The More Things Change, the More They Stay the Same: Educational and Disciplinary Backgrounds of American Librarians, 1950–2015

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Discussions of diversity in American librarianship usually focus on gender or ethnicity, but historical studies also show a lack of diversity in educational and disciplinary backgrounds. Librarians traditionally hail from the humanities, especially English and history. But as current educational attention shifts to science, technology, engineering, and math (STEM) fields, are librarians reflecting this change? Anonymized data from ALA-accredited graduate programs from the last five years were collected, coded, and classified to determine librarians' educational and disciplinary backgrounds and in what ways, if any, they differ from the past 65 years and from the contemporary US general population. Unsurprisingly, we found that contemporary librarians still hail predominantly from English and history—a stark contrast from the business and health undergraduate degrees earned by the general US population. Backgrounds in STEM fields remain lacking in librarianship, but librarians with undergraduate education in the arts are on the rise, perhaps supporting the creativity, flexibility, innovation, and risk taking necessary in twenty-first-century libraries.

Keywords: academic disciplines, bachelor degrees, educational diversity, LIS education, undergraduate education

In recent years, increased attention has been paid to diversity in American librarianship, or discussions of the lack thereof. While many of these discussions have focused on gender or ethnicity, other factors, such as educational and disciplinary background, also contribute to diverse perspectives. This is especially true in American librarianship, where the master's degree serves as the professional criterion for the field, thus presuming previous undergraduate education.

But contemporary librarianship needs to represent and reflect the diversity of today's needs. An increased focused on science, technology, engineering, and math (STEM) fields is underway, with employment in these fields growing significantly faster (24.4%) than non-STEM jobs (4.0%) (U. S. Department of Commerce, 2017). This growing emphasis on STEM, combined with the advent of creative tools like makerspaces in libraries and the need for twenty-first-century librarians to be innovative,

KEY POINTS

- Since the 1950s, most American librarians' undergraduate degrees have been in the subjects of English and history, although this trend is slowly tapering down.
- American librarians' undergraduate areas of study differ starkly from the degrees earned by the general US population, especially in biology, business, engineering, health, and physical sciences.
- American librarians with undergraduate education in the arts are on the rise, perhaps supporting the creativity, flexibility, innovation, and risk taking necessary in twenty-first-century libraries.

flexible, creative problem solvers (Bertot, Sarin, & Percell, 2015) means that librarians need knowledge and education that support these new areas of strength.

To support these needs, we need a more educationally diverse library profession. To that end, this study examines the educational diversity of American librarianship. Drawing on both historical and contemporary data, we investigate the following research questions:

1. What are the educational and disciplinary backgrounds of contemporary librarians?
2. In what ways, if any, do the educational and disciplinary backgrounds of contemporary librarians differ from those of the past, or from the contemporary general population?

We conclude with a discussion of potential implications for the field of American librarianship, with special consideration paid to the needs of the field going forward in the twenty-first century.

Literature review

Many studies in the course of contemporary American librarianship have sought to profile the educational and disciplinary backgrounds of various types of library practitioners. During the first half of the twentieth century, education for librarianship was often provided through training courses at functioning libraries. But as librarianship became increasingly established as a profession, more formalized approaches to education emerged. In 1948, the American Library Association (ALA) passed a resolution calling for library education to be offered only at the graduate level (Bobinski, 2007), and by 1951, the ALA had limited accreditation to programs offering master's (i.e., graduate-level) degrees (Quinn, 2014). At that time, the earliest reported data on librarians' education backgrounds showed that only 58% of public librarians in America held college degrees; of those who did, one-third had majored in English and one-sixth in social science (Bryan, 1952, p. 58–60). While one-third of 58% does not represent a majority of librarians in the field at the time, this sample does reflect a starting point for a persistent pattern in

which English and social sciences majors are consistently represented at higher rates in studies dealing with general populations of librarians. A few years later, Douglass (1957, p. 59) found English again to be represented at a much higher rate as a major area of undergraduate study, with 35.8% of 545 contemporary library-school students having focused on it in their undergraduate education. Among the others, 14.4% had studied history, 10.7% foreign languages, 8.17% education, 7.78% social sciences, 7.2% library sciences, 4.28% biological sciences, 3.7% physical sciences, 1.75% fine arts, and 1.36% business administration.[1] Based on available data, it seems that most librarians hailed from humanistic backgrounds, despite the post–World War II rise of information science, the Space Race, and other contemporary national interests in science and technology.

Morrison (1969, p. 19) found that 72% of academic librarians in the United States pursued humanities as an undergraduate course of study; this included those who majored in a foreign language, but not in history, which comprised an additional 26%.[2] Some 16% studied social sciences, 10% natural sciences, and 7% education. The next decade reflected much of the same situation. In a survey of 1,969 students across 45 ALA-accredited library education programs, White and Macklin (1970, p.12) found that "the large majority are from liberal arts backgrounds, with English and history being the two largest concentrations": 28% of students had undergraduate majors in English, 17% history and government, 13% education, 11% behavioral sciences, 10% foreign languages, 5% physical sciences and math, and 2% biological sciences. However, they claimed, "there is also a small, but growing, number who are coming from the sciences and this is likely to increase as information science gets more emphasis in the library school" (p. 13). Although White and Macklin were correct about the increasing influence of information science on library schools, their optimism seems to have been misplaced. It is also unclear how White and Macklin could lay claim to any changes since they collected and analyzed only one year of data. Denis (1970, pp. 66, 183) reported similar findings for public and academic librarians in Canada at the time, with no significant differences between the two types of librarians: "the educational background of the vast majority of respondents is in the humanities and to a lesser extent the social sciences."

By the 1980s, it was well established that librarians across the board came from predominantly liberal arts educational backgrounds. Although not universally representative, a survey of 440 students enrolled in three ALA-accredited master's programs at the time—Atlanta University, University of North Carolina Chapel Hill, and University of South Carolina—showed that 51.9% held undergraduate degrees in the humanities, 6.6% in library science, 5.0% in the sciences, 2.7% in business, and 2.0% in agriculture, nursing, and other (Brown, 1988, p. 65).

