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"Becoming a Science Librarian: Accident, Serendipity or Purposeful Plan?"

Donna M. Beck

Rachel Callison

ABSTRACT. Increasing concern has been expressed in the literature regarding the recruitment and retention of qualified librarians within the profession. Science and Technology Libraries share equally in considering the consequences of this trend. Two Science Librarians, neither possessing a degree in the sciences, will discuss the skills, competencies, and experiences that enable them to thrive in a challenging and dynamic work environment. Descriptive statistics from a survey of other newly hired science librarians, regardless of their science background, will also be incorporated. In addition to exploring perceived strengths, this paper will address the possible disadvantages that the lack of a science "background" may present. Science background will be discussed in terms of having previously obtained a degree in the sciences. The approach to the topic is from the perspective of the new hire (not necessarily a "new" librarian), rather than that of the hiring institution; however, strategies and methods that are useful to both groups will be offered.

KEYWORDS. Science Librarians—Education**,** Surveys – Science Librarians, Librarians—Careers, College and University Librarians—Status, Recruitment and Retention of Science Librarians

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INTRODUCTION

The notion that individuals are "accidental" librarians because their original intent was not necessarily to become a librarian is difficult to measure. To take this proposition a step further would be to ask if an individual's intention at the start of their graduate program was to become a certain subject librarian. However, this too is difficult to measure. Is there really such a thing as an "accidental" librarian? Specifically, this paper will explore the question: Do individuals "accidentally" become science librarians? Or, do the librarians hired into academic science positions bring a certain mixture of skills, interests, experiences, and backgrounds (both formal and non-formal) that place them into more of a "serendipitous" category?

Horace Walpole is credited with creating the word "serendipity" in a 1754 letter to an English agent. In explaining his "derivation" of serendipity; rather than give a mere definition, Walpole shares the story of the *Three Princes of Serendi(b)p:* sons of a philosopher-king of Serendi(b)p, who utilize their deductive powers in various adventures. Walpole not only linked his newly coined word to the "act of 'accidental' discovery" by relating this tale but, more sagely and apropos to the use of the word in this paper, he connected serendipity to the concept of "sagacity"; i.e. "acute mental discernment, keenness and soundness of judgement, an aptitude for investigation, and adaptation of means to ends" (OED online; Britannica online; and Friedel, 2001). Other disciplines, including the sciences, have considered the role serendipity may play in various events and situations. A 1998 research study of prominent female faculty in counseling psychology, for example, explored their perceptions of serendipity with regard to their own career choices. This study wanted to see if they could determine "when people were ready to take advantage of chance events" in order to "help predict the effects of chance on career choices" (Williams, 1998).

We wanted to explore, and compare with our own experiences, the path one takes in becoming a science librarian. We prefer to illustrate how we arrived at our positions by describing the process as "serendipitous" rather than merely "accidental." When members of our own esteemed institution were considering us as candidates for reference librarian positions within our science libraries, they may have had serious deliberations over the fact that neither of us have an undergraduate or graduate degree in the sciences. In accepting our positions, we realized that many of the colleagues in our own profession might look upon us as "unqualified" based solely on this lack of degree. The authors contend that whereas we were fortunate to discover the field of science librarianship, we did not arrive to our positions because our employer felt resigned that we were the best available amongst a weak pool of candidates. Rather, we do not view ourselves as "accidents." Our combined backgrounds tell a tale of varied interests in many subjects and unique service within the library field. We believe that it is this range of experiences and intellectual curiosity that led us to find a niche in science librarianship.

How have others "discovered" that specializing in science librarianship would be a good career path? We designed a survey to identify the people who are being hired for academic science library positions and to find out whether or not they have a formal science background, i.e. a science degree. Are they seeking out professional librarian opportunities with a certain level of intent and "purposefulness," no matter what kind of educational background that they may have? The authors feel that any experience or learning about the sciences is an asset to success as a science librarian, but that understanding and utilizing the underlying principles and core competencies of the library profession, especially that of the concept of life long learning is what will ultimately serve them best as LIBRARIANS.

