no. 3 (2008): 7–13,

accessed July 17, 2014, http://aasl.metapress.com/content/n58l04h238135346/fulltext.pdf; Tracy L. Coskie and Kimberley J. Davis, "Encouraging Visual Literacy," *Science & Children* 46, no. 3 (2008): 56–58, accessed July 17, 2014, http://cmapspublic2.ihmc.us/rid=1H0VWKYQY-1PFL9JT-K54/Encouraging%20Visual%20Literacy.pdf; Peter Felten, "Visual Literacy," *Change: The Magazine of Higher Learning* 40, no. 6 (2008): 60-4; Keith McPherson, "Visual Literacy and School Libraries," *Teacher Librarian* 32, no. 2 (2004): 58.

34. PBS and Grunwald Associates, *Deepening Connections: Teachers Increasingly Rely on Media and Technology*, accessed May 24, 2013, www.pbs.org/about/media/about/cms_page_media/182/PBS-Grunwald-2011e.pdf; Discovery Communications, *At a Glance*, accessed October 21, 2013, http://media.corporate.discovery.com.s3.amazonaws.com/uploads/pdf/at-a-glance-2q13-final.pdf.
35. PBS and Grunwald Associates, *Deepening Connections*, accessed May 24, 2013, www.pbs.org/about/media/about/cms_page_media/182/PBS-Grunwald-2011e.pdf.
36. Chih-Ming Chen and Ying-Chun Sun, "Assessing the Effects of Different Multimedia Materials on Emotions and Learning Performance for Visual and Verbal Style Learners," *Computers & Education* 59, no. 4 (2012): 1273–85; Lawrence T. Escalada and Dean A. Zollman, "An Investigation on the Effects of Using Interactive Digital Video in a Physics Classroom on Student Learning and Attitudes," *Journal of Research in Science Teaching* 34, no. 5 (1997): 467–89; Stephan Schwan and Roland Riempp, "The Cognitive Benefits of Interactive Videos: Learning to Tie Nautical Knots," *Learning & Instruction* 14, no. 3 (2004): 293–305; Kerry Shephard, "Questioning, Promoting and Evaluating the Use of Streaming Video to Support Student Learning," *British Journal of Educational Technology* 34, no. 3 (June 2003): 295–308; Randy Yerrick, Donna Ross, and Philip Molebash, "Promoting Equity with Digital Video," *Learning & Leading with Technology* 31, no. 4 (2003–4): 16–19.
37. Discovery Communications, *At a Glance,* accessed October 21, 2013, http://discoveryeducation.com/pdf/DEstreaming_BROCHURE.pdf.
38. Discovery Education, *Discovery Education Streaming Usage Linked to Top Performing Schools*, accessed June 1, 2013, http://static.discoveryeducation.com/feeds/www/media/pdf/DEstreaming_Usage Achievement Overview.pdf; Franklin J. Boster et al., "The Impact of Video Streaming on Mathematics Performance," *Communication Education* 56, no. 2 (April 2007): 134; Franklin J. Boster, *Use of Discovery Education Science and school performance: Charlotte/Mecklenburg, 2012*, accessed May 24, 2013, http://static.discoveryeducation.com/feeds/www/media/pdf/DEScience_School%20Performance.pdf.
39. Marcia A. Mardis, "Viewing Michigan's Digital Future: Results of a Survey of Educators' Use of Digital Video in the United States," *Learning, Media & Technology* 34, no. 3 (2009): 243-57, dx.doi.org/ 10.1080/17439880903141539.
40. Robin H. Kay and Liesel Knaack, "Evaluating the Use of Learning Objects for Secondary School Science," *Journal of Computers in Mathematics & Science Teaching* 26, no. 4 (2007): 261–89; Eric N. Wiebe, Aaron C. Clark, and Eleanor V. Hasse, "Scientific Visualization: Linking Science and Technology Education through Graphic Communications," *Journal of Design & Technology Education* 6, no. 1 (2001): 40–47, accessed July 17, 2014, http://ojs.lboro.ac.uk/ojs/index.php/JDTE/article/view/434/411; Hsin-Kai Wu, Joseph S. Krajcik, and Elliot Soloway, "Promoting Understanding of Chemical Representations: Students' Use of a Visualization Tool in the Classroom." *Journal of Research in Science Teaching* 38, no. 7 (2001): 821–42.
41. Nancy Everhart et al., *From District to Desktop: Making the Most of Broadband in Schools*, accessed July 17, 2014, www.nsf.gov/sbe/sbe_2020/2020_pdfs/Everhart_Nancy_32.pdf; Warren R. Goetzel, "The Role of Media Specialists with Respect to Instructional Technology in an Urban School District in Georgia" (doctoral dissertation, Georgia State University, 2012), http://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1096&context=msit_diss; Shirley Benson McDonald, "The Role of Technology in the Interactions between Secondary School Library Media Specialists and Teachers" (doctoral dissertation, Louisiana State University, 2006), http://etd.lsu.edu/docs/available/etd-04022006-211850/unrestricted/McDonald_dis.pdf.
42. Marcia A. Mardis, *Infusing Science into Middle School Media Centers: Obstacles and Strategies: A Final Report for the Institute for Library and Information Literacy Education (ILILE) National Research Grant Program,* accessed May 20, 2013, www.ilile.org/initiatives/grants/final_reports/easternmichiganuniversity.pdf; Marcia A. Mardis and Ellen S. Hoffman, "School Library Factors Affecting Science Achievement," (paper presented at the American Educational Research Association, Chicago, IL, April 10, 2007).
43. Ibid.
44. Ibid; Anna L. Ball, Neil A. Knobloch, and Sue Hoop, "The Instructional Planning Experiences of Beginning Teachers," *Journal of Agricultural Education* 48, no. 2 (2007): 56–65; Sue Bennett, Lori Lockyer, and Ian Brown, "Investigating the Factors That Influence the Use of Digital Learning Resources in the K-12 Educational Context," in *Proceedings of the World Conference on Educational Multimedia, Hypermedia and Telecommunications 2005, Montreal, Canada*, ed. Piet Kommers and Griff Richards (Chesapeake, VA: Association for the Advancement of Computing in Education, 2005): 2391-–403; Anne Diekema and M. Whitney Olsen, "Personal Information Management Practices of Teachers," in *Proceedings of the American Society for Information Science and Technology Annual Conference* (New Orleans: American Society for Information Science and Technology, 2011): 1–10; Katherine Hanson and Bethany Carlson, *Effective Access: Teachers' Use of Digital Resources in STEM Teaching* (Newton, MA: Education Development Center, 2005); Louanna

Ione Smolin, and Kimberly A. Lawless, "Becoming Literate in the Technological Age: New Responsibilites and Tools for Teachers," *Reading Teacher* 56, no. 6 (2003), 570–77; Marcia A. Mardis et al., "The Digital Lives of U.S. Teachers: A Research Synthesis and Trends to Watch," *School Libraries Worldwide* 18, no. 1 (2012): 70–86; Anne Marie Perrault, "An Exploratory Study of Biology Teachers' Online Information Seeking Practices," *School Library Media Research* 10 (2007), accessed July 21, 2014, http://files.eric.ed.gov/fulltext/EJ851701.pdf; Elizabeth Probert, "An Investigation into the Teaching of Information Literacy Skills by Teachers in New Zealand Secondary Schools," in *IASL Reports 2006: Reading, Knowledge, Doing, the Multiple Faces of Literacy : Papers from the 35th Annual Conference of the International Association of School Librarianship*, ed. Ana Bela Martins et al. (Erie, PA: International Association of School Librarianship, 2006); Dorothy Williams and Louisa Coles, *The Use of Research Information by Teachers: Information Literacy, Access and Attitude: Final Report* (Aberdeen, Scotland: Robert Gordon University, 2003); Teresa D. Williams, Bonnie J. Grimble, and Marilyn Irwin, "Teachers' Link to Electronic Resources in the Library Media Center: A Local Study of Awareness, Knowledge, and Influence," *School Library Media Research* 7 (2004).

45. Marcia A. Mardis and Anne M. Perrault, "Examining the Information Behaviors of Educators to Inform a Model of Professional Exchange between Science Teachers and Library Media Specialists," paper presented at the American Educational Research Association, Chicago, April 10, 2007; Anne Marie Perrault, "The School as an Information Ecology: A Framework for Studying Changes in Information Use," *School Libraries Worldwide* 13, no. 2 (2007): 49–62.
46. Hanover Research Council, *District Administration Practice: Technology Usage and Staffing*, accessed June 1, 2013, www.hanoverresearch.com/toolkit/pdf/Technology-Usage-and-Staffing-in-Public-School-Districts-Membership.pdf.
47. Erik Drake, "The Teaching and Partnering Responsibilities of Michigan School Library Media Specialists," *Media Spectrum* 33, no. 3 (2007): 46–54; Warren R. Goetzel, "The Role of Media Specialists with Respect to Instructional Technology in an Urban School District in Georgia" (doctoral dissertation, Georgia State University, 2012); Melissa Johnston, "Connecting Teacher Librarians for Technology Integration Leadership," *School Libraries Worldwide* 18, no. 1 (2012): 1–11.
48. David D. Thornburg, "Why STEM Topics Are Interrelated: The Importance of Interdisciplinary Studies in K–12 Education," accessed July 22, 2014, www.tcse-k12.org/pages/stem.pdf.
49. Ibid.

Notes on Operations

When One Plus One Remains One

The Challenges and Triumphs of Merging Two University Libraries

Elaine Mael

Following the trend for library mergers of various configurations, the recent union of a state university with a private specialized university, each with its own library, provides insight into this ongoing phenomenon. The issues involved in such a vision occur on many fronts, including administrative decisions, technological implementation, physical plant management, and staff commitment. All of these require considerable strategic planning, sometimes in the shadow of time constraints. The author addresses the challenges, the benefits, and the potential problems resulting from the merger of two university libraries and the implications for other libraries considering a similar amalgamation.

Imagine this scenario: two universities, one a sprawling urban campus with multiple colleges and departments, hundreds of faculty members, and more than 20,000 students, and the other a private institution located in a single building, with a faculty of less than twenty and a small student body. Both universities possess magnificent libraries, the former containing over half a million books and periodicals plus online access to a multitude of electronic databases covering a vast array of disciplines, the latter a highly specialized collection of monographs, periodicals, audiovisual materials, rare books, and electronic resources and numbering more than 70,000 items. Energize the scene with the merger of the two institutions, a move that integrates both academic programs and faculty. Overlay the process with instructions to consolidate both libraries, physically and electronically, resolving the complexities of two very different library systems. This must be accomplished in approximately four months.

This, in essence, was the mandate faced by the Albert S. Cook Library in June 2009, when the planned merger of Towson University (TU) and the Baltimore Hebrew University (BHU) became a reality. As a staff member in the library of each of these institutions, formerly at one and currently at the other, the author enjoys a unique perspective on this process, and the focus of this paper is specifically on technical services aspects of the library merger.

Historically, a recurring trend in institutions of higher education is the merger of two or more separate institutions into one single new entity.[1] A literature review reveals that such mergers have occurred throughout the world. In the United States, mergers were relatively common among private and public higher education institutions beginning in the 1960s, and became more frequent in the 1980s and 1990s.[2] While some research regarding these mergers analyzes the reasons behind the mergers, other studies concentrate on the variables affecting their success. Only a few papers focus on the contemporaneous merger of the libraries along with their institutions, and still fewer address the technical aspects.