Studies began to focus on narrower slices of librarianship, such as one's role or position in the library, or librarians in subject-based libraries, but little changed in librarians' educational backgrounds. Across 300 college libraries, Reynolds (1981, p. 17) found the educational backgrounds of the staff to be as follows: 44% humanities (including English, classics, foreign languages, literature, linguistics, philosophy, and religion), 16.7% education, and 5.2% library science. No information for any other major areas of study was mentioned. Karr (1983, p. 344) profiled average public and academic library directors in 1981 as a 51-year-old male from the northeastern United States who had majored in the liberal arts. Library directors at the time had majored mostly in English (28%) and history (21%), followed by other humanities (13%), social sciences (13%), science and engineering (9%), education (6%), library sciences (5%), and business (4%). Mech (1985, p. 9) also found that library directors at small Midwestern colleges had majored "mostly in the humanities and liberal arts": again a predominance of English (26%) and history (22%), followed by education (14%), other humanities (9%), foreign languages (8%), non–social sciences (7.5%), social sciences (6%), library science (3%), and business (2.5%). Cain (1988) was one of the first to also look at trends in further graduate education in addition to undergraduate area of study. Using demographic data sourced from the Vita Bank, Cain found that 50% of librarians (with or without MLS or equivalent degrees) had at least one graduate degree other than the MLS. After coding the degrees by discipline, humanities again stood out. The highest percentage of undergraduate degrees (32.3%) and non-MLS master's degrees (25.4%) were coded as humanities subjects (p. 294). These are significant percentages on their own, but Cain categorized history as a "humanities social science," meaning that history was not included in the numbers for humanities. When broken out by specific subject, history led both undergraduate and non-MLS master's degrees, followed, predictably, by English and education. Cain found the fact that nearly 60% of undergraduate degrees were in the same four fields "disturbing" and lamented the poor representation in the hard sciences: "they indicate that we have a fairly narrow educational perspective from which to examine issues or approach problems" (p. 296).

This concern seemed to lead into an investigation of the academic and educational backgrounds of librarians specializing in science and related fields (what today we might call STEM, or science, technology, engineering, and mathematics). Responses from 100 academic science librarians engaged in bibliographic instruction showed that nearly two-fifths (37%) had a degree at any level—undergraduate, master's, or doctoral—in a scientific discipline (Thomas, 1988, p. 253). Another survey of "sci-tech librarians" asked whether they "had either an undergraduate degree or extensive coursework in a field of science or technology." Fifty-nine respondents (67%) said they did (Sandy, Lembo, & Manasco, 1998, p. 16). Another survey of 56 engineering librarians revealed that 11% had been

social science majors, 10% English, 9% liberal arts, 9% education, 9% fine arts, 9% biology, 7% engineering, 7% chemistry, 7% history, 5% natural sciences, 4% math, and 4% journalism (Mosley, 1995, p. 57). Of 119 science and engineering librarians who were members of the science and technology section of the Association of College and Research Libraries (ACRL), 20% had majored in biology, 12.2% in physics/chemistry, 11.1% in history, 7.8% in English, and 5.6% in foreign languages (Winston, 2001, p. 17). Winston acknowledges the propensity toward humanities backgrounds and the difference from this in his population, yet he also acknowledges that issues of representation still exist: "In a profession in which English and history majors are the most predominant, the academic science and engineering specialty includes more science majors, as well as those with more traditional backgrounds. However, there were very few reported engineering majors" (p. 22). A subsequent study showed the continuing trend for science librarians to have science backgrounds. Of 72 physical science librarians, 63% had majored in a science field as undergraduates, and 18% had earned a master's degree in a science: "The data collected suggest that a greater number of physical science librarians have an undergraduate science degree than do science librarians in general" (Ortega & Brown, 2005, p. 75).

The pattern of educational backgrounds of STEM librarians seems to be anomalous. Results of other studies focusing on specific types of librarians follow the general overall trend of favoring the humanities. A survey of 162 academic business librarians found that 23.5% had majored in history, 19% in English, 6% in education, and less than 5% in all other identifiable majors. In terms of additional master's degrees, 17.3% of the respondents had an MBA, followed by 9% in history and 3% in English (Kendrick, 1990, pp. 395–396). A demographic survey of 198 children's librarians found that 23.2% had an undergraduate major in English, 18.7% in education, 10.1% in history, 5.1% in fine arts, 5.1% in psychology, 3.5% in sociology/social work, and 3.0% in communications/journalism (Winston & Dunne, 2001, p. 31–32). "Double majors" were reported by 12.6%, but no data was included about what subjects those might entail. Of business librarians, only 15% held a bachelor's degree in a business field, according to Perret (2011, p. 50). A survey of librarians dealing with "media" (such as videos, film, audiovisual, and other non-print materials) noted that of 98 respondents, "the only degree held by a significant number of respondents [17] was a Bachelor's degree in English" (Laskowski, 2010, p. 394). And of 280 art librarians, 35% had a degree in art history and 12% in art/studio art (Tewell, 2012, p. 37). Some 52% of respondents had a second master's degree; of those, the most frequent areas were art history (52%), fine arts (16%), architecture (11%), and history (4%). Interestingly, with the exception of Denis (1970), this is the only study among those discussed that addresses an international audience; all other studies were focused on librarians in the United States.

In recent years, some librarians have found their way to the profession after completing doctoral education in another field. Of academic librarians with subject doctorates (other than LIS) earned between 1965 and 2006, 72% chose to pursue librarianship either during or after their PhD studies (Lindquist & Gilman, 2008, p. 36). Although the fields of study varied, doctoral degrees earned prior to librarianship still skew significantly toward the arts and humanities (59.9%), trailed by professions/applied sciences (24.4%), social sciences (8.8%), and natural sciences (5.4%) (pp. 40–41).

While we acknowledge that differences exist across various library settings, making the data from these previous studies seem disparate, all librarians are required to complete the same master's level degree as professional qualification regardless of what type of library (academic, public, school, etc.) they find themselves working in. While some librarians have specific goals regarding organizational placement, other librarians may change from one library type to another (e.g., academic to public) in the course of their career. The data reviewed here from these historical studies offer a broad picture of librarianship at large.