MATCHING LIBRARIANS TO SCIENCE LIBRARIAN POSITIONS

Job seekers scanning job postings for academic librarian positions are accustomed to noting that the standard requirement for any position is a Master's degree (MLS, MLIS, or equivalent) from an American Library Association (ALA) accredited library science program. For clarity, this degree will be abbreviated throughout this article as MLIS. In addition to the MLIS requirement, science library positions will often include a statement for a preferred qualification of a background in the sciences. Academic science librarians are already armed with a professional foundation, the MLIS. This article will examine other qualifications that science librarians possess, and it will address the questions: Is an "interest" in sciences enough? What about developing an interest in the sciences as a result of working as a science librarian--after being hired into a position? Or, is the additional degree in a science subject a prerequisite for success as a science librarian? Reasons that may have prompted them to apply for their current position and whether or not the possession of a science degree affected either their desire to apply or effectiveness in their position will also be discussed.

Matching people to positions is the biggest challenge of the hiring process and one of the most important decisions made by an employer. Numerous studies have attempted to benchmark how professionals compete and compare within their respective workforce spheres. Perspectives on the recruitment and retention issues of librarians from different library environments, including academic, have also been explored and discussed in the literature. Over the last 30 years, starting with Ellis Mount's initial findings published in *University Science and Engineering Libraries* in 1975 and including the follow-up in 1983, several surveys have sought to identify and address the specific recruiting and retention concerns of academic science libraries and science librarians.

The majority of studies about academic science librarians have presented the obvious conclusion that having a science background is an asset. Many of the same findings have also indicated that the possession of a degree is not necessarily the deciding factor for professional success and, quite possibly, not the greatest of the professional assets. Exclusively recruiting individuals with a science background may not always meet the expectations of an institution or the profession as a whole. Slutsky, writing in *Science & Technology Libraries*, agrees that a candidate "with a science/technology subject degree and an MLIS may not always be suited for a specific job situation" (Slutsky, 1991).

Hackenburg & Chu's 2002 *Science & Technology Libraries* article points out that a solid foundation in library science coupled with the competencies gained from experience, regardless of degree, is often a strong indicator of career success. Those without a science and technology background have found "that a good basis in librarianship could overcome a lack of science knowledge" (Hackenberg, 2002). An additional view that experience counts, and is not exclusive to the experience of having a science undergraduate degree, is Winston's article titled, "Academic Science and Engineering Librarians: A Research Study of Demographics, Educational Backgrounds, and Professional Activities." Winston points out that, "Recruitment of science and engineering librarians should not focus solely on those individuals with science backgrounds, but on experienced librarians as well" (Winston, 2001). A 2005 article by Mayer and Terrill presents the views of academic librarians on the topic of advanced degrees. Their survey responders indicated that an advanced degree "helped most by opening doors early in their careers, but later it was their experience that counted most" (Mayer, 2005). Several compelling reasons for possessing an advanced degree were presented; including statements that having a degree "assists with gaining tenure and promotion, gives librarians better credibility on

campus,…can provide increased opportunities for scholarly projects, immerses one in academic culture, and exemplifies a commitment to the importance of life-long learning" (Mayer, 2005).

The authors' observations are that this debate will continue, but that real life data will serve to define future discussions. How can anyone define what "success" as a science librarian means? Even strong proponents of a science degree requirement are not truly able to state as a fact that those without a science degree are less successful. Having a formal background in the sciences has been the foremost issue to the debate. This may be an appropriate time to look beyond this factor alone. We propose to no longer separate the issue into black and white, but to find and discuss those "gray" factors within librarians' backgrounds that can benefit academic science libraries and the profession. While our stance may be that we do not feel an undergraduate science degree should be the main predictor for success, we also do not mean to claim that a belief in life-long learning or anything else is the sole factor either. Armed with confidence from our graduate training in library science, we were willing to take the risk to put ourselves in with the group of other non-scientifically trained science librarians.