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In his overview of mergers in higher education, Skodvin traces the various reasons behind amalgamations and differentiates between forced and voluntary mergers.[3] Forced mergers are initiated by external sources, such as educational authorities intending to restructure the higher education system. Voluntary mergers are initiated by the institutions involved. These can be motivated by political aims, to expand educational capability, or by economic needs such as a financial crisis. Skodvin emphasizes that although the impetus for mergers can range from the desire to resolve financial constraints to strategic planning goals, the common thread in every merger is the conviction that there is some assumed gain for the institutions involved.

Harman and Harman review the history of mergers and follow the development of types of amalgamations over the decades.[4] Earlier mergers were used to combine academic departments or faculties to form institutions with a greater range of programming, and more recent mergers were more likely to be driven by the quest for cost savings, the threat of declining enrollment, and/or concerns about institutional closures. More recently, the primary reason for mergers is the attempt to enhance the competitive advantage in the academic marketplace. While their paper concentrates on mergers between two strong institutions, they note that a merger between a large institution and a smaller specialized one can boost the attractiveness of the blended institution among potential students and staff, and increase access to research funds.

Martin and Samels document the increase in mergers.[5] In a later paper, Martin and Samels analyze the more recent escalation of "strategic alliances" in institutions of higher education.[6] There is consensus in the literature that whether the primary reason is to improve a market position in higher education or to avoid closure or bankruptcy, the ultimate goal is to achieve administrative, economic, and academic benefits by merging smaller entities into a larger whole.

Most mergers among public and private institutions are between similar types of organizations, although they may vary in size. This would imply that public institutions will typically merge with other public ones, and private ones with private ones, but that is not always the case. A recent policy brief by McBain indicates that mergers in American higher education are becoming increasingly complex.[7] It cites examples of proposed or actual mergers that included a state institution and a private not-for-profit college, a community college with a vocational school, and a church-affiliated university with a state university system. This complexity is true in the recent merger of two Baltimore institutions of higher education involving a state university and a private not-for-profit university of Jewish studies.

One significant part of such mergers is the impact on each institution's libraries. The consolidation of libraries should be as advantageous as a merger of the institutions, and the potential for better resources, new funding, and higher visibility are some of the desirable outcomes. Moll points out that in mergers among institutions of higher education, the library is rarely the initiator, and must conform to the facts of such a merger.[8] The type of merger is less important to the library than the steps taken to insure the success of the amalgamation.

Several studies address the issues of lessons learned from successful mergers. Skodvin stresses the benefits of a bottom-up strategy, focusing on openness among all affected participants and strategic planning for all aspects of the merger.[9] Equally important is strong management, good communication, and ongoing access to resources such as library databases. Swanepoel focuses specifically on library mergers in institutions of higher education, and emphasizes the benefits of involving independent consultants, administrative acknowledgement of the complexity of the merger, and maintaining a positive outcomes goal among stakeholders.[10]

Saarti and Juntunen analyze the merger of two universities and their libraries, and note the benefits of including the libraries in the process from the beginning.[11] By addressing human resources management, customer service production, and documentation practices, mergers can be facilitated more easily. Kathman chronicled the process by which two institutions of higher education merged their libraries.[12] The libraries had an exisitng cooperative relationship, and the merger was intended to reduce costs for both. He highlights staff involvement in premerger decision-making, hiring a consultant, and top administrators committed to the merger as positive factors affecting its success.

In their case study of a merger between two academic libraries, Rozum and Brassow address the strategic and practical aspects of the process.[13] Their study includes a close examination of catalog system migration, reconciling policies and procedures, collection development, acquisitions, staff responsibilities, e-resource management, public service, and research and instruction. The mandate for this merger was to combine the libraries to reduce overall costs and still maintain the identities of two distinct institutions. This differs widely from the merger of TU and BHU, in which the libraries merged in all respects except for location within one building; the operations affected are the same. Rozum and Brassow highlight the importance of communication, staff flexibility to assume different or additional duties, clear direction from library management, and acknowledgement of intense time allocation as key elements in a successful merger.

Historical Perspective

TU was founded in 1866 as the Maryland State Normal School (MSNS), the first teacher training institution in the state. MSNS initially addressed the need for educating qualified teachers, but in response to the developing academic needs of the community it served, it expanded the curriculum to include the arts and sciences and later added graduate programs. Reflecting its continued growth through its various name changes, from Maryland State Teachers College at Towson to Towson State College, Towson State University, and finally Towson University, the institution has evolved in response to educational and societal changes. Now offering programs in the health professions, business, and technology, Towson University became part of the newly established University System of Maryland in 1988.

BHU was established in 1919 as the Baltimore Hebrew College Teachers Training School (BHCTTS). It was founded in response to a pressing need from Baltimore's growing Jewish community for teachers trained in both the Jewish tradition and contemporary pedagogic methods. Joined at one time with the Board of Jewish Education, BHCTTS later separated from the Board to focus on changing community needs to become the Baltimore Hebrew College (BHC), and developed an undergraduate division, supported teacher continuing education, and established relationships with colleges offering Jewish studies courses. BHC eventually became one of a handful of independent schools of Jewish studies in the US, offering dual graduate programs with several local colleges and universities. In 1987, the school changed its name to Baltimore Hebrew University (BHU), reflecting the expansion of its curriculum and subsequent granting of advance degrees.

By the beginning of the twenty-first century, changes in the larger academic community began to affect this nearly 100-year-old institution. Jewish studies were already a part of larger universities in the United States, but these were generally small, adjunct programs of larger departments. As universities embraced multicultural diversity in their academic programming, Jewish studies programs began to grow. A consequence of this change meant that students interested in Jewish studies no longer needed to attend an independent institution to earn an undergraduate degree, and such schools began to lose enrollment. By the mid-2000s, BHU was offering upper-level courses only, with an emphasis on its masters and doctoral programs. The major sponsoring body of BHU reevaluated its investment in the university, and notified the school in 2007 that it would gradually withdraw its support over a five-year period. The immediate result of this decision was the necessity for BHU to develop a new strategy to guarantee its survival.

BHU approached the challenges of this new status on several fronts. It immediately began trimming its budget and staff wherever possible, including its administrative offices and the staff of its library. Beyond this, the first priority was to propose alternative possibilities for the university's continued existence. Proposed scenarios included a self-funded university; a joint high school/university institution with like-minded organizations; and a merger with another institution of higher education.[14] This last scenario had precedents in the world of higher academia, and BHU ultimately pursued it to retain and rejuvenate the university's academic integrity.

Discussions between BHU and TU began in the spring of 2008.[15] The proposed integration of the institutions seemed to be a natural alliance from the beginning. Both institutions were initially founded as teachers' training schools, designed to meet the educational needs of their developing populations. Each expanded and developed in response to the region's growth and educational requirements. While BHU added increasingly higher levels of degrees plus high school and adult-education programs to its offerings, TU expanded to state university status and emerged as an outstanding institution of higher learning, granting degrees from the undergraduate through doctoral levels. BHU was an independent school concentrating on higher Jewish education, and TU's programs covered a vast range of disciplines, offering more than 100 bachelors, masters, and doctoral degree programs in the liberal arts and sciences and applied professional fields. Similar to other universities in the United States, TU offered an undergraduate minor in Jewish studies. This last point is significant, as the interest in programming for studies in this area was already well established. One of the inherent strengths in the continued growth of TU was its capacity to identify and nurture new programs in the fields that interested the academic community.[16] Viewing itself as a service organization, TU developed interdisciplinary partnerships with other institutions in the region, and cultivated programs and departments that reflected emerging disciplines and addressed economic needs. The basis for an expanded Jewish studies program at TU was already in place. The time seemed ripe to cultivate this need into a full-blown program.

Of great interest to TU was the fact that BHU had long been offering master's degrees in Jewish studies, Jewish education, and Jewish communal services. Some of these were, in fact, dual degrees granted with other area institutions, among them, TU. For TU, one of the attractions of the proposed merger was the existence of these programs as well as BHU's doctoral program in Philosophy and Jewish studies. The goal was for TU to offer all of these programs. TU announced its intention to integrate

BHU's academic programs into its own offerings on September 22, 2008. The two institutions approved a Memo of Intent, signifying a commitment to negotiate exclusively with each other, with details to be completed within sixty days. The goal was to merge the programs and to employ as many of BHU's current faculty as possible. This included incorporating BHU's library into TU's Albert S. Cook Library. Integrating BHU's library proved to be a massive undertaking as the library consisted of more than 70,000 volumes, several hundred periodical titles, many discrete audiovisual collections, a 1000+ volume rare book collection, and artifacts relating to Jewish history or religious practices (menorahs, spice boxes, textile art, and a miniature sculpture collection by sculptor Louis Rosenthal).

The Plan

The objective was to begin the newly integrated program at TU as early as the 2009–10 academic year. This goal was extremely important to BHU's stability, not only to the students currently matriculated at BHU, but to present the university as a viable institution with a future. Expediting the merger would ensure a smooth transition for the BHU students, with immediate attention given to the logistics of admission and placement of the students. As part of this expedited merger, the entire BHU library needed to be absorbed into the Cook Library at TU in a very short timeframe. To appreciate the magnitude of the factors involved in the consolidation, it must be viewed in light of the larger picture of the merger of the two universities. Following is a summary of the timeline encompassing the merger.

In October 2008, news of the impending merger was announced to the TU Senate. The university provost articulated the long-term benefits of such a partnership, highlighting the potential for joint research, library resources, and awarding of degrees. BHU programs and courses would be vetted to ensure compliance with TU's academic standards, and BHU faculty would be reviewed to facilitate their integration into TU.[17] Negotiations concerning the academic programs, finances, faculty review, and library absorption continued into the spring of 2009.[18] Hoping to expedite the merger to minimize academic disruption to BHU students, plans moved forward as quickly as bureaucratic steps permitted. By the beginning of May 2009, procedures for the merger were solidified. BHU and TU signed a Memo of Understanding (MOU), and received approval from the University System of Maryland Board of Regents and the Maryland Higher Education Commission on June 20, 2009.[19] The MOU stated that BHU would integrate its academic programs into TU beginning July 1, 2009, and that BHU students would be affiliated with the newly established Baltimore Hebrew Institute at Towson University (BHI).[20]

While the terms of the merger were being worked out, the general consensus was that the merger would move ahead. With the unofficial understanding that BHU would be functional at TU by the 2009 fall semester, there was much to be accomplished in terms of library functionality. To address this issue, the university librarian at Cook Library began to move forward on merger plans to accommodate the physical and technical requirements of a library merger. This initial planning began less than a year before the proposed integration of both libraries.

TU is a member of the University System of Maryland and Affiliated Institutions (USMAI) consortium sixteen libraries of the public universities and colleges in the state of Maryland. All management and administrative work related to the consortium's technology aspects is coordinated by the Information Technology Division (ITD) at the University of Maryland College Park (UMCP). Any major project involving the library and the shared catalog is in their purview. In December 2008, the university librarian contacted the director of ITD to establish a timeline for reviewing BHU's bibliographic records to determine what preparations were required to integrate BHU's holdings into Aleph, TU's library system. The director of ITD outlined the probable steps needed to merge BHU's bibliographic records, including evaluating their compatibility with OCLC records and the possible methods to extract and map local data. The goal was to extract the data file from BHU's catalog and load it into Aleph. The ease of this task was dependent on the quality of BHU's records. Of prime importance were the holding codes, the four-character sets that identify a location or collection within an institution. These codes are embedded in the bibliographic records, and the accuracy of this information is of particular importance in managing a large library collection. Significant to the impending database merge was the compatibility of the system of origin with Aleph.