Methods

Studies throughout the past 75 years clearly show librarians skewing heavily toward backgrounds in English, the humanities, and social sciences. But contemporary librarianship is increasingly emphasizing support for STEM fields in library activities such as teaching, information literacy, collection development, outreach, research, and publishing (Gubnitskaia & Smallwood 2014; Mardis 2015). Outreach and other instructional endeavors, such as the "Big Orange STEM Saturday" at the University of Knoxville, Tennessee, have increased in popularity and offerings (Flash, Allen, Mack, & Clement, 2017). Scientific-focused information literacy instruction is increasingly incorporated into academic curricula and requires the support of academic librarians (Scaramozzino, 2008, 2010). Laherty (2000) emphasizes the need for librarians to incorporate information literacy into science education programs to be competent in the theories, pedagogies, and standards of scientific fields. But academic libraries are not the only libraries emphasizing STEM learning. STEM activities and programs, such as science fairs, non-fiction book clubs, and other programming strategies, are popular in public libraries, as are displays, reading lists, and other readers' advisory services promoting STEM topics (Hopwood, 2012; Myers Spencer & Huss, 2013; Roberson, 2015). School libraries support STEM curriculum through similar techniques (Duff, 2012; Lamb, 2016). As contemporary librarianship increases support for STEM fields, one might think that the backgrounds of librarians might also be shifting in this direction. Is this truly the case? What actually comprises the educational and disciplinary backgrounds of contemporary librarians? In what ways, if any, do contemporary librarians'

educational and disciplinary backgrounds differ from those of the past, or from the general population at large?

To ensure the most current and up-to-date information for this study, contemporary librarians were considered those on the cusp of their library careers—that is, current and recent master's-level students in librarianship over the previous five years (2012–2016). Although previously the ALISE Annual Report included data about prior areas of study, the organization discontinued collecting undergraduate major data in 1980 (Saye & Lan, 1997, p, 74). Instead, anonymous de-identified data about matriculated students' year of enrollment, previous undergraduate and graduate degrees, and the areas of study for those degrees were solicited from every ALA-accredited master's programs in the United States, Canada, and Puerto Rico. (See Appendix A for the letter soliciting participation.) Although many of the previous studies reviewed above solicited data via survey questionnaires, this form of data collection was chosen over a survey in an attempt to collect a more thorough and representative set of data, not reliant on individual personal responses.

Requests for data were sent in January 2017 to the 60 institutions with ALA-accredited master's degree programs. Of these, seven institutions in the United States (12%) agreed to provide program data for the study. Thirty additional institutions (50%) responded but opted not to participate. While reasons for non-participation varied, most reflected the unavailability of the data in a readily sharable format and/or the labor-intensive nature of data collection and the program's inability to devote staff time or resources to the task. The requests stated a preference for de-identified data but also stated that special arrangements could be made to collect identifiable data while still protecting students' information, an offer extended after consultation with Syracuse University's Institutional Review Board. Despite the assurance of IRB compliance, several institutions declined to participate because of concerns over student privacy, with one institution going so far as to seek counsel on the matter from their legal department before declining to participate. To encourage participation in the study, data were collected in whatever format was most convenient for the institution, resulting in a variety of formats, from spreadsheets to simple lists. The data were standardized and aggregated, and then coded based on a scheme developed during a pilot study with admission data from the University of Washington (Clarke, 2016b). The coding scheme was revised and expanded to accommodate the data from additional schools (See Appendix B for the full coding scheme).

Every degree subject was normalized; for example, degrees listed with subjects in Classics, Classical Studies, and Classical Civilization were all synonymized to Classics. In addition, every normalized subject was hierarchically classified under a broader discipline code (e.g., History was classified as a humanities discipline). Although many subjects are well recognized as falling into certain disciplinary categories, some

classifications, especially for new and emerging subjects, proved challenging. Whenever possible, we investigated the subjects and degrees and attempted to represent their actual nature. If the degree-granting institution was known, we examined web pages and other information about the degree to determine which discipline might be appropriate. We consulted established classifications and definitions, such as the National Endowment for the Humanities, to guide our classification. When subject and disciplinary classification was complete, descriptive statistics were used to understand the landscape of educational backgrounds in contemporary librarianship, as well as to compare with historical data. After presenting preliminary results at the American Library Association's annual conference (Clarke, 2017), we also coded every undergraduate degree a second time based on the IPEDS Classification of Instructional Programs taxonomic scheme (National Center for Education Statistics [NCES], n.d. b), based on external feedback and suggestions. This allowed us to compare the distribution of subjects among librarians' undergraduate degrees with that of undergraduate degrees in the American population at large.

Results and discussion

Current overall educational and disciplinary profile of contemporary American librarians

Based on the data from seven institutions with ALA-accredited master's programs, it is clear that contemporary librarians predominantly hail from disciplinary backgrounds in the humanities, with 41% of previous degrees having been awarded in this discipline. This is followed by the social sciences (22%), the professions (17%), STEM (11%), the arts (6%), and miscellaneous/interdisciplinary studies (3%) (see Figure 1).

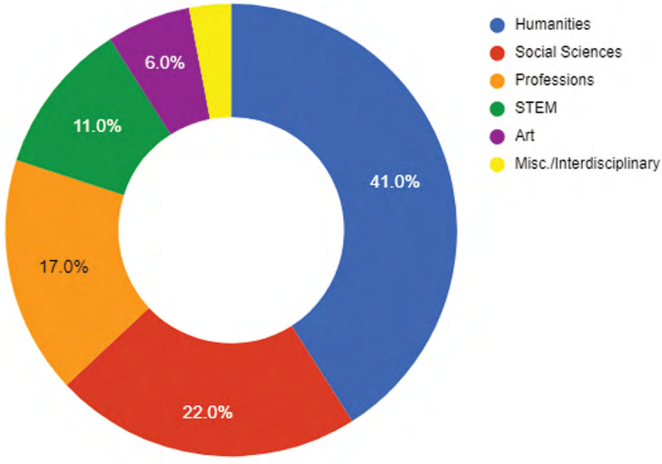

Figure 1: Disciplinary backgrounds of contemporary librarians.