SURVEY METHODOLOGY

We conducted a survey of newly hired science librarians to determine if any commonalities of experience exist among them, regardless of their backgrounds. A target group was identified by a search of job advertisements for science librarian positions that covered the 2003 through 2005 time period. Issues of *The Chronicle of Higher Education*, *College & Research Libraries News*, and *SciTech News* were reviewed for ads that fit the description for science librarian positions in academic institutions. Medical librarians working in a library affiliated with a school of medicine within an academic setting were excluded from the targeted group. A subsequent search for the library websites of the institutions was made in order to obtain contact information for the person currently holding the position. Survey questions were reviewed and approved by Carnegie Mellon University's Institutional Review Board (IRB) and posted using SurveyMonkey software (SurveyMonkey.com). Email was sent to 90 librarians identified as the target group asking them to complete a survey consisting of 22 questions. A total of 35 responses were received, accounting for a 38.9% response. Female responses were almost double the male responses. To assure that the only responses received were from librarians working at libraries in educational institutions, this question was asked, "What is the name of the institution where you are currently employed?" It is interesting to note that although all respondents were recent hires, many were not new to the profession. Those working in the library field in a position requiring an MLIS were represented as follows: 2 years or less=14, 3-6 years=7, 7-10 years=5, and 10 plus years=9. These years do not necessarily represent only the time in their current positions or time in positions at other science libraries. The majority - 63.9% - of those hired for science librarian positions posted between 2003-2005 held prior positions that required a MLIS degree with about half (33.3%) of those prior positions being within another science and technology library. Although the initial scope of this survey was not to measure if people both new to the profession and new to an academic science library job differed significantly in their answers from more experienced librarians, a few of these differences will be presented in this article.

The majority of the survey questions were designed to garner information about the educational background, work experiences, and interests of the new hires. New graduates of library science programs were not specifically included or excluded in the target

group and, as stated earlier, respondents were broadly represented in terms of years of experience. The main objective was to obtain an overall perspective on the candidates recently hired into academic science librarian positions, i.e., What kinds and years of experiences do they possess? Do they consider themselves as having any unique qualifications that set them aside as a match for the position other than having a MLIS and/or a background in the sciences? What possibly made them an attractive hire beyond a science degree?

INTEREST IN LIBRARY SCIENCE

Professional librarian positions still require the minimum of a Master's degree in Library Science. Since all of our survey respondents acknowledged that a MLIS was a requirement of their current academic science library position; a look at who is initially attracted to enter a graduate program in library science is relevant in order to give a general picture of those applying to MLIS programs and what their career goals might be. A reasonable assumption regarding those that apply is that they have a general interest in and orientation to the library profession. Are there certain demographics that guide or hinder a library graduate student's decision to pursue specific area of librarianship; both type and subject discipline?

One could surmise that an 'ideal' pool of candidates for academic science library positions would be individuals with an undergraduate and/or advanced science degree and an MLIS. However, due to several factors, this is a consistently small group of individuals which does not appear to be increasing in a significant manner in the immediate future.

Not only have men historically dominated the science fields, they continue to do so. A 2004 United States General Accounting Office (GAO) report states that, "Although women's participation in the sciences has improved steadily over the last three decades, men still outnumber women in nearly every field in the sciences," and that, "In 1960 women constituted less than 1 percent of engineers, 8 percent of scientists, and 26 percent of mathematicians. By 2003, women made up 14 percent of engineers, 37 percent of scientists and 33 percent of mathematicians" (GAO, 2004*)*. In contrast, the majority of entrants into the library profession are still women. Census data from 2000 (Table 1) shows that women are still dominant in the profession, making up 82% of all librarians. Although women dominant the profession overall, proportionately they are not the majority within academic settings. The 2004 *LJ* (*Library Journal)* Placements and Salary Survey indicates that there is a "disproportionately higher ratio of men working in (academic libraries) than within the library profession as a whole" (Maata, 2005). Recognizing these facts, it is clear that the largest pool of candidates entering library science degree programs (i.e. women) are also not likely to possess an undergraduate degree in the sciences. Survey results obtained for this article (Table 1, "2005 Science Librarian Survey" - Beck and Callison) showing a greater ratio of men to women within the science librarian specialty is not surprising.