The records required review by USMAI's Cataloging Policy Committee (CPC), which advises on records scheduled for batchloading into the catalog. TU's cataloging staff needed to develop specifications for this record load. Extracting BHU's bibliographic records also required working with the BHU integrated library system (ILS) vendor, The Library Corporation (TLC), to map the local data into specific fields. Aside from the general intent to process the files through the OCLC database (USMAI's usual manner of uploading records), there were additional goals. One was to flip BHU's OCLC holdings to reflect their new status as a TU collection. The specifications from ITD to OCLC for the batchload project included the request to delete all holdings marked "BHD"

(for BHU) and to replace them with "TSC" (for TU). To address the duplication of OCLC accounts, TU notified Lyrasis, the library network for both universities, to consolidate their memberships and to confirm that BHU's records would assume the TSC symbol.

The multi-lingual nature of the collection was another consideration. Since the BHU catalog contained a large percentage of Hebrew and Yiddish titles, and because their ILS was not Unicode compliant, the records for those titles were Romanized. Aleph can handle records that contain parallel fields for the Romanized and vernacular entries or parallel records in the language of origin. Matching BHU's records against the OCLC database would enable record enhancement. The specifications of the batchload order were intended to identify the newest form of the record and, if possible, to select a record that included the vernacular in paired fields. This did not always result in the latest form of the record, but it harvested many instances of vernacularly enriched versions.

Strategizing

The amount of programming required for the merger would determine the need for a new bibliographic loader at ITD; if the records were "clean" enough, they could be uploaded with the regular ongoing OCLC loader routine. With this in mind, ITD estimated a preliminary timeline for integrating the database into Aleph at approximately four months.

At this point, the author was brought into the process. She had been a librarian at BHU for many years and had joined the TU library six months previously. The author had served as BHU's cataloger and was familiar with the original implementation of BHU's ILS; she had worked with the vendor when the collection was converted to electronic form. The author had unique insight into the library's s subcollections, holding codes, local bibliographic customizations, and the origin and significance of existing bibliographic decisions. Her institutional memory became very useful in the ensuing months. Another benefit of her presence was her relationship with her former BHU colleagues. The sharing of information pertinent to the merger of two databases flowed easily, a fact which would prove invaluable as the process progressed. Some of the files and documents that provided crucial information for the cataloging process had been written by the author. In addition, as a specialized Judaic collection, the BHU library contained a large number of materials published in foreign languages, primarily Hebrew and Yiddish. As the only Hebrew language specialist on the TU library staff, the author's language skill was invaluable for identifying, testing, verifying, and planning for the future addition of these items.

In January 2009, the TU university librarian convened a preliminary committee meeting to discuss the details of the library merger. In light of the expected integration of BHU before the 2009 fall semester, the committee began to gather estimates from outside vendors to address the logistics of the merger. These included companies that handled the physical aspects of the move, such as dismantling and rebuilding shelving, and those that moved entire library collections. It also included those that offered multiple processing services, such as cataloging, authority control, and digitization. BHU was investigating possibilities for funding the renovation of facilities at TU and for the cost of the move. Another outcome of this initial meeting was the selection of a BHU task group at TU, comprised of staff members from content management, public services, circulation, periodicals, technical services, and facilities management. Before the first meeting, the task group began work to prepare the strategic plan for implementing the move.

The practical implications of moving a 70,000-volume collection into the existing space of another library was daunting. The first challenge was the allocation of physical space to hold the collection. The pending agreement specified that the BHU collection would be housed separately from the general TU collection, so a large defined area was required. Fortuitously, a back-burner project that would become essential to the proposed move was already in progress. One entire floor of Cook Library was currently designated for periodicals, with more than 100,000 bound journal volumes shelved on long open stacks. These volumes occupied the majority of the space on the floor, filling the central area with scores of metal shelves. A glassed-in area which housed the periodicals reading room, the periodicals service desk, microform machines, and storage cabinets for library microforms was on one side of this space. The floor also held study tables and carrels, and a small lobby with group study tables (see figure 1). This floor was cleared of the bound periodicals to make space for the BHU collection.

The pending periodicals project addressed a growing trend in academic libraries to interfile bound periodical material by call number with the monographs in the general stacks. This brought together all printed material on one topic and enhanced user accessibility to resources. On a technical level, classifying and interfiling the bound journals required several steps, including reviewing the bibliographic records for all journal titles in the print collection; verifying title changes and production cessations; assigning class numbers to records to be retained in the collection; printing spine labels with the new call numbers; and affixing the labels to 100,000 volumes. Most important in terms of time was be the massive shift in the general stacks to create space and accommodate these bound journal volumes.

Determination that there was sufficient space in the stacks was crucial to the success of this endeavor. Technical services staff managed the projections and measurements to ascertain the possibility of absorbing an influx of materials. Using a formulaic approach to estimate the space required for the periodicals, a detail-oriented library technician determined that the periodical collection could be accommodated on the upper floors by increasing the number of shelves in each range. By removing unneeded shelves from the second floor and rebuilding them on the fourth and fifth floors, the initial shifting could begin. Along with confirmation of space, another issue arose. The layout of the general stacks on the upper floors of the library was not intuitive. The head of circulation, who also managed the re-shelving and shifting, speculated that while the collection was being shifted to make room for the journals, it might be time to shift and re-route the entire collection to correct this directional flow problem. The task group also addressed the facilities aspect of the move, as the spaces on both floors needed reconfiguration. The second floor shelves consisted of two sets of ranges, each many stacks deep, stretching across the room. The new configuration that would hold the BHU collection required removal of one of these sets; the remaining one would be extended by two sections to accommodate the BHU volumes. Additional sections of shelving were required on the upper floors to receive the newly integrated journals. The floor designated to house the BHU collection needed considerable reconfiguration; the number of books shelved there would be reduced by thirty percent. While one half of the floor space would be devoted to the incoming monograph collection, the other half was redesigned as study space (see figure 2).

The library administration investigated the possibility of outsourcing all or some steps of the project. The costs were deemed too steep to accommodate all of the plans, and the eventual outsourced pieces included the moving of the shelves, the shift of the collection, and the re-shelving of the bound journals. In retrospect, there were some serious flaws with the work provided by the company chosen to perform the work. The original conceptual map called for the move of approximately one-half of LC-arranged volumes to the uppermost fifth floor and the rest to the floor below. The contractor, lacking solid knowledge of the collection, encouraged moving more of the collection to the fifth floor. The library had chosen not to hire a project manager for the move and relied on estimations and configurations generated by its own staff. Because the titles could not all be processed for moving in order of their location on the shelves, it became apparent midway through the move that the upper floor would run out of shelf space. This necessitated building additional shelving, some serious reshifting in the middle of the project (involving all members of the library staff), and many overtime hours by the contractor's workers as they raced against the deadline.

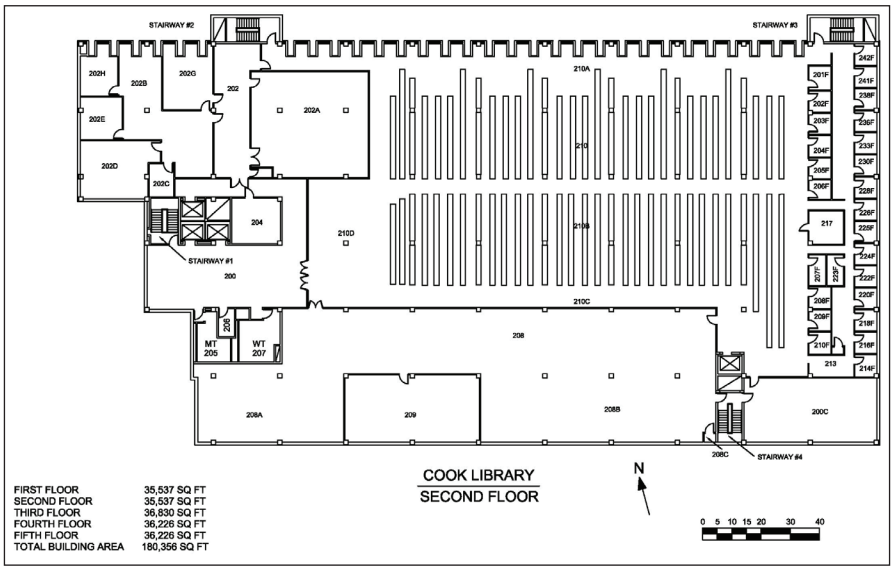

Figure 1. Cook Library 2nd Floor before BHI collection arrival

Once the journals were removed from the second floor, renovations began. The stacks area of the floor received new carpeting and paint. While the journal project and the second floor overhaul were proceeding, two other developments were occurring simultaneously. Although unrelated to the merger, the timing of another Cook Library project proved to be fortuitous for the transition from two libraries to one. In 1970, the TU library established the Department of College Archives, which collected historical archives and artifacts from the university, and included the Towson Room, designated for special collections and school archives. The library began plans to renovate and expand the existing special collections space and the Towson Room in 2007. The plans included the creation of a state-of-the-art climate-controlled closed stacks area, space for processing items, reading space for researchers, and a conference room.

This project was scheduled for completion in July 2009, one month before the BHU collection, together with its collection of rare books and artifacts, was scheduled to arrive. The Archives and Special Collections area was completed on time, and the

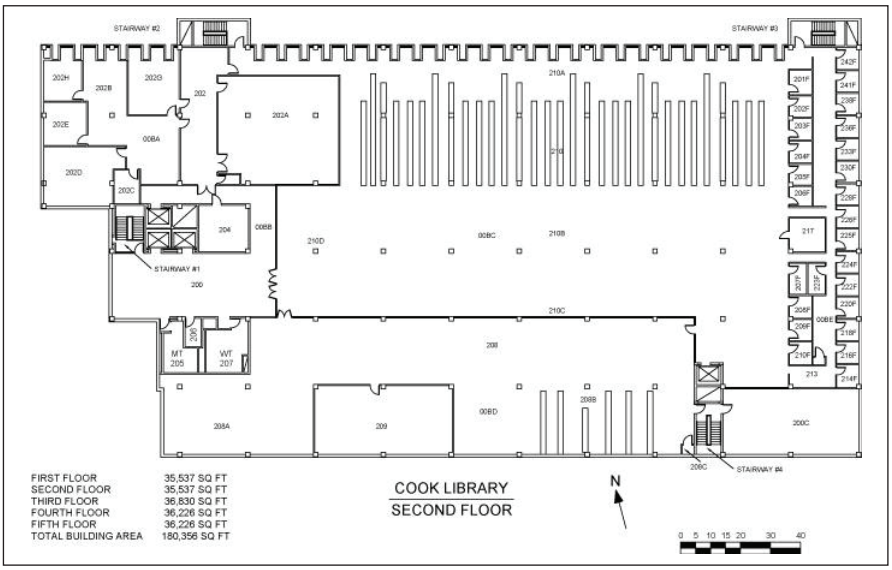

Figure 2. Cook Library 2nd floor after BH collection arrival

first items from BHU to arrive were the contents of its Rare Book Room. Because of the delicate nature of these items, they were moved directly into the special collections location to unpack and process them there.

The other project that was taking place was the preparation of the BHU collection for its move to its new quarters at TU. This part of the move was under the supervision and sponsorship of BHU, and to avoid storage fees in the face of a deadline for removal from its current location, the timing was coordinated with TU and scheduled for the first week in August. All work was scheduled for completion by July 31, 2009.