In addition to examining the overarching disciplinary divisions, we also tabulated counts for specific areas of study (e.g., the "major" or topic of study of each degree). The predominant areas of study reflected in previous degrees held by matriculating MLIS students also emphasizes subjects in the humanities, with English and history topping the list (see Table 1). These subjects rose to the top even without including counts for

Table 1: Top 25 degree subjects across all LIS programs

Degree subject	Number of degrees awarded	Percentage of all degrees awarded
Humanities: English	643	14.68%
Humanities: History	457	10.43%
Professions: Education	151	3.45%
Social Sciences: Cultural Studies	143	3.26%
Social Sciences: Psychology	138	3.15%
Humanities: English: English Literature	129	2.95%
Humanities: Languages	120	2.74%
Social Sciences: Political Science	105	2.40%
Professions: LIS	105	2.40%
Humanities: Art History, Theory, & Criticism	99	2.26%
Social Sciences: Anthropology	88	2.01%
Humanities: Religious Studies	78	1.78%
Professions: Law	78	1.78%
Social Sciences: Communication	73	1.67%
Social Sciences: Economics	73	1.67%
STEM: Computer Sciences	70	1.60%
Professions: Business: Administration	70	1.60%
Social Sciences: Sociology	67	1.53%
Social Sciences: Journalism/Mass Communication	57	1.30%
Professions: Information Sciences	57	1.30%
STEM: Engineering: Electrical Engineering	49	1.12%
Humanities: English: Creative Writing	48	1.10%
Miscellaneous: Interdisciplinary	47	1.07%
Humanities: Philosophy	46	1.05%
Art: Other/General/Miscellaneous	44	1.00%

more specific topics in those areas, such as English literature (6th most common), art history (10th), or creative writing (22nd). Degrees in education were the third most common, but they represent a very distant third place compared to the top two subjects.

While this table reflects the subjects of previous degrees earned by matriculated master's students, it does not delineate the levels of those degrees. Some students entered into a master's-level library education program with only a single undergraduate degree, while others entered with an undergraduate degree as well as a master's degree, or some other combination of degrees (e.g., multiple bachelor's and/or master's degrees, associate degrees, law degrees, doctoral degrees, etc.). No attempt was made to distinguish the level of education a student received based on the level of degree; that is, no assumption was made that a graduate degree conferred more expertise or education in a particular subject than an undergraduate degree. Only the subjects were noted. A total of 3,191 students recorded 4,380 degrees, giving an average of 1.37 degrees per student.

Current undergraduate educational and disciplinary backgrounds

While all entering MLIS students are required to have earned an undergraduate degree, not all have earned additional graduate or other degrees. Including all degrees, as we did above, offers a holistic picture of focus of study by discipline, but it also may skew the results toward subjects in which additional degrees were earned. It also makes comparisons with other data sets, both historical and contemporary, more difficult.

For instance, based on the above data, humanistic disciplines seem to be overrepresented in librarianship. But perhaps humanistic courses of study are popular across the board, not just in librarianship. To determine whether the undergraduate degree subjects of librarians differ from the population at large, we compared the subjects of the undergraduate degrees in our data set to national data from the US Department of Education's Integrated Postsecondary Education Data System (IPEDS). IPEDS is a system of annual surveys conducted by the National Center for Educational Statistics. Every college, university, and technical and vocational institution that participates in federal student financial-aid programs is required to self-report numerous pieces of institutional data, including data related to institutional characteristics and prices, admissions, measures of enrollment and access, and degrees conferred, among others (NCES, n.d. a).

We took several steps to prepare our study data for comparison with national data from IPEDS. First, all non-undergraduate degrees were removed from our data set, as IPEDS collects only data relating to postsecondary, non-graduate studies. Next, each degree from our original coding scheme was checked against the IPEDS Classification of Instructional Programs (CIP) searchable site (NCES, n.d. b) in order to crosswalk our data.

CIP is the taxonomic scheme utilized by IPEDS to organize degrees into fields of study and sub-fields. Our data were crosswalked at the higher field level in order to compare it to national numbers reported in the *Digest of Education Statistics*, an annual compilation of American educational statistical information with data drawn from many sources, including IPEDS. Our data set was then re-coded to match the CIP scheme. Table 322.10 (NCES, 2016) from the *Digest* contains data for bachelor's degrees conferred by all reporting institutions between 1970–71 and 2014–15, the latter being the most recent year for which complete IPEDS data are available. Numbers for the 2012–13, 2013–14, and 2014–15 academic years were aggregated across our data set and IPEDS data for comparison purposes. These academic years were selected because complete data for these years were available across both data sets.[3]

Our comparison shows a number of stark differences in patterns of undergraduate study (see Table 2). IPEDS classifies history with social sciences, making social sciences comprise the highest percentage (21.37%) of undergraduate degrees earned by MLIS students between 2012 and

Table 2: IPEDS fields of study—aggregates for 2012–13, 2013–14, and 2014–15

CIP field of study	Aggregate across all LIS programs	Percentage across all LIS programs	Aggregate of IPEDS	Percentage of IPEDS
Agriculture and Natural Resources	17	0.81%	104,994	1.87%
Architecture and Related Services	8	0.38%	27,996	0.50%
Area, Ethnic, Cultural, Gender, and Group Studies	51	2.42%	24,907	0.44%
Biological and Biomedical Sciences	29	1.37%	314,950	5.62%
Business	87	4.12%	1,082,818	19.32%
Communication, Journalism, and Related Programs	87	4.12%	263,080	4.69%
Communications Technologies	0	0.00%	15,113	0.27%
Computer and Information Sciences	138	6.54%	165,813	2.96%
Education	86	4.08%	295,159	5.27%
Engineering	57	2.70%	276,014	4.92%
Engineering Technologies	5	0.24%	51,055	0.91%
English Language and Literature/Letters	429	20.33%	148,712	2.65%

(Continued)