TABLE 1. Gender Factors

	2000 Census data Librarian profession as a whole. (a.)	2005 Science Librarian Survey (Beck & Callison)
Men	18%	**33.3%**
Women	82%	**66.7%**

a. Lynch, Mary Jo; Tordella, Stephen and Godfrey, Thomas. 2005. Retirement and Recruitment: A Deeper Look. *American Libraries*, (January): 36(1). http://www.ala.org/ala/ors/reports/recruitretire/recruitretire-adeeperlook.pdf

The intention of the authors is not to argue that a science degree is harder for women to attain than for men, or that the library field is not equally attractive to both men and women, including those who possess a science degree; but to provide some context on possible gender- related circumstances that may impact the overall pool of candidates available for or interested in academic science library positions. Librarians want to have a sense of credibility amongst their colleagues and their campus communities. Along with the thought that science librarians with a science degree have better credibility, the authors sense a perception by some to see the higher ratio of men as science librarians equated to an image that male science librarians are more credible. As female science librarians, without a formal science degree background, we strive to overcome these two credibility issues by arguing that our prior educational preparations and accomplishments serve to qualify us well.

The 2004 *LJ* Placements and Salary Survey asked MLIS graduates to discuss their backgrounds and 53% indicated that (by pursuing an MLIS degree) they were seeking a second or third career (Maatta, 2005). Regardless of where they were in their careers, at the point of deciding to pursue an MLIS, many entrants to library science graduate schools are likely not to have a science degree. Individuals represented in Winston's survey indicate that as a whole, "the (library) profession is dominated by English and history majors," and that even within the majority of science librarians who do possess a science background, "there are very few reported engineering majors" (Winston, 2001). One could further illustrate this by observing that although a librarian has an undergraduate degree in the sciences, for instance in biology, they may actually be working in an engineering library. The authors (one with a Bachelor of Fine Arts and one with a Bachelor of Arts in Sociology) agree that the primary reason for their obtaining the MLIS was to work as a professional librarian. At the start of our graduate programs, we may not have envisioned ourselves in positions within science libraries. However, the pursuit of the library degree was one of the core influences that ultimately placed us on a course that we characterize as one of "positive serendipity" in the process of becoming science librarians.

REASONS FOR APPLYING FOR SCIENCE LIBRARIAN POSITIONS

Another survey question, "What influenced your decision to APPLY for your current position?" was posed in an effort to gauge why the respondents applied for positions as science librarians instead of another area of librarianship. Position titles of the respondents ranged from the general "Science Librarian" to the more specific "Biological Sciences Librarian and Coordinator for Digital Initiatives in the Sciences." Rather than rating what may have been the most influential factor(s) in becoming science librarians, the question was worded to give the librarians several choices. Instructions on the survey asked the librarians to check off all that they felt applied (Table 2).

TABLE 2. Factors Influencing Decision to Apply to Current Position

Factors influencing decision	**Percent Responding**
Desired work as librarian in science affiliated subject area	69.4%
Felt qualified for the position based on the job advertisement	66.7%
Previously worked in a librarian position at a science/technology library	33.3%
Other (please specify)	33.3%
Wanted to work at a particular institution in any kind of librarian position	22.2%
Previously worked in a non-librarian position at a science/technology library	13.9%
Believed salary would be higher than for other non-science librarian positions	11.1%
Felt that the pool of candidates (competition) would be smaller for science librarian positions than other librarian positions	11.1%