Work in Progress

The first meeting of the task group in mid-February reflected the work already in progress. Technical Services staff began to review the bound journals to determine which to classify in preparation for integration into the stacks. They analyzed the serial titles for ceased or standing orders and verified holdings of individual titles. They consulted with the reference staff about weeding the stacks in the latter's liaison areas. With the major goal of collection integration in mind, any items no longer essential to the collection would be removed. Technical Services also worked with the Archives staff to identify bound periodical volumes that should be relocated to Archives due to age, condition, or value. Cataloging staff reviewed each title, taking note of any changes in title or production, importing new records as necessary to conform to upgraded cataloging policies, and assigning call numbers. To accommodate the need for spine labels for 100,000 volumes, the library ordered a new thermal transfer printer.

While plans were developing for the catalog merger, the TU staff member responsible for ordering and maintaining periodical subscriptions began to address this matter. BHU subscribed to approximately 250 current journal or annual titles and owned an additional 150 titles that were no longer active. The initial task was to identify any duplication with TU titles and determine the acquisition details of the subscriptions. Working from a detailed spreadsheet provided by BHU, the staff member compared current titles with those of TU. This step proved problematic for two reasons. First, the process began even before the bibliographic records migrated to Aleph; comparing records within the system would have been far easier than working with the BHU database, which was then under scrutiny for migration preparation and thereby inaccessible. Second, many of the periodical titles were in foreign languages, most notably Hebrew and Yiddish. Because these languages are written in a different script, the titles require transliteration into Roman alphabet script. Although there are standardized rules for such transliteration, the spreadsheet titles did not conform to those rules, and ambiguous spelling was not uncommon. This resulted in frequent consultation with the author and much trial and error regarding the accurate spellings for the titles. Once the titles were identified, the staff member attempted to ascertain the acquisition source for each one. TU's primary vendor for electronic resources is EBSCO; the plan was to move as many titles as possible to this service, and if possible, to switch print titles to online subscriptions. For those titles not available through EBSCO, the staff member contacted the publisher directly. This was also initially true for the print annual subscriptions. Approximately one year after the arrival of the BHU collection, TU switched from its previous distributor for print and digital books to Yankee Book Peddler (YBP) and moved its annuals subscriptions to this vendor. If possible, titles were moved to online subscriptions. Because BHU was scheduled for closure by the end of June, it was essential to move quickly with regard to the periodicals. Staff needed to know the terms of the current subscription, including financial agreements and renewal dates. Equally important was the request to each vendor to change the address for all current titles to TU's library to avoid the loss of issues. Some of these steps were hampered

by the lack of documentation other than the spreadsheet. Because the database had not yet arrived, arranging for the renewal of some subscriptions became more complex. For example, EBSCO required an order number to process such a request, and the staff member manually input a temporary bibliographic record as a placeholder for the order; she then suppressed the record so that it would not display in the OPAC until it was replaced by an updated record. Once the collection arrived from BHU in August, staff could consult current invoices for more information about the status of the subscriptions.

Some problems still remained. There were manually updated check-in records for the periodicals, but these were not always accurate. Also, because some of the most recent issues of current titles never arrived at TU with the rest of the collection, there was lack of clarity regarding missing issues. Another ongoing problem in the attempt to reconcile subscriptions concerned overseas vendors. Communications from them sometimes arrived in foreign languages only, and time differences complicated contacting them; however, email proved useful for some of these issues. There were also some fulfillment problems because of the numbering system used by some publishers of Hebrew language materials. These differed from the familiar January-December cycle, as these publishers followed the Jewish calendar, which begins in the fall; it was not always easy for the periodicals staff to determine which issues had arrived. Transliterated titles remained a challenge for the staff to decipher. Although labeled a "summer project," the merging of the periodicals collection took approximately two years to complete.

Database Merger

To prepare for the technical aspects of the database merge, ITD began its work early in February 2009. Specific data was requested: the number of bibliographic records slated for absorption, local customization information, and whether or not to expect the addition of vernacular characters. Hebrew/Yiddish characters are supported in Aleph, and replacing existing monolingual records with multi-lingual ones would enhance the discoverability of items in the database. ITD wanted to identify the bibliographic sources of the BHU records. While most of the records were OCLC records, approximately twenty-five percent of them came from other sources, such as TLC's Bibliofile (an early CD-based bibliographic database), BHU's originally cataloged records, and on-the-fly records that were created for reserve materials and not intended to become permanent. TU staff designated new sub-library/collection codes for use in Aleph to accommodate the BHU items and determined which BHU holding codes could be mapped to those new sublibrary collection codes. They also identified which codes to use for special collections items. Information that would be overlaid on loading and the mapping destination for all local information were also considerations.The technical services cataloging subcommittee consisted of three staff members, including the author: two catalog librarians and one library technician. Record analysis proceeded by working with comprehensive lists of the BHU collection provided by its ILS vendor, TLC. The subcommittee determined both the BHU holding codes and the record sources, along with the number of titles/items per holding code, and identified the MARC tags for which local notes fields should be retained. They discussed each part of the collection and its future electronic and physical location at TU. The subcommittee decided which sub-library/collection codes were needed, and the actual shelf placement for the items assigned to each of these collections. Some of these decisions could not be made until after an onsite visit to BHU, during which the TU staff could get a cursory look at the materials.

The retention of local, copy-specific bibliographic information was a consideration, and the unique implementation of local notes in the USMAI database requires a footnote in this narrative. Because the database represents the holdings of sixteen separate campuses, with a single bibliographic record shared by all campuses that own copies of the title represented by that record, it was necessary to indicate ownership of local bibliographic information by an individual campus. USMAI's solution is to provide copy-specific information in a "superholding"—records attached to the shared bibliographic record (see figures 3, 4, 5).

The information from this superholding displays only in the local catalog of the campus that owns that particular item (see figure 6).

USMAI uses an ongoing bibliographic record loader, which processes OCLC export transactions on a daily basis. It loads into Aleph any records produced or updated in OCLC by any of the USMAI campuses. Specifications for the loader include a local tags list, but the BHU records required a tag to indicate TU ownership, and additional local fields needed to be mapped to the superholdings. This affected between four to seven codes.

BHU possessed a significant number of rare, valuable, or fragile items, which were housed in various locations other than the stacks. The bibliographic records for these items contained specific information that did not apply to the rest of the collections. Among these were local notes referring to provenance, donor source, physical condition, or physical attributes of the items. For these items, the subcommittee wanted to retain a larger number of fields (between thirteen to seventeen). Additionally, the total number of titles (more than 51,000) and volumes (more than 71,000) were ascertained, and the subcommittee provided the statistics

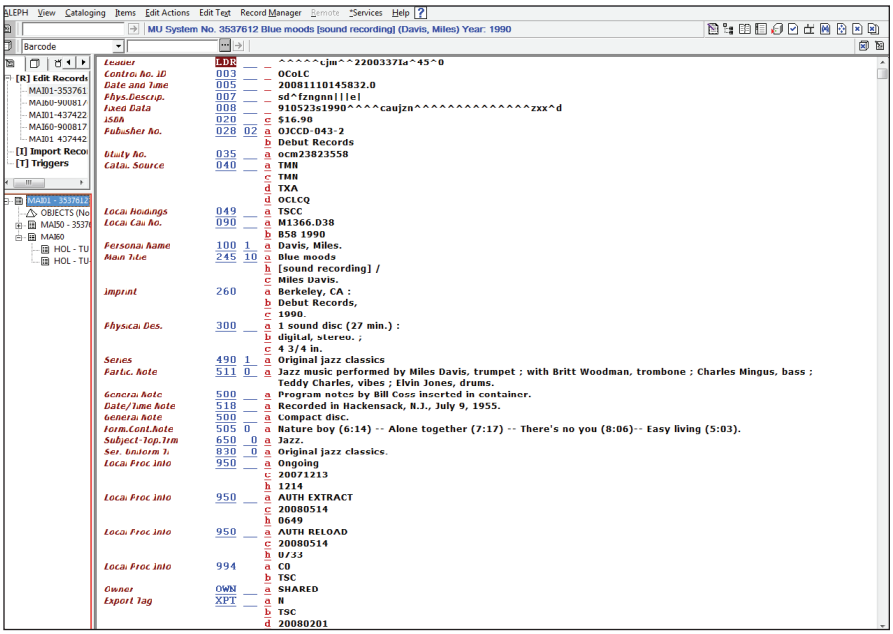

Figure 3. Aleph Marc record

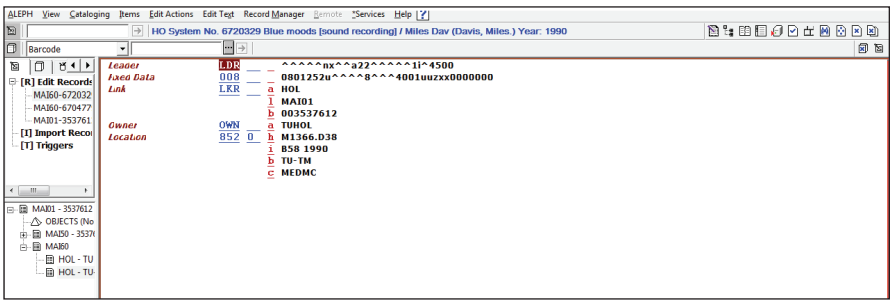

Figure 4. Aleph holding record

necessary for ITD to predict costs for matching the records in OCLC and uploading them to Aleph.

Collection overlap was raised early in the merger discussions. One other USMAI campus has a large Jewish studies collection, and concern was raised whether duplicate records would result from the integration of the two catalogs. The search of a random sample of titles revealed some overlap in the general collection, but very little duplication of special or rare items. The plan had been to match duplicates upon batchload through OCLC and to compare the USMAI OCLC control numbers with the BHU control numbers, which provided the OCLC information. After examining the BHU files, ITD staff discovered that the OCLC information recorded was not straightforward. For example, several hundred records had been added to the BHU database from TLC's BiblioFile Service. Data from this service comes from publishers, vendors, and OCLC, and the records contained fields with an identifying prefix (tlc). These would not match with OCLC records according to the specifications applied by ITD. ITD broadened the criteria for determining a match so that the incoming records would contain enough match points to reduce the number of duplicates to a minimum.

As previously mentioned, an important issue relevant to the BHU records was the prevalence of the local information they contained, such as local notes, gift sources, provenance, or the presence of signatures or inscriptions. Retention of this information was a critical public relations issue for TU, as it often identified people or places significant to BHU, and its importance would have a considerable impact on the choices available for uploading the records.

One option was to load the records directly from TLC into Aleph. There were two main problems with this approach: (1) TLC could not provide protection for any special or local notes, and these fields would be lost in the migration, and (2) uploading the records without first searching them in OCLC would leave them in the transliterated Romanized versions, even when an upgraded or better record with vernacular language existed. Any preprocessing would be prohibitively expensive and time-consuming. A variation of this option was to separate the "Special Collection" records and upload those through OCLC, allowing the bulk of the collection to remain transliterated and bereft of local information. The third option was to send all of the records to OCLC through a batchload and then upload them to Aleph. The latter choice allowed for the exchange of the value-added vernacular records and the preservation of local information, which was dependent on an initial "grooming" of the records by TLC to prepare them for extraction. The TU staff preferred the straightforward OCLC option, as it would maintain the integrity of the records.