CIP field of study	Aggregate across all LIS programs	Percentage across all LIS programs	Aggregate of IPEDS	Percentage of IPEDS
Family and Consumer Sciences/Human Sciences	1	0.05%	73,203	1.31%
Foreign Languages, Literatures, and Linguistics	132	6.26%	61,472	1.10%
Health Professions and Related Programs	4	0.19%	596,154	10.64%
Homeland Security, Law Enforcement, Firefighting and Related Protective Services	6	0.28%	185,403	3.31%
Legal Professions and Studies	3	0.14%	13,358	0.24%
Liberal Arts and Sciences, General Studies and Humanities	32	1.52%	135,718	2.42%
Library Science	53	2.51%	328	0.01%
Mathematics and Statistics	26	1.23%	63,289	1.13%
Military Technologies and Applied Sciences, Other	0	0.00%	566	0.01%
Multi/Interdisciplinary Studies	50	2.37%	143,606	2.56%
Other[a]	15	0.71%	0	0.00%
Parks, Recreation, and Leisure, and Fitness Studies	4	0.19%	137,681	2.46%
Philosophy and Religious Studies	50	2.37%	35,863	0.64%
Physical Sciences	13	0.62%	87,398	1.56%
Precision Production	0	0.00%	121	0.00%
Psychology	81	3.84%	349,315	6.23%
Public Administration and Social Service Professions	6	0.28%	99,796	1.78%
Social Sciences and History	451	21.37%	517,843	9.24%
Theology and Religious Vocations	7	0.33%	28,735	0.51%
Transportation and Materials Moving	1	0.05%	13,960	0.25%
Visual and Performing Arts	181	8.58%	291,045	5.19%

[a]Degrees within LIS Programs data set that do not fit any CIP category

2015. However, English language, literature, and letters also represents a large percentage (20.33%) and would likely be the highest percentage were history not conjoined with social sciences. Both social sciences and English are much more concentrated in librarianship than the US population at large, which saw only 9.24% of undergraduates completing degrees in social sciences and 2.65% in English. Conversely, the largest category of degrees earned in the US population was in business subjects (19.32%), followed by health professions at 10.64%. In librarianship, 4.12% and 0.19% of MLIS students earned undergraduate degrees in these subjects, respectively. There is obviously a significant disconnect in librarians' representativeness of the population at large.

Although IPEDS does not present a unified category for STEM as an overall discipline, we can identify individual subjects representing the sciences, technology, engineering, and mathematics to present a more holistic picture (see Table 3). Most of the subjects in the STEM disciplines—agriculture, biology, engineering, health, and physical sciences—show a higher rate in the overall population than in librarianship. In contrast, the percentage of MLIS students holding undergraduate degrees in computer and information science (6.54%) is twice as high as the overall rate (2.96%). This may be due to the inclusion of

Table 3: IPEDS STEM fields of study—aggregates for 2012–13, 2013–14, 2014–15

CIP fields of study	Aggregate across all LIS programs	Percentage of aggregate across all LIS programs	Aggregate of IPEDS	Percentage of IPEDS
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Engineering Technologies	5	0.24%	51,055	0.91%
Health Professions and Related Programs	4	0.19%	596,154	10.64%
Mathematics and Statistics	26	1.23%	63,289	1.13%
Physical Sciences	13	0.62%	87,398	1.56%
TOTAL of all IPEDS fields of study	289		1,674,780	

information science alongside computer science in the IPEDS classification; MLIS students often have undergraduate degrees in library and information science (LIS). This could also be due to data from programs offering a broader graduate-level degree in information with tracks or specializations for LIS, computer science, information management, user experience (UX), and other cognate fields. IPEDS does offer a separate category specifically for library science, and that is where we classified undergraduate LIS degrees from our dataset. However, other non-library information-related degrees, such as information administration and management, were assigned to the IPEDS category of computer and information sciences. Computer science degrees may also be more highly represented due to the types of MLIS programs that responded: several contemporary degree programs now admit students to a general information-based course of study, where students subsequently may select to pursue a specialization or track in library science and librarianship. Therefore, some degrees in our dataset surely represent matriculated students who went on to pursue information degrees exclusive of the MLIS.

A similar issue arises in the area of law. At least one of the MLIS programs that contributed data offered a specialization in law librarianship, thus attracting people with previous experience in that area. Although this may not be evident in the undergraduate data (0.14% in librarianship compared with 0.24% overall), 1.78% of all previous degrees (undergraduate, graduate, and post-graduate) earned by incoming MLIS students were in law. This likely reflects the fact that the juris doctor (JD), a degree earned only after already earning an undergraduate degree, is considered the first degree in law in the United States (Law School Admission Council, n.d.).

Surprisingly, the percentage of MLIS students with undergraduate degrees in mathematics and statistics is nearly identical to the overall rate (1.23% in librarianship vs. 1.13% overall). The only other categories with similar distributions were architecture, communications/journalism, and multi-/interdisciplinary studies.

How this profile compares to previous studies

Librarianship clearly reflects a different distribution of undergraduate degrees than the US population at large. To investigate whether this distribution is a new trend reflecting contemporary needs or has remained constant over time, we compared undergraduate degree data from our dataset to similar data reported on in previous studies (see Figure 2). Data from Douglass (1957), White & Macklin (1970), and Cain (1988) were used for this comparison, as they all offered a similar level of specificity to the IPEDS classification of undergraduate majors. Two of the studies gleaned data from questionnaire responses of undergraduate students (Douglass; White & Macklin), while Cain relied on data from the Vita Bank, an attempted census of practicing librarians. Not all subject

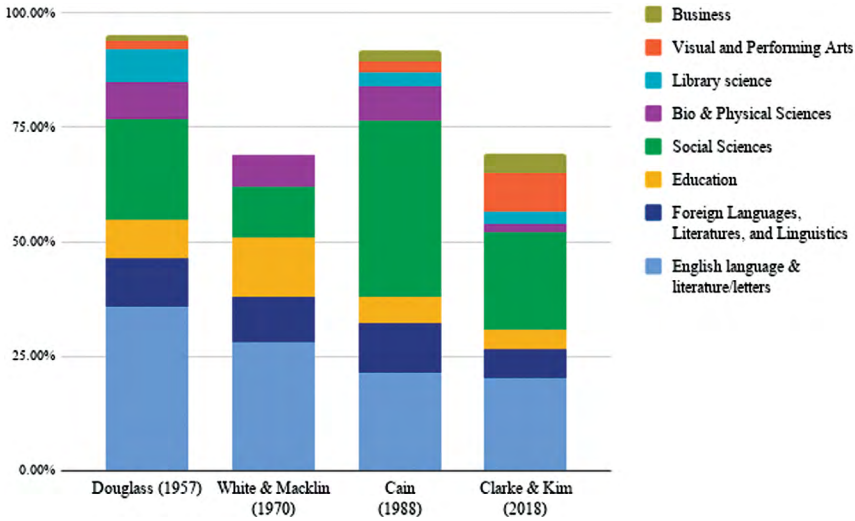

Figure 2: Undergraduate degrees across four studies.

designations were reflected in each study; notably, White and Macklin did not specifically report library science, business, or arts undergraduate degrees as individual categories. Totals do not add up to 100% due to additional subject area designations not consistently reported across all four studies, as well as accounting for other/miscellaneous degrees. It should be noted, as per the previous discussion of IPEDS classification, history is categorized as a social science rather than part of the humanities.