As already noted, academic science librarian position descriptions state that the MLIS is required. When asked if a science background was described as a "required" qualification for their position, 27.8% of the respondents from the survey indicated it was; 55.6% responded that it was not; and 16.7% were unsure. Whereas 67.6% of the respondents stated that it was a "preferred"

qualification in the job descriptions; 17.6% said that it was not; and 14.7% were unsure. These results are in line with the trend discussed in a 2002 article appearing in *Sci-Tech News* titled, "Recruiting Entry-Level Sci-Tech Librarians: An Analysis of Job Advertisements and Outcome of Searches." The authors of this article, in their review of 2000 and 2001 job ads, observed that recruiters appear to be adding more general types of qualifications as requirements in lieu of the science degree in the hopes of gaining a larger pool of candidates. The article states that, "Administrators, when recruiting candidates for science/technology positions, value communication and computing skills so highly that they do not want to consider candidates without them. It also appears that, even though they would very much like to get candidates who have science degrees, they seem to be resigned to not finding candidates with those degrees and therefore do not insist on them" (Jones, 2002). In light of the fact that candidates responding to most of the recent job advertisements are not required to have a science degree, although it is often still listed as a preference, looking at other reasons that influence their applying would be relevant. For example, a candidate might be attracted to a position for reasons other than the science aspect; such as supervisory responsibilities, helping to lead digital initiatives, instructional duties, or budgeting for acquisitions of science databases. One of our respondents states that their, "position involves (the) supervisory/management duties which I was seeking." These skills, which are not exclusive to those with formal science degrees, may also be extremely significant to the institutions' and departments' needs. Respondents also indicated that they were influenced to apply because they either felt qualified for the position based on the job advertisement or because they had previous experience related to science libraries. One author felt compelled to apply for a librarian position at the university where she had previously worked for 5 years since she had established collegial relationships. She felt prepared to take a leap into a lesser know subject area in order to gain further skill at providing subject specific reference support. The previous work that she had done placing orders for science materials also served to inform her of what kinds of collections the science library was building and where the interests of the researchers were leading. The challenge of working in her current position appealed to her and the knowledge that her role as a science reference librarian would reflect directly upon the science library's contributions to the research needs of the university was a strong motivator for her to apply; as was the desire for her to succeed.

Explanations as to what influenced our respondents to apply to their current science librarian positions, as listed in the "Other" category of Table 2, could be categorized under four general headings:

- Personal or family reasons, e.g., they were moving to a new area.
- Left industry for private or academic sector, e.g., they were downsized.
- Desired to work somewhere else, e.g., they wanted room for growth, to escape difficulties in a previous workplace, or to supervise.
- Admitted to having luck, e.g., they were in the right place at the right time.

These reasons are fairly universal and, in and of themselves, are not specific to the desire to work as a "science" librarian. However, they do factor into the equation of why these individuals may have ended up applying for their current positions.

How do salary expectations make an impact on the type of positions librarians are applying for? If academic science librarians have higher salaries than other academic librarians, candidates could conceivably be attracted to this specialty as opposed to other library specialties. *LJ's* 2004 Annual Placement and Salary Survey reported that "colleges and universities (have the) greatest difficulty in hiring librarians due to lower pay, even though there was an increase in academic salaries of 7.28% in 2004" (Maatta,

2005). As a baseline, one must first look at average salaries for all librarians in academic libraries. According to the 2006-2007 *Occupational Outlook Handbook*, the median salary for all academic librarians in 2004 was nearly $47,830 (Bureau of Labor Statistics, 2006-2007). More than five years earlier, the average salary reported in Winston's 1998 survey of academic science librarians was already between $45,000 and $50,000 (Winston, 2001).