In late March, ITD received an estimate for OCLC costs for the BHU load, which included flipping BHU's OCLC institution symbol to reflect new ownership by TU, uploading the records to Aleph, and upgrading the transliterated records to vernacular when possible. The estimate included

the retention of some local notes, but because some of the notes were not recorded in standardized form, those would be lost. Technical services staff decided to edit the records manually and to replace any information that the upload process would remove. This was dependent on either harvesting the information before the BHU database was frozen or having a copy of the BHU records for reference after the load. The information was preserved in both ways. Staff assigned a TU student worker to access various sets of BHU bibliographic records and to cut and paste them into spreadsheets in MARC format. The sets were selected based on the likelihood of a significant number of local notes in the records, such as those for the rare book collection. The spreadsheets were labelled to identify the sets and saved for later reference. Manual searching using a "find" search was necessary to access the information. The staff requested that TLC send a copy of the BHU database in its final form before migration. These records could later be accessed using MarcEdit to locate specific records.

Aleph preparations for the incoming records were underway. With the conceptual plan of integration in mind, TU submitted to ITD a detailed spreadsheet, mapping all BHU holding codes to corresponding Aleph sub-library/collection codes and clarifying which MARC fields should be retained. ITD began loading sets of sample records into the USMAI test database, and by early May, the cataloging staff began testing retrieval and display of these records. The subcommittee wanted to review the search results, location limiters, and display features before the records were loaded into the live database. The cataloging team met with ITD to discuss the details of the data extraction and the load of the BHU records, which was scheduled for later that month. The plan was to establish a timeline and specifications regarding how TLC and OCLC should handle the data.

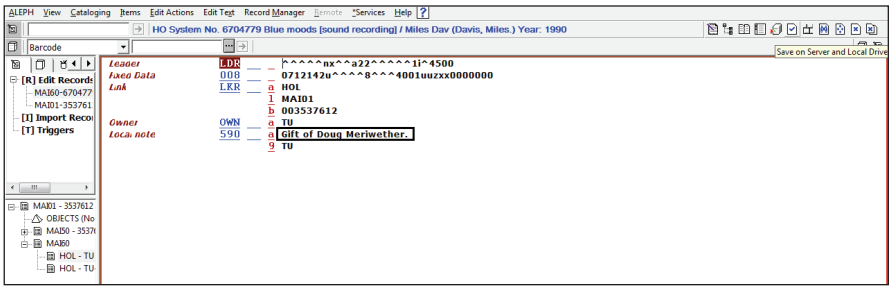

Figure 5. Aleph superholding record

The team established a freeze date for the BHU catalog and a tentative date for the final extract from TLC. Discussions with TLC included a clarification of data specifications and the retention of a copy of the complete TLC file by ITD. TU initiated steps with OCLC, and together with ITD, requested a batchload order early in June 2009. This included not only the matching and upload of the BHU records, but the symbol flip from BHD to TSC. Based on ITD's record analysis, some cleanup of records was necessary before the extract. Additional mapping was required for lost, missing, replaced, or out for repair items. ITD completed their discussions with TLC for options/estimates on the data processing and extraction by the middle of July. Given a choice between cleaner data with a later date of completion and potentially inaccurate data with an earlier date, TU chose to delay the completion date by a few weeks. The data was ready for extraction by the end of August, one month after the library collection was scheduled to arrive at TU. TU staff selected BHU records that were representative of various scenarios to review when the programming was completed.

TU catalogers and the ITD project manager tested sample records from TLC and compared results. The first results were promising, as the records loaded properly, but several adjustments regarding holding and item information were required. To ensure proper mapping of data from TLC, the testers reviewed the sublibrary, collection code, item status, and material type that had been assigned in Aleph, and they analyzed the presence or absence of various local fields. One problem detected early in the process was that local notes were not being created as superholdings, and were being lost. Another issue was the inaccurate display of enumeration levels for serial and other multiple volume titles, which would later result in one of many clean-up projects. Because this problem was possibly due to inconsistency in the recording of the information rather than inaccurate display, clean-up was deferred until after the migration.

In early September, after fine-tuning the data, TU gave the final go-ahead to ITD to send the files to OCLC. The request was for a single institution batchload, with a file of the matching records returned to USMAI. The requested fields would be retained, non-matching records would be added to WorldCat as new records, and BHU holdings would be flipped to display as TU holdings (see figure 7).

The files were ready for uploading from OCLC in early October. ITD began loading small samples of records into the Aleph test module for TU staff to review for accuracy of content and OPAC display. The full load of the records into the test system occurred in late October, and the entire staff was encouraged to check access to the records and report any problems. On November 20, 2009, ITD completed the live load of the BHU records.

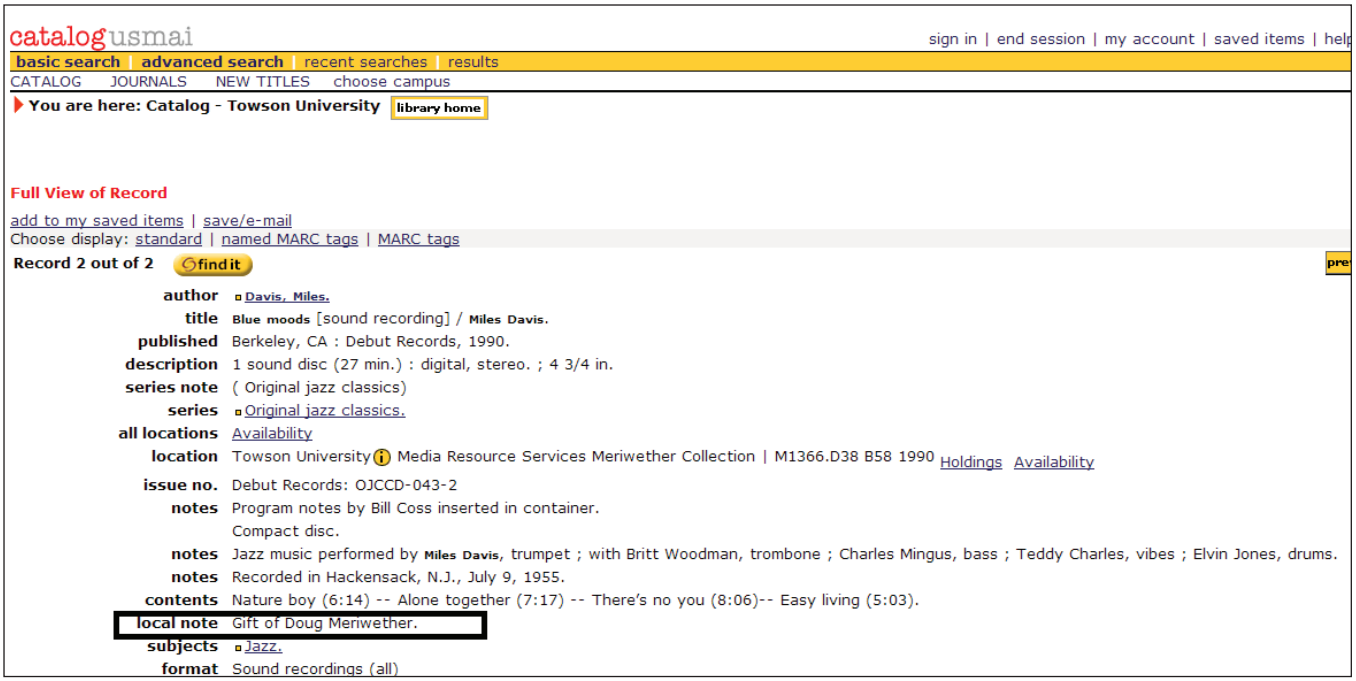

Figure 6. Aleph OPAC local note dispay

File cleanup began almost immediately. As previously noted, this was deferred until after migration because of possible inaccuracies in the serials item information. Another reason for delaying clean-up was pressure to complete the migration as quickly as possible. The serials records were of the most concern, as it was imperative to track arrived and expected issues. TU began receiving some periodicals, re-routed from BHU in May. This created a new layer of acquisition, and also impacted the accuracy of the catalog records. Another concern regarding the entire database was that some local holdings did not display properly, and the catalog contained duplicate records. By early December, the local holdings were adjusted, and duplicate records were resolved.

A Retrospective Look

Looking at the library three years after the merger highlights some interesting points. Because the BHU collection primarily supported academic programming at the institution, collection development centered on reinforcing the Jewish studies curriculum. Nurtured by the faculty and library staff, this specialized collection developed into a world-class academic library. Mindful of the library's role in the Jewish community at large, the collection also contained popular Jewish literature, Jewish cultural materials, and notable juvenile titles.

The library also housed a sizable collection of special and rare items; although there was not a collection development policy for the acquisition of rare books, many unique items were added to the collection by other means. This included gifts, bequests, and the designation of the BHC as one of the institutions to receive Jewish Cultural Reconstruction (JCR) materials following World War II. These heirless items, confiscated by Nazi Germany during the war, were distributed to centers of Judaism and Jewish learning throughout the world, and BHU housed them in its Rare Book Room.

Development of the BHI collection at TU follows a similar path, designed to support the academic courses that utilize the collection the most. All former BHI faculty members, although scattered throughout several departments (Family Studies and Community Development, Philosophy and Religious Studies, Educational Technology and Literacy, Biblical and Archaeological Studies, Department of History), are encouraged to submit requests through their designated library liaisons. Furthermore, the Jewish studies liaison (the author) contributes to the collection by selecting suitable titles in various formats or by recommending titles to the faculty for review and selection.

There are no circulation or usage statistics from BHU for comparison purposes. Current statistics for circulation, interlibrary loan (ILL), and database usage indicate increasing use of the collection. Three years after the arrival of the BHI collection at TU, staff members collected statistics on circulation, and reports indicate that 11,734 of its items have circulated. This figure represents 6,322 unique items; close to one-half of them were circulated

multiple times. ILL reports show that since the BHI collection arrived, nineteen of the top 151 monograph titles requested were BHI titles. The most requested title was a BHI title. Of the 563 requests for most-loaned monographs (only those titles requested three or more times were selected), seventy-six were for BHI items.

TU tracks electronic resource use by database and by journal title. Statistics for the BHI collection show a steady increase in database searching for the first few years; a similar increase is noted for online journal titles (see table 1).

Managing the BHI collection involves some particular issues. With the exception of the special and rare items, which were directed immediately to the TU Archives and Special Collections Department, BHI items were maintained as a separate collection for the first three years after merger. To enable this situation, processing staff placed an adhesive blue strip at the bottom of the spine of every print item in the collection. Every new print acquisition also received this strip. Circulation staff could thereby easily identify these items and place them on separate carts for shelving.

After the three years ended, the administration decided to combine the two print reference collections. This move would place all reference materials on the same floor as the reference desk. Although any research and instruction librarian would accompany a student or patron to the BHI floor for assistance, there was no service desk on the same floor as the collection. Staff accomplished the technical part of this project by changing the holdings information in the bibliographic record for each item, and removing or covering the blue strip on the spine. It is unclear at this point whether the two general collections will be combined, and the possibility is under discussion.

Because the two collections are shelved separately, there are questions regarding the appropriate location for new acquisitions. The choice is based on how and by whom the resource is likely to be used. Most items that could be shelved in either the BHI or TU collection are usually placed on the BHI floor where most patrons would expect to find them

The merger agreement between TU and BHU mandated that the latter would fund the collection for three years. The funding was used for subscription maintenance and binding for active subscriptions, binding for older, non-current titles that had local significance, and print materials acquisitions. Planning for future funding requires adjustment and is yet to be determined by the library stakeholders.