Despite still comprising a near-majority, earning an undergraduate humanities degree prior to librarianship appears to be on the decline. Social sciences are represented in higher numbers in more recent years, although this could be attributed to a number of reasons. The classification of history as a social science certainly affects these results in a significant way. But a higher number of social science undergraduates pursuing librarianship could also correspond with the evolutionary alignment of librarianship to information science, which is often positioned as a social science. Or perhaps more options for social science degrees have become available in recent years.

Some professions, such as education, library science, and business, were identified individually in most of the studies, while other professions determined by our own original inductive coding were not. Again, this may be an artifact of an evolving education space, which now includes degrees in subjects that were previously not offered in the academy. Of the specific professions highlighted in three of the four studies compared here, education seems to have peaked in the 1970s and declined since then. Although librarianship is still often affiliated with an educational bent, especially when considering its historical foundations and core values, a decline

in this focus has been noted as a result of the field's alignment with information science (Dali, 2015). When compared with the contemporary IPEDS data, librarianship actually slightly lags the nation in undergraduate education degrees (5.27% nationally vs. 4.08% in librarianship). Business, on the other hand, has seen a slight rise, from 1.36% of undergraduate degrees in 1957 to 4.12% today, but as previously noted, this is starkly out of proportion with the national figure of 19.32%.

Interestingly enough, degrees in the visual and performing arts appear to be on the rise, perhaps due to graduates of those degrees facing increased challenges in securing jobs in fields directly related to their studies.

Implications and conclusions

This work set out to investigate the educational and disciplinary backgrounds of contemporary librarians, as well as to understand how these backgrounds compare to librarians of the past as well as to the general population. Unsurprisingly, we found that contemporary librarians, represented by MLIS students on the cusp of their career so as to reflect the future landscape as much as possible, still hail predominantly from humanities backgrounds, especially English. History is also a strongly represented area of study. The large number of people with humanities backgrounds may have made sense when libraries were focused on books, literature, and reading. However, by the time library education shifted to the graduate level in the United States, librarianship itself had also already begun the shift toward becoming the social science field it is considered today. Yet the undergraduate backgrounds of people pursuing librarianship do not seem to have shifted at the same rate. This leaves library educators with the difficult task of training people with humanities backgrounds to do social science work—a fundamentally different approach that risks mismatches in disciplinary norms. While most students with humanities backgrounds are more than capable writers, their unfamiliarity with the research methodologies and genre conventions often found in MLIS curricula, which is more closely aligned with the social sciences, leaves many of these students struggling to understand expectations. Mandel (2017, p. 200) reports that this same skill set is especially valuable in post-MLIS employment, where "the ability of library and information professionals to responsibly consume and competently produce research is critical to the growth of the field and to the way other disciplines view LIS." This is true for academic librarians, who may be required to engage in primary research as part of their tenure obligations, and for librarians in the field in general, who are increasingly called upon to demonstrate the value and impact of their work through evidence-based practice (Oakleaf, 2010, p. 6).

The backgrounds of librarians are quite different from those of the college-educated American populace at large, where 33% of adults aged 25 and older have bachelor's degrees or more (Ryan & Bauman, 2015), with

especially noticeable differences in business and health fields, as evidenced in the most recently available IPEDS data. Additional emphases on STEM in American society, along with calls for increased research, resources, and education in these fields, point to the need for librarians to support these services. But the small number of people with STEM backgrounds going into librarianship leaves a disconnect. For future librarians to serve patrons in these areas, MLIS programs must recruit more people with undergraduate education in such fields and/or integrate education about services for these populations into graduate-level library education curricula. We are not claiming that STEM librarians who have an undergraduate background in the humanities or social sciences are unqualified and unable to fulfill their professional duties, only positing that an increase in the number of librarians with STEM undergraduate education can help serve the profession's increased need for STEM support and contribute to more diverse perspectives in MLIS education.

Although they still represent a small percentage overall, librarians with undergraduate education in the fine and creative arts are increasing in number. While the needs in these fields are perhaps not as concrete as the needs in STEM fields, people with arts backgrounds may be able to offer some of the skills necessary for twenty-first-century librarianship, such as creativity, flexibility, innovation, and risk taking (Bertot et al., 2015). Undergraduate art education, especially the studio arts, explicitly offers instruction that fosters creativity (Clarke & Cripps 2012). Undergraduate studio art education includes learning how to take risks, view topics from multiple and flexible points of view, and appreciate various perspectives (Salazar 2013). Innovation—even in scientific fields—has long been linked with creative pursuits like the arts. For example, Gurnon, Voss-Andrae, and Stanley (2013) show how including visual arts in the undergraduate science curriculum can help develop scientific imagination. Such integration underlies the revision of STEM to STEAM (science, technology, engineering, arts, and mathematics), a movement encouraging the inclusion of art and design as integral aspects of STEM (Rhode Island School of Design, 2018). Although skills derived from art and design are certainly used by librarians, Clarke's (2016a) historical research shows that they have been implicit and underdeveloped in American librarianship and have yet to be explicitly taught in library education. Given the argument that library work is actually more aligned with the discipline of design than of social sciences (Clarke, 2016a, 2018), people with art and design backgrounds may be better equipped with the creative skills necessary for twenty-first-century library careers. Yet until MLIS education embraces a design approach, these students may find themselves trapped in similar patterns to those mentioned for humanities students above and may risk being unable to apply the skills learned in their design educations to librarianship.