Several cataloging projects have resulted from the merger. Because several of them involve the Hebrew-language periodicals, the library hired temporary staff with the skills to work on them. Some of these projects involved changes or enhancement to the bibliographic records; for example, current periodicals required updating the issue-specific holdings information in the records. For each title, staff consulted the bibliographic record, BHU's check-in card, and the volumes on the shelves to check for accuracy, and they then improved the record as necessary. They did the same for the noncurrent periodicals titles, many of which had incomplete holdings data.

Some of the projects involved the uncataloged materials from BHU's "cage," the locked area where loose materials were held. For periodicals, staff who read Hebrew first searched the titles against the Aleph database. If the title was found, they added TU's holdings data to the record. If not, they searched the title in WorldCat, imported the most appropriate record to Aleph, and entered the holdings there. If no records were found, the items were brought to the author for original cataloging.

Other projects originated in Archives and Special Collections. For example, the library archivist ran a report to identify books published before 1850, and found that many of them, although fragile, were still on the open shelves. She also visually examined the collection and removed those items that needed preservation. The author continued the project by evaluating each item for its rarity, fragility, and provenance; determining its status as "special" or "rare;" changing the holdings information in the bibliographic record; and enriching the record with additional information. Another cataloging project addressed the provenance of the JCR materials. All of these items were identified in the collection and moved into Archives and Special Collections; many of them were categorized as rare. The catalogers discussed the appropriate wording for this part of the collection, and extensive provenance information was added to each record.

It may be helpful for other libraries facing merger to know that the cataloging aspect of such an event is a lengthy affair. Numerous clean-up projects will result from even the best planned mergers. At TU, there are many cataloging tasks that remain to be addressed. Among these are the rare books which have been researched, but not cataloged; uncataloged monographs

Retainthefollowingfieldsiftheycontain$5 MdBT:
510
590
599
710
Retainthefollowingfields:
852
853
863
866
876
FlipBHDholdingstoTSC
Evaluateallnon-matchingrecordsforpossible additiontoWorldCat.

Figure7. Special Instructions for TU-OCLC Batchload Project

Table1. Sample from online journal usage statistics

Database	Sessions	Searches
Index to Hebrew Periodicals		
FY10	10	n/a
FY11	42	n/a
FY12	2	n/a
FY13	5	n/a
Index to Jewish Periodicals (EBSCO)		
FY10	9,532	51,297
FY11	10,985	63,375
FY12	14,548	84,216
FY13	16,051	89,813
ATLA Religion Index		
FY10	9,918	53,791
FY11	12,018	66,406
FY12	14,995	86,504
FY13	16,817	93,360

from the cage; and the selection of older periodical titles appropriate for digitization. These remain as planned future projects.

Lessons Learned

Many of the goals of the library merger have been met. To highlight some of the positive outcomes, one can point to the enhanced research capacity of the unified library institution, its attractiveness to potential student markets, and better facilities and exposure for the BHU collection. To share information with other libraries facing mergers, it is helpful to convey some of the lessons learned from the TU/BHU experience.

On the positive side, an important part of the process was the inclusion of all library departments in the early planning stages of the merger. Staff members from every area of the library attended an initial meeting to discuss all aspects of the merger. Follow-up meetings within some departments occurred regularly, especially in technical services, where the many phases of bibliographic work transpired.

From the very beginning, the head librarian demonstrated her commitment to the success of the merger and freely shared this optimism with the entire staff. She laid out the framework for the libraries integration as early as December 2008, six months before the merger of the universities was formalized, and her determination to complete the job on time motivated the staff to produce results. Another example of the head librarian's positive approach was her assurance that the library would outsource as much work as possible to lessen the load on in-house staff. She began by gathering estimates from vendors for various stages of the project. These included the reclassification, editing holdings information, spine labels, and reshelving of TU journals; the removal and reassembly of shelving and end panels; and shifting the general collection. While only some of this work was outsourced, the effort to consider all possibilities was helpful to staff morale.

The good working relationship between the two libraries was an exceptionally helpful part of the merger. Although the remaining library staff at BHU was quite small, and most of the merger-related work fell to one person, regular communication and clear requests for information from TU made the process easier. BHU shared all pertinent documentation and facilitated interaction with TLC, and following the database migration, the staff member continued to be available for follow-up questions.

The fact that the merger took place during the summer months was an advantage. There were none of the common semester distractions, such as urgent requests from faculty to fill and process materials. Additionally, the fiscal year was just beginning, and there was no pressure to place orders for the yearly budget fulfillment. Timing is one factor to consider when planning a library merger.

Conversely, despite the fact that the merger was successful, there are things that would have made it smoother. From the beginning, there was not a systematic merger strategy, and preparations and implementation were driven by the need for speedy results. Although the TU staff met to discuss merger requirements, there was no step-by-step plan that would have provided structure for each department. Each department was left to determine the priority of necessary actions.

Although a plan for the database merger process existed, there was no similar plan for other parts of the merger. For example, periodicals management initially had no overall plan other than to remove duplicate subscriptions and to renew the remaining BHU titles. This lack of preparation for the complexity of managing the voluminous work was stressful; a more detailed plan of action would have benefitted the staff.

While the administration was very supportive of its staff, direction from a source experienced in mergers was lacking. Most of the integration was coordinated by technical services staff, none of whom had previously managed a project of this size or scope. It would have been more efficient to hire a consultant to help strategize the project from its inception, and a designated project manager would have been a welcome addition. This would have alleviated the stress placed on inexperienced staff, and it might have anticipated problems before they appeared. For example, it might have obviated the need for all library staff to participate in the physical move of books when the reshelving vendor miscalculated the placement of parts of the collection; a consultant familiar with space-related reshelving projects would have the knowledge to prevent this type of problem. Even though the vendor worked overtime to correct the issue, the library staff helped to meet the looming deadline for completion.

One of the lessons learned highlighted by Swanepoel is that "library

mergers at institutions of higher education should not be underestimated in terms of complexity and the volume of work involved."[21] Although the staff were involved from the beginning, it was not acknowledged by the administration that the amount and intensity of some of the work may have been overwhelming. The short timeframe mandated by the merger affected technical services' regular workflow for the entire technical staff, and routine work slowed or ceased. Management could have informed the staff to anticipate duties reassignment and daily workflow interruption. Hiring additional personnel to augment the technical services staff would have been a prudent decision, given the amount of work required.

Another area with room for improvement was the ongoing communication to all library staff as the project progressed. Communication seems to have worked best among the cataloging staff. They held frequent meetings and had a clear plan to follow for merging the databases. Acquisitions staff had less direction, and pertinent information from the administration was spotty and slow to arrive. Although intradepartment meetings in technical services occurred informally every day, staff members did not always have current information about possible services from outside vendors. More communication with the library archivist regarding special collection items would have been helpful; the same is true regarding the research and instruction librarians, relating to the impact of the incoming collection on public services. Despite the less-than-perfect conditions for the integration of the two libraries, there is much to appreciate about the results.[22] The research capabilities of Cook Library are now expanded, public services for both collections are operating smoothly, the collections are fully merged, with the ILS accommodating all aspects of both collections, and the BHI collection is housed commodiously and attractively.

References

1. James Martin and James E. Samels, Merging Colleges for Mutual Growth: A New Strategy for Academic Managers (Baltimore: Johns Hopkins University Press, 1994).
2. Ole-Jacob Skodvin, "Mergers in Higher Education—Success or Failure?" *Tertiary Education & Management* 5, no. 1 (1999): 65–80.
3. Ibid., 66.
4. Grant Harman and Kay Harman, "Strategic Mergers of Strong Institutions to Enhance Competitive Advantage," *Higher Education Policy* 21, no. 1 (2008): 99–121, dx.doi.org/10.1057/palgrave.hep.8300172.
5. Martin and Samels, "Merging Colleges for Mutual Growth," 3–21.
6. James Martin and James E. Samels, "We Were Wrong; Try Partnerships, Not Mergers," *Chronicle of Higher Education* 48, no. 36 (2002): B10.
7. Lesley McBain, *College and University Mergers: Recent Trends. Policy Matters: A Higher Education Policy Brief* (Washington, DC: American Association of State Colleges and Universities ED507987, 2009).
8. Michiel E. Moll, "First Mergers: A Case Study of the Boland College of Education and the Cape," Technikon Libraries," *South African Journal of Libraries & Information Science* 76," South African Journal of Libraries and Information Science 76, no. 1 (2010), dx.doi.org/10.7553/76-1-86.
9. Skodvin, "Mergers in Higher Education," 16.
10. Adriaan Swanepoel, "Lessons Learned from Library Mergers at Colleges of Higher Education in Flanders," *South African Journal of Libraries & Information Science* 71, no. 1 (2005), dx.doi.org/10.7553/71-1-659.
11. Jarmo Saarti and Arja Juntunen. "The Benefits of a Quality Management System: The Case of the Merger of Two Universities and their Libraries." Library Management 32, no. 3 (2011): 183–90, dx.doi.org/10.1108/01435121111112899.
12. Michael D. Kathman, "Anatomy of a Merger," *Journal of Academic Librarianship* 9, no. 4 (1983): 203.
13. Betty Rozum and Lori J. Brassaw, "Merging Two Academic Libraries: Finding Unity from Diversity while Maintaining Institutional Identities," *Advances in Librarianship* 37, (2013): 201–21
14. Arthur Hirsch, "A New Chapter: Baltimore Hebrew University is Closing After 90 Years, Merging with Towson and Moving its Programs," *Baltimore Sun*, June 20, 2009.
15. Rochelle Eisenberg, "A Broader Base: Towson and Baltimore Hebrew Universities Announce Intention to Integrate Programs And Resources," *Baltimore Jewish Times*, September 26, 2008.
16. "More than a Marriage of Convenience: Our View: A Baltimore Hebrew University-Towson U Merger Could Strengthen Both Schools," *Baltimore Sun*, January 16, 2009.
17. Valerie Thaler, "From Park Heights to Towson," *BHInsight* (blog), June 29, 2011, http://bhinsight.org/2011/06/29/from-park-heights-to-towson.
18. Stephen Kiehl, "Hebrew, Towson Colleges in Talks," *Baltimore Sun*, January 8, 2009.
19. Rochelle Eisenberg, "End of an Era: BHU, Towson Sign Merger Deal," *Baltimore Jewish Times*, May 8, 2009.
20. "Baltimore Hebrew University Pursuing Historic Merger with Towson University," Associated Jewish Community Federation of Baltimore, accessed June 11, 2012, www.associated.org/page.aspx?id=200454.
21. Swanepoel, "Lessons Learned from Library Mergers," 91.
22. Ron Snyder, "BHI-TU Marriage is Thriving," *Baltimore Jewish Times*, September 6, 2012.

Book Reviews

Elyssa Gould

Data Management for Libraries: A LITA Guide. By Laura Krier and Carly A. Strasser. Chicago: ALA TechSource, 2014. 112 p. $58 paperback (ISBN: 978-1-55570-969-3).

Data Management for Libraries provides a brief guide to data management for librarians who are novices in this emerging area. The book is organized into eight chapters, with three appendixes.

Chapter 1 provides a basic overview of data, data management, and the data curation lifecycle. Chapter 2 a variety of considerations for starting a new service: developing a new service as a pilot project; collaborating with other colleagues within both the library and the institution during the entire data lifecycle; training scholars to better manage their data; and staffing, particularly when that staffing requires that existing librarians take on responsibilities without relinquishing others. The general information regarding starting a new service includes several considerations that are worthwhile for initiating any new service. Particular to data management are planning for data preservation as a part of the service, and also data training for researchers that may not have experience in data management.

Chapter 3 is devoted to an overview of data management plans. Librarians are well-poised to assist researchers in this particular capacity, especially since many researchers currently lack the skills to write a data management plan. Some researchers may need extra motivation to create a data management plan, and this chapter provides useful suggestions to help researchers find value in writing a plan. This chapter also provides an overview of the components of a data management plan, including: description of data/metadata; security, ethics and intellectual property; plans for data access, sharing and reuse; plans for short-term management and storage; plans for long-term management/storage; resources needed to implement the plan. The chapter offers several questions to generate the readers' ideas of what may need to be considered in a data management plan, and concludes with some advice for complying with funder requirements.

Chapter 4 discusses the data management interview, which is similar to a reference interview. The chapter summarizes previous research into data curation profiles and personas of researchers that may require assistance with data management. It also stresses the importance of involving liaison/reference librarians in data management since they are likely the colleagues that already have strong relationships with researchers at the institution. An important role for librarians may be to raise components of data management when interviewing researchers. Like the reference interview, data management interviews require active listening.

Chapters 5 and 6 address facets of data management wherein librarians clearly lead their institutions regarding expertise: metadata and preservation. In chapter five, the authors provide an overview of the three different types of metadata that can describe a dataset: descriptive, administrative, and structural. This basic review is most useful for librarians with relatively little familiarity with metadata concepts, standards, and schemas. Chapter six describes the difference between data storage, data archiving, and data preservation, and provides a summary of repository types. The preservation process includes data appraisal, repository selection, and document and deposit data. Certain disciplines have domain repositories that facilitate data preservation. Institutional repositories are adept at handling open access goals. Other options are also considered, such as server or cloud-based storage. Data preservation also has costs, particularly for personnel and data curation.

Chapter seven provides a discussion of data access. Data access can run the gamut between completely closed data (confidential or requiring top-level security) to completely open data (freely available in the public domain for anyone's use). Open data also facilitates reproducibility of data, and may help credibility concerns. Tips on crafting an institutional data policy are provided. The role of data identifiers is addressed, as well as a summary of the benefits of access: ensures reproducibility of results, credibility of researcher and results (and institutions, funders), acceleration of research speed, and funders get a maximum gain for their investment. It is also easier to identify/generate new research questions.

The guide concludes with a brief chapter on data governance issues. The chapter provides insights into the various stakeholders for data governance, including the researcher, their institution, the funding organization, the academic publishing community, and the public. The chapter touches on the complexity of copyright law regarding data sets. Mechanisms to share rights such as contracts, licenses and waivers are discussed, along with privacy and confidentiality issues.

Three practical, useful appendixes are included in the guide: "Appendix A: List of Resources to Consult

When Establishing an Institutional Repository"; "Appendix B: Sample Job Descriptions for Data Librarian Positions"; and "Appendix C: Sample Data Management Plans."

Data Management for Libraries is extremely well organized and provides many useful suggestions in its overview of data management from a library perspective. Krier and Strasser are careful not to proscribe what a data services department must include in a library, which is a strength of the guide. The guide coaches the reader to carefully tailor data management to the needs of a particular institution. Libraries that may be initiating a data services department would do well to consult this title when considering data management.—*Betsy Appleton (eapplet1@gmu.edu), George Mason University, Fairfax, Virginia*

Exploring Digital Libraries: Foundations, Practice, Prospects. By Karen Calhoun. Chicago: ALA Neal-Schuman, 2014. 352 p. $95 softcover (ISBN 978-1-55570-985-3).

The back cover of Calhoun's book *Exploring Digital Libraries: Foundations, Practice, and Prospects* declares it "a landmark text on digital libraries for students of LIS, educators and practicing information professionals throughout the world." It also states that it provides "an authoritative and in-depth treatment of the digital library arena, from the field's emergence to current topics and future prospects." Calhoun is a prolific and well-respected author and lecturer on the subject of digital libraries, and is definitely someone worthy of earning such accolades.

The book consists of two main themes. The first is a broad, international overview of the past twenty-plus years of digital libraries, while the second concerns the social roles digital libraries play in relationship to their online communities. Chapter 1, "Emergence and Definitions of Digital Libraries," covers the first decade of this brave new world. The World Wide Web had been born, costs associated with computing had become much more affordable, and the National Science Foundation assembled a series of workshops on how to make digital libraries a reality. Projects such as the eLib Programme in the UK and the Digital Library Initiatives (DLI-1 and DLI-2) in the US, plus Project Gutenberg and the Internet Archive, gave a taste of what was to come. Calhoun also uses this chapter to establish the definition of digital libraries upon which she bases the rest of the book. In her eyes, digital libraries are both a multidisciplinary field of research and practice, and the systems and services that support the advancement of knowledge and culture; contain managed collections of digital content; and often utilize architecture from the computer and information science/library field (e.g., repository, resource identifiers, user interface).

In chapter 2, "Outcomes of Digital Libraries' First Decade," Calhoun identifies several key results from this initial period. These include a new field of research and practice, the transformation of scholarly communication processes, open access, digitization and digital preservation, metadata and its standards, and actual working digital libraries and the communities they serve. Each outcome is discussed in detail, and introduces such topics as *D-Lib Magazine*, PageRank (Google's forerunner), the Open Archives Initiative (OAI), JSTOR (short for Journal Storage), Dublin Core, the Library of Congress' American Memory, and the British Library Online Newspaper Archive. Chapter 3, "Key Themes and Challenges in Digital Libraries," introduces the concept map that Calhoun created based on the major themes from the digital library literature of the decade 2002–12. The map consists of a collection of keywords plotted in a continuum of themes and topics arranged from "collections" to "communities" (x-axis) and from "technology" to "social and economic aspects" (y-axis). The remainder of the book is based on both this map and the four challenges that she has identified to building collections and communities for digital libraries: interoperability (providing uniform access for users to diverse information from various systems), community engagement, intellectual property rights, and sustainability.

Chapter 4, "Digital Library Collections: Repositories," begins with a look at traditional library collections and collection development in light of the web. It provides a close examination of digital repositories, including content usage and discovery (e.g., Google Scholar), the application of repository software (e.g., DSpace, Fedora), and web services such as XML (Extensible Markup Language), and concludes with examples of next-generation repositories such as Drupal and Scholar's Workbench. Chapter 5, "Hybrid Libraries," wraps up the book's first theme by examining the interaction between library users and hybrid libraries (collections of non-digital, digitized, and born-digital materials). Calhoun discusses the growth of e-books, the importance of special collections and archives, the emergence of digitized research library collections (e.g., Europeana, HathiTrust) and discovery services (e.g., portals), and concludes with licensing, e-resource management, remote access, and finally the web visibility of hybrid libraries.

An examination of the book's second theme begins with chapter 6, "Social Roles of Digital Libraries." Calhoun considers the value of libraries to their communities, both past and present, and uses them as a framework to describe the social role of their digital counterparts. She emphasizes five key areas: to support the free flow of ideas, to empower individuals and reduce what is known as the digital divide (the gap between those with and those without access to digital

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information and its related technologies), to support teaching, learning, and the advancement of knowledge, to provide economic benefits (in the global economy, knowledge and networks feed the fire of innovation and economic growth), and to preserve the intellectual and cultural assets for future generations. By incorporating these areas into their framework, digital library managers should be able to describe their roles to external audiences such as funding bodies, in making priorities and improving service to their communities, and finally in defining desired outcomes and assessing the libraries in terms of their community impact. Chapters 7 and 8, "Digital Libraries and Their Communities" and "The Prospects of Open Access Repositories," expand on the work begun in chapter six by looking at why some digital libraries continue to succeed while others fail, and focuses on the potential of digital library repositories to have a positive impact on scholarship and increase their social and economic value.

The last two chapters examine potential paths digital libraries can follow through the maze that is the social web. Chapter 9, "Digital Libraries and the Social Web: Scholarship," examines how digital libraries can promote the importance of scholars' work, and increase their avenues for collaboration. Finally, chapter 10, "Digital Libraries and the Social Web: Collections and Platforms," expands on chapter 9 to examine the transition of collections to platforms that fit well with users' expectations for finding information, reusing data for their own needs, inviting collaboration, and generally working and playing on the web. One possibility is through crowdsourcing to leverage user strengths and encourage their support of digital libraries' future existence.

The book should be experienced in the digital realm, rather than under the limitations imposed by the physical (read "analog") world. While it can be read from cover to cover, each chapter contains what could be considered hyperlinks that pinball the reader from like concept to like concept, no matter their physical relativity to each other within the book. This reviewer would not be surprised if future editions of this book will come to market as a digital download or permanent web link.

Another quote from the back cover, by Lorcan Dempsey, Vice President, OCLC Research and Chief Strategist, states that "this book provides an overview of the digital turn in libraries," and "fills a clear gap in the library literature." After reading Exploring Digital Libraries, the reviewer would have to agree. The book covers a plethora of topics about digital libraries within its 300-plus pages, while not overwhelming the reader in the process. The one complaint that this reviewer has is that the book is indeed an overview of the field, and some areas (such as streaming media) are skimmed over due to time and space constraints. This book is definitely recommended to library science students and educators, and those libraries trying to understand the digital world in which they now find themselves.—*Robert Freeborn (rbf6@psu.edu), Pennsylvania State University, University Park, Pennsylvania*

Delivering Research Data Management Services: Fundamentals of Good Practice. Edited by Graham Pryor, Sarah Jones, and Angus Whyte. London: Facet, 2014. 242 p. $99.95 softcover (ISBN 978-1-85604-933-7).

Delivering Research Data Management Services proposes to build awareness of the need for a research data management (RDM) service infrastructure and explain how to set up such a service (including technological and human resources as well as securing institutional support). It accomplishes this through five chapters authored individually by the three editors, all currently or formerly affiliated with the United Kingdom's (UK) Digital Curation Centre (DCC). It discusses three case studies from institutions that have successfully launched RDM services in the United States, UK, and Australia; and two case studies from national programs in the UK. The book provides in-depth information about high-level considerations for RDM services; it does not provide instruction in best practices for managing data. An earlier publication by the same lead editor, *Managing Research Data*, may prove more useful for those seeking best practices information.[1] Since this book demonstrates the value in planning ahead through advocacy and capacity-building before tackling the preservation and provision of access to research data, it may be a good first read.

The authors have extensive knowledge of and experience on this subject, yet write clearly enough for novices to comprehend. However, readers need to have a high tolerance for acronyms, since every agency, service, and tool seems to have one. Each chapter provides enough context to stand on its own, but this reviewer would have preferred that the book had been more tightly edited to facilitate cohesion across chapters. For instance, the authors recommend that Case Study 5 (chapter 10) be read in conjunction with chapter 5, begging the question of why Case Study 5 was not positioned as Case Study 1 (chapter 6). Such sequencing would have naturally achieved the authors' suggestion.