These findings may be useful, but like all studies of this nature, they are not without flaws. Despite our attempt to collect census data from all

60 ALA-accredited degree programs, only seven cooperated. The schools from which we collected data varied in program structure, size, ranking, and other characteristics. Some schools offered multiple degrees (both ALA-accredited and not); some offered specific focus areas or concentrations that surely affected our findings. This explains our attempt to collect census population data. While we understand and respect the reasons for programs not sharing their data, we remain unsatisfied. Data on undergraduate degrees were systematically collected in the past for the ALISE statistical report until 1980. The rationale and motivation for no longer collecting such data remain a mystery, when the information could surely assist with recruitment and outreach for a more educationally diverse profession. Perhaps given some of the challenges faced by library programs in the late twentieth century, such data became a kind of "competitive intelligence," making sharing prohibitive and reflecting a change from the traditions of cooperation so commonly seen in librarianship to a more competitive landscape where MLIS program sought various means of staying afloat. Despite these limitations, this study still illustrates trends in librarians' educational backgrounds in the 21st century, which can help shape MLIS education in this contemporary evolving space.

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Notes

1. Categories of "other," "no answer," or "undefined" are not included here, so percentages may not total 100.
2. As Morrison (1969) points out, some subjects reported two or more majors, so percentages total more than 100.
3. It should be noted that data from one program was dropped for this particular comparison, since its data were provided to us in aggregate form and we were unable to isolate the years in question.

Appendix A: Request for data, sent in January 2017

Subject: Request for Data Related to Educational Backgrounds of Graduate LIS Program Applicants

Dear [NAME],

You are receiving this email because you appear to be the person in your—department who handles data related to the LIS program at your institution.

We are conducting a study examining the educational backgrounds of graduate LIS program applicants. To that end we are reaching out to all ALA accredited master's programs in library and information science across the United States, Canada, and Puerto Rico with the hopes of collecting relevant program data to assist with this study.

We are seeking the following information, ideally for at least the last five years. For each matriculated MLIS (or equivalent) student, we would like to have the **matriculation year**, the student's **previous academic degrees** (undergraduate and graduate), the **major areas of study** for those degrees, and, if possible, **the schools which awarded those degrees**. For example, a specific student that matriculated in 2015 might have a bachelor of arts in English from California State University Long Beach and a master's degree in history from the University of Florida.

We understand that this data may exist in a variety of formats, and in an effort to make this process as easy as possible, we will accept data in whatever format you have on hand and we are happy to provide support in any way. Ideally we would prefer data that has been de-identified (that is, data that does not include names, Social Security numbers, or other identifying information), but if your data cannot be de-identified or you

don't have the time or resources to de-identify it yourself, please let us know and we can make arrangements to collect your identifiable data while still protecting students' information. If we have reached you by mistake and you are not the person who handles data related to the LIS program, we would appreciate it if you could please forward this email to the appropriate person.

We appreciate the time involved in gathering this data and are grateful for any assistance you can provide. Please reply to this email with any data you are able to share or if you have questions or comments.

Sincerely,
Rachel Ivy Clarke and Young-In Kim, Syracuse University

Appendix B: Study coding scheme

Humanities

Humanities: Art History, Theory, & Criticism
Humanities: Classics
Humanities: Comparative Literature
Humanities: English
Humanities: English: Creative Writing
Humanities: English: Non-Creative Writing
Humanities: English: English Education
Humanities: English: English Literature
Humanities: English: Rhetoric
Humanities: History
Humanities: History: Ancient Studies
Humanities: History: Medieval/Renaissance Studies
Humanities: History: Music History
Humanities: History: Public History
Humanities: Languages (Includes specific languages)
Humanities: Languages: Education
Humanities: Culture, Language & Literature (Non-English)
Humanities: Philosophy
Humanities: Religious Studies (Includes specific religions, comparative religion)
Humanities: Interdisciplinary: Folklore
Humanities: General/Other/Miscellaneous

Social Sciences

Social Sciences: Anthropology
Social Sciences: Archaeology
Social Sciences: Communication
Social Sciences: Community Studies
Social Sciences: Cultural Studies

Social Sciences: Cultural Studies: African American Studies
Social Sciences: Cultural Studies: African Studies
Social Sciences: Cultural Studies: American Indian Studies
Social Sciences: Cultural Studies: American Studies
Social Sciences: Cultural Studies: Area Studies
Social Sciences: Cultural Studies: Asian Studies
Social Sciences: Cultural Studies: Comparative Cultural Studies
Social Sciences: Cultural Studies: Ethnic Studies
Social Sciences: Cultural Studies: Eurasian Studies
Social Sciences: Cultural Studies: European Studies
Social Sciences: Cultural Studies: Gender and Women's Studies
Social Sciences: Cultural Studies: German Studies
Social Sciences: Cultural Studies: Hispanic Studies
Social Sciences: Cultural Studies: Irish Studies
Social Sciences: Cultural Studies: Jewish Studies
Social Sciences: Cultural Studies: Latin American Studies
Social Sciences: Cultural Studies: Latino Studies
Social Sciences: Cultural Studies: Middle Eastern Studies
Social Sciences: Cultural Studies: Near Eastern Languages and Civilization
Social Sciences: Cultural Studies: Russian Studies
Social Sciences: Cultural Studies: Southeast Asian Studies
Social Sciences: Cultural Studies: Urban Studies
Social Sciences: Economics
Social Sciences: Education
Social Sciences: Ethnomusicology
Social Sciences: Family and Consumer Sciences
Social Sciences: Geography
Social Sciences: Global Studies/International Studies
Social Sciences: Human Services
Social Sciences: Human Development
Social Sciences: Interpreting and Translating
Social Sciences: Journalism/Mass Communication
Social Sciences: Labor Relations
Social Sciences: Linguistics
Social Sciences: Media and Film Studies
Social Sciences: Media Production
Social Sciences: Medical Anthropology
Social Sciences: National Security Affairs
Social Sciences: Parks, Recreation and Leisure
Social Sciences: Political Science
Social Sciences: Psychology
Social Sciences: Psychology: Biopsychology
Social Sciences: Psychology: Cognitive
Social Sciences: Psychology: Counseling
Social Sciences: Psychology: Developmental Psychology

Social Sciences: Psychology: Social Psychology
Social Sciences: Public Administration
Social Sciences: Public Policy
Social Sciences: Reconciliation Studies
Social Sciences: Society, Ethics, and Human Behavior
Social Sciences: Social Work
Social Sciences: Sociology
Social Sciences: Urban/Regional Planning
Social Sciences: Urban/Regional Planning: Landscape Architecture
Social Sciences: Interdisciplinary: Cognitive Science
Social Sciences: Interdisciplinary: Comparative History of Ideas
Social Sciences: Interdisciplinary: New Media
Social Sciences: General/Other/Miscellaneous