The book lacks a concluding chapter summing up the best practices, but it is left to readers to draw their own conclusions based on their institutional settings. Indeed, institutions in the UK seem to have an advantage in terms of governmental funding and shared infrastructure. In contrast, US institutions must either step up advocacy and coordination efforts at a national level or find smaller-scale solutions to the challenge of research data management. Examples of US universities' current and emerging practices

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We can learn much from our UK counterparts and their advancements. Many of the institutions cited in this book developed RDM services incrementally, starting with pilot projects and repurposing existing resources while advocating for the allocation of additional resources. Several authors advised including the costs and risks of doing nothing in that advocacy. In chapter 5, "The Range and Components of RDM Infrastructure and Services," Sarah Jones describes "DUDs," or "Data centers Under Desks," created by research groups attempting to do their own data management at low cost. She notes, "However, while the upfront costs may be only a fraction of those quoted by central services, the risk of data loss and security breaches are significantly higher, potentially leading to far greater costs in the long run" (98). Pryor (chapter 2), and Hodson and Malloy (chapter 10) concur that data management increases efficiency while reducing the risk of data loss, necessitating the recreation of data or the loss of grant income, and leads to more successful grant proposals. A recent report on *The Value and Impact of Data Sharing and Curation: A Synthesis of Three Recent Studies of UK Research Data Centres* asserts that the return on investment in RDM services is high;[3] at a mere twenty-six pages, it may be a more helpful advocacy piece on this topic than the anecdotal evidence scattered throughout the current considerably lengthier book.

Still, one would have to read many such focused reports and individual articles to achieve the depth of knowledge and advice contained within *Delivering Research Data Management Services*, provided readers are willing to invest the time in sorting out the universally applicable from the particular. Practical advice includes Jones' recommendations in chapter 5 to map an RDM strategy to the institution's mission statement, which she finds to be more persuasive even than funding mandates, and to propose different levels of service provision to ensure that administrators choose from among a range of options rather than reject the more expensive options and therefore avoid taking any action. Jones further recommended focusing RDM policy on high-level principles rather than specifics that may evolve, since ratification by university governing bodies will be required. Whyte describes a daunting array of methods for discovering and changing data management norms in chapter 4, "A Pathway to Sustainable Research Data Services: From Scoping to Sustainability," including case studies, data curation profiles, and online surveys such as Data Asset Framework (DAF) and Collaborative Assessment of Research Data Infrastructure and Objectives (CARDIO).

Throughout the book, the authors stress the importance of metadata and persistent identifiers for discovery, deposit agreements, training for researchers, especially those in graduate degree programs whose workflows are still under development, and collaboration among librarians, information technologists, research administration offices, university administrators, and the researchers themselves. Choudhury's case study from Johns Hopkins University—the only US institution featured in the book—emphasizes that, beyond merely establishing RDM services, we need to change the culture associated with data sharing, access, and preservation. This book could be a good starting point for doing just that.—*Rachel I. Howard (rachel.howard@louisville.edu), University of Louisville, Louisville, Kentucky*.

References

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The RDA Workbook: Learning the Basics of Resource Description and Access. Edited by Margaret Mering. Santa Barbara, CA: Libraries Unlimited, 2014. 190 p. $55 paperback (ISBN 978-1-61069-489-6)

With the implementation of *RDA: Resource Description and Access* in 2013, catalogers have been faced with the task of learning a new set of rules and guidelines that is complex and unfinished.[1] To aid in this effort, several experts have written books dedicated to explaining RDA, clarifying the rules, and interpreting them effectively. However, there have been very few works that both make a concerted effort to guide catalogers to a clear understanding of the rules and the underlying theory, and that offer practical steps in creating RDA records. With *The RDA Workbook*, Mering and her colleagues have taken the first steps toward rectifying this deficiency, albeit in a very general way.

The book begins as any work on RDA should, with an explanation of the Functional Requirements for Bibliographic Records (FRBR). This explanation, written by Melissa Moll, takes the wise step of first explaining the *Statement of International Cataloguing Principles* (ICP) and how FRBR, and its implementation in RDA, conforms to these principles.[2] By doing this, Moll removes FRBR

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from the vacuum in which it sometimes seems to exist and makes it more concrete. Where many explanations of FRBR simply describe the varying entities in Groups 1, 2, and 3, Moll orients her description of these entities around a single work, in this case "the bibliographic universe surrounding *The Adventures of Tom Sawyer*" (4). By focusing on a particular work, the reader gets a clear picture of the entities and attributes associated with the work and how they correspond to the FRBR model. The key to this chapter's success is the wealth of diagrams explaining how FRBR maps to real works. Rather than simply offering explanations, the chapter is peppered with small exercises related to the material at hand. It ends with three larger exercises that both solidify the FRBR model and help the reader navigate the *RDA Toolkit*, which derives its organization from FRBR. The chapter concludes with diagrams that guide readers through RDA based on whether they are identifying an attribute or a relationship.

Once the theory is explained, the actual application of RDA is addressed in the context of bibliographic and authority records. Rather than immediately describing how to create records, a list of key differences between RDA and the *Anglo-American Cataloguing Rules*, second edition (AACR2) is provided, such as the concept of core and core-if, the lack of abbreviations, and the elimination of the rule of three.[3] The reader is then guided through the process of creating an original cataloging record for a book using RDA with citations of the applicable rules and associated Library of Congress Program for Cooperative Cataloging Policy Statements (LC-PCCs). Following this is a very helpful table that maps the MARC fields to the RDA elements and instruction numbers. This table reinforces the structure of the *RDA Toolkit* and further solidifies the reader's knowledge of how to find rules and guidelines. The chapter concludes with tables giving the various RDA elements and their core status, of what they are attributes, where they are found in RDA, and how they are recorded in MARC. While this chapter offers sample records for formats beyond the book, there are no explanations for the more specialized fields (511 and 518, for example). Although mention is made of specialized guidelines such as the *Best Practices for Music Cataloging*and the as-yet unpublished OnLine Audiovisual Catalogers DVD best practices, it may have been better to omit the sample records rather than offer them with no explanation.[4] The potential exists for real confusion, especially if catalogers who are working with an unfamiliar format use these samples as a template instead of seeking out the specialized guidelines or consulting RDA itself. The sample record in Figure 2.36 (70), which describes a book with an accompanying CD, also makes the mistake of placing $3 in the wrong location in the 33X fields. This mistake does not appear serious, but since these fields are new and have the potential to be useful to users, catalogers should not be confused about the proper encoding of these elements. The RDA guidelines for creating authority records are also explained in the book. The reader is taken step-by-step through RDA chapter 9 and is then shown how these elements correspond to the MARC authority format. As in the FRBR chapter, helpful exercises are offered throughout and at the close of each chapter.

A real strength of this volume lies in its final chapter, written by Casey Kralik. The question of how best to implement RDA has been hanging over the heads of librarians for some time, and Kralik outlines a phased process for implementation. Kralik also makes a point of including ILS concerns in her plan. She recognizes the importance of involving public services staff in the implementation process so they can help library users operating in an RDA environment.

Mering and her colleagues have provided a useful introduction to RDA. It is just that, however—an introduction. This book is best viewed as an entry point, and Mering is very clear about this; it is meant for a general audience, and only gives a very basic outline of what RDA is and how it is to be used. The book's chief values lie in its explanation of FRBR, which is clear rather than obfuscated, and in its suggestions for implementation, which are well thought out and very practical.—*Seth Huber (sahuber@email.wcu.edu), Western Carolina University, Cullowhee, North Carolina*

References

1. *RDA: Resource Description & Access* (Chicago: ALA; Ottawa: Canadian Library Association; London: Chartered Institute of Library and Information Professionals, 2010).
2. International Federation of Library Associations and Institutions, *Statement of International Cataloguing Principles*, accessed May 9, 2014, www.ifla.org/files/assets/cataloguing/icp/icp_2009-en.pdf.
3. *Anglo-American Cataloguing Rules*, 2nd ed., 2002 rev., 2005 update (Chicago: American Library Association; Ottawa: Canadian Library Association; London: Chartered Institute of Library and Information Professionals, 2002).
4. Music Library Association, *Best Practices for Music Cataloging Using RDA and MARC21*, version 1.0.1, accessed May 9, 2014, http://bcc.musiclibraryassoc.org/BCC-Historical/BCC2014/RDA%20Best%20Practices%20for%20Music%20Cataloging_v101.pdf.

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3. *Anglo-American Cataloguing Rules*, 2nd ed., 2002 rev., 2005 update (Chicago: American Library Association; Ottawa: Canadian Library Association; London: Chartered Institute of Library and Information Professionals, 2002).
4. Music Library Association, *Best Practices for Music Cataloging Using RDA and MARC21*, version 1.0.1, accessed May 9, 2014, http://bcc.musiclibraryassoc.org/BCC-Historical/BCC2014/RDA%20Best%20Practices%20for%20Music%20Cataloging_v101.pdf.

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and Littlefield, 2014. 332 p. $75.00 softcover (ISBN: 978-0-8108-8769-5).

Organized in three parts, *Making the Move to RDA* is a guidebook for applying *RDA: Resource Description and Access,* the successor to the Anglo-American Cataloging Rules (AACR2). Author Chamya Pompey Kincy was a UCLA life and social science cataloger and active on committees in the Medical Library Association (MLA), American Library Association (ALA), and the Program for Cooperative Cataloging (PCC). Chamya had almost finished her book when she died of cancer at age thirty-seven. UCLA colleague, Sara Shatford Layne, finished the book and had it published in memorial to Kincy.

Part 1 discusses RDA's history and use, models and organization, and major differences with AACR2. This section can be read to gain a basic understanding of the background and development of RDA. The first chapter outlines RDA's objectives and principles, and clarifies the main differences with AACR2, namely the family of conceptual models that underpin RDA: the Functional Requirements for Bibliographic Records (FRBR), Functional Requirements for Authority Data (FRAD), and Functional Requirements for Subject Authority Data (FRSAD). Part I also introduces Group 1, 2, and 3 entities, describing and recording attributes, relationships between entities, and the organization of RDA. The chapter detailing the major differences between RDA and AACR2 describes differences in terminology (such as using "access point" instead of "heading"), conceptual distinctions between the two codes, and changes in other areas such as transcription, granularity, and source information.

Part 2 aims to teach the reader how to master RDA basics, and explains the major instructions contained in RDA, including how to record relationships. This section also describes the attributes of manifestations and items. It provides instruction on the organization of bibliographic elements in RDA chapters 1–4; the attributes of works and expressions in RDA chapters 5–7; attributes of people, families, corporate bodies, and places in RDA chapters 8–11 and 16; and recording relationships between Group 1 entities (works, expressions, manifestations, and items) and Group 2 entities (people, families, and corporate bodies).

Part 3, which focuses on applying RDA in the MARC environment, examines the creation and interpretation of bibliographic and authority records. This section instructs catalogers on creating and interpreting bibliographic records for books, nonbook resources, and authority records, and provides detailed examples and side-by-side comparisons of RDA and AACR2. This section is especially useful to those creating and modifying RDA records.

The book begins with a helpful list of essential acronyms decoded and explained, and ends with a bibliography of cataloging tools, standards, policies, guidelines, and training materials. This reviewer particularly appreciated the straightforward description of the RDA Toolkit's organization. This exposition complements previous works on this topic, providing more detail of the contrast between RDA and AACR2 than Chris Oliver's *Introducing RDA: A Guide to the Basics* (ALA Editions, 2010) while also being somewhat easier to browse than Magda El-Sherbini's *RDA: Strategies for Implementation* (ALA Editions, 2013).

Making the Move to RDA will be useful to new and experienced catalogers alike who lack an understanding of RDA, especially those working in a MARC environment. The book is a strong reference guide that will help catalogers navigate the current mixture of RDA and AACR2 records that coexist in today's catalogs.—*Hilary L. Robbeloth (hrobbeloth@pugetsound.edu), University of Puget Sound, Tacoma, Washington*