Professions

Professions: Business
Professions: Business: Accounting
Professions: Business: Accounting and Information Systems
Professions: Business: Administration
Professions: Business: Advertising
Professions: Business: Banking
Professions: Business: Business Information Technology
Professions: Business: Education
Professions: Business: E-Commerce
Professions: Business: Electronic Business
Professions: Business: Engineering Management
Professions: Business: Finance
Professions: Business: Human Resources
Professions: Business: International Affairs/International Relations
Professions: Business: Management Information Systems
Professions: Business: Management
Professions: Business: Marketing
Professions: Business: Organizational Management
Professions: Business: Public Relations
Professions: Business: Sports Management
Professions: Business: Trade
Professions: Education
Professions: Education: Administrative
Professions: Education: Childhood Development
Professions: Education: Curriculum and Instruction
Professions: Education: Educational Psychology
Professions: Education: Educational Technology
Professions: Education: Instructional Design
Professions: Education: Learning Disabilities and Behavioral Disorders
Professions: Education: Literacy

Professions: Education: Museum Education
Professions: Education: School Counseling
Professions: Education: Secondary English Education
Professions: Hospitality
Professions: Information and Communication Technology
Professions: Information Sciences
Professions: Information Systems
Professions: Law
Professions: Law: Criminal Justice
Professions: LIS
Professions: LIS: Archives
Professions: Museum Studies

STEM

STEM: Agriculture
STEM: Allied Health: Dietetics
STEM: Allied Health: Health and Wellness
STEM: Allied Health: Health Policy and Administration
STEM: Allied Health: Occupational Therapy
STEM: Allied Health: Public Health
STEM: Allied Health: Speech and Hearing Sciences
STEM: Health Sciences: Kinesiology
STEM: Allied Health: Dietetics
STEM: Allied Health: Health and Wellness
STEM: Allied Health: Health Policy and Administration
STEM: Allied Health: Occupational Therapy
STEM: Allied Health: Public Health
STEM: Allied Health: Speech and Hearing Sciences
STEM: Health Sciences: Kinesiology
STEM: Allied Health: Dietetics
STEM: Allied Health: Health and Wellness
STEM: Astronomy
STEM: Aviation Science
STEM: Biological Sciences
STEM: Biological Sciences: Animal Science
STEM: Biological Sciences: Aquatic and Fishery Sciences
STEM: Biological Sciences: Biochemistry
STEM: Biological Sciences: Biology
STEM: Biological Sciences: Biomedical Engineering
STEM: Biological Sciences: Cellular and Molecular Biology
STEM: Biological Sciences: Ecology
STEM: Biological Sciences: Genetics
STEM: Biological Sciences: Marine Biology
STEM: Biological Sciences: Microbiology
STEM: Biological Sciences: Neuroscience

STEM: Biological Sciences: Zoology
STEM: Botany
STEM: Botany: Horticulture
STEM: Chemical Sciences
STEM: Chemical Sciences: Chemistry
STEM: Chemical Sciences: Chemistry Education
STEM: Chemical Sciences: Geochemistry
STEM: Computer Sciences
STEM: Computer Sciences: Computer Engineering
STEM: Computer Sciences: Computer Graphics
STEM: Computer Sciences: Computer Information Systems
STEM: Computer Sciences: Computer Technology
STEM: Computer Science: Information Security
STEM: Computer Science: Information Technology
STEM: Computer Sciences: Software Engineering
STEM: Computer Sciences: Technology/Web Design
STEM: Computer Sciences: Telecommunications
STEM: Earth Sciences: Environmental Science
STEM: Earth Sciences: Forestry
STEM: Earth Sciences: Geology
STEM: Earth Sciences: Oceanography
STEM: Engineering
STEM: Engineering: Architectural Engineering
STEM: Engineering: Automation
STEM: Engineering: Ceramic Engineering
STEM: Engineering: Chemical Engineering
STEM: Engineering: Civil and Environmental Engineering
STEM: Engineering: Communication Engineering
STEM: Engineering: Computer Engineering
STEM: Engineering: Electrical Engineering
STEM: Engineering: Industrial Engineering
STEM: Engineering: Information Systems/Technology
STEM: Engineering: Instrumentation Technology
STEM: Engineering: Materials Science
STEM: Engineering: Measuring and Control Technology
STEM: Engineering: Mechanical Engineering
STEM: Engineering: Surveying and Mapping
STEM: Engineering: Systems Engineering
STEM: Health Sciences: Nutrition
STEM: Health Sciences: Medicine
STEM: Health Sciences: Pharmacology
STEM: Health Sciences: Veterinary Medicine
STEM: Informatics/Information Management
STEM: Mathematics
STEM: Mathematics: Actuarial Science

STEM: Mathematics: Applied
STEM: Mathematics: Education
STEM: Mathematics: Statistics
STEM: Physics
STEM: Interdisciplinary: Applied Technology and Performance Improvement
STEM: Interdisciplinary: Biotechnology
STEM: Interdisciplinary: E-commerce Engineering with Law
STEM: Interdisciplinary: Engineering Management
STEM: Interdisciplinary: Human Computer Interaction
STEM: Interdisciplinary: Human Ecology
STEM: Interdisciplinary: Microbial Engineering
STEM: Interdisciplinary: Natural Science
STEM: Interdisciplinary: Renewable Resource Management

Art

Art: Administration and Policy
Art: Architecture
Art: Book Arts
Art: Dance
Art: Design
Art: Design: Fashion Design
Art: Design: Graphic Design
Art: Design: Industrial Design
Art: Design: Interior Design
Art: Design: Media Arts
Art: Design: Visual Communication
Art: Education
Art: Management
Art: Music
Art: Music: Education
Art: Music: Performance
Art: Music: Theory
Art: Studio Art
Art: Studio Art: Animation
Art: Studio Art: Illustration
Art: Studio Art: Painting
Art: Studio Art: Photography
Art: Studio Art: Sculpture

Miscellaneous

Miscellaneous: General Studies
Miscellaneous: Individualized Studies
Miscellaneous: Interdisciplinary
Miscellaneous: Liberal Arts