Additional evidence can be found showing that differences in salary based on subject discipline do exist. For example, in the August 2005 issue of *The Chronicle of Higher Education*, two positions at the same university were in the same advertisement. Other than mentioning the different departments that the librarians would serve as in their respective liaison roles, the requested qualifications were identically described for both positions using the same sentences. The end of the ad stated that the English Librarian was to be given a minimum salary of $38,000 and the Science Librarian a minimum salary of $42,000. Our survey results (Table 2) present an interesting contradiction to salary concerns being discussed within various library spheres, i.e. low salaries are making it harder to recruit individuals into the field. The low survey results (11.1%) indicate that a higher salary was not considered to be a factor that greatly influenced the respondents to apply for their current science librarian positions. Whereas it cannot be denied that livelihood is important, salary in and of itself may not be ranked as one of the top or deciding motivations for pursuing an academic library position due to the nature of what draws people to the library profession in general. Ho, in an essay titled, "Rationalizing Anxiety", argues that perhaps a "passion for scholarly work" makes those in academia more "willing to sacrifice financial rewards…(because)…Academics value the status of an institutional affiliation more than the money that goes with it" (Ho, 2006).

Looking at other survey results regarding reasons that they applied, an inference could be made that those hired into science librarian positions from 2003-2005 had a previous desire for this type of work. Of the choices influencing the respondents' decisions to apply, the highest percentage (69.4%) confirmed that they desired work as a librarian in a science-related subject area. This interest could have been established before starting a search for jobs. While in library school, for example, the thought that they might someday work in a science subject area would have been a motivating factor to take coursework supporting this possibility. Both authors attended library programs that offered a science technology resources course; one took the course and one did not; although she had considered it, but at the time it did not fit her schedule. She has recently considered auditing the course and has also been provided access to the courseware of a colleague teaching a science resources online MLIS course at another university.

Out of the 77.1% of respondents who confirmed that their library schools offered a course specific to science/technology resources, 70.4% of the survey respondents indicated that they took the course. In regards to their reason for taking the course, only one person indicated "elective" as an answer. The others, even those who stated that the course was an elective, further explained that they wanted to know more about science resources and/or they wanted to become a science librarian. The authors find it intriguing to note that librarians who attended a library school not offering a science resources course tended to have 2 or fewer years of professional experience.

TABLE 3. Years Experience: Science Resources Course Offered at Library School

Years in MLIS position	Took a MLIS Science Resources Course	Did not take MLIS Science Resources Course	MLIS Science Resources Course NOT offered	**Totals**
Less Than 1 year	3	1	3	**7**
1-2 years	3	1	3	**7**
3-4 years	3	2	0	**3**
5-6 years	3	0	0	**3**
7-8 years	3	3	0	**4**
9-10 years	3	0	0	**1**
10+ years	7	1	2	**10**
Totals	**19**	**8**	**8**	**35**

BACKGROUND IN THE SCIENCES

In addition to taking a science resources course in library school, prior interest in the sciences is reflected in both the librarians' formal (a degree) and informal backgrounds. Our findings parallel earlier studies. In Hackenberg and Chu's 1999 survey, "61% had a background in the sciences and 39% indicated that whereas they had no background in the sciences they did have an interest in the sciences" (Hackenberg and Chu, 2004). Their results compare to our survey results with undergraduate degrees in the sciences held by 66.6% of our respondents in areas of study ranging from computer science to animal science. The other 33.3% completed undergraduate degrees in such non-science fields as history and linguistics. When our respondents were asked if they agreed that having a formal degree in the sciences is important to their work as a science librarian, the following results were seen (Table 4).

TABLE 4. Importance of Science Degree

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Science degree is important to my work as a science librarian	0%	17%	14%	42%	28%

In an expected result, most who disagreed with the statement that a science background is needed to perform their work as science librarians did not have an educational background in the sciences. Their degrees were: Education, English Literature, International Relations, General Studies in Mathematics, English & Marine Science, and History. Conversely, those with an undergraduate degree in the sciences strongly agreed with the statement, but were also represented in the categories of "Agree" and "Neither Agree nor Disagree." When attempting to find possible differences in opinion between those new (working with MLIS in field for 2 or less years) and those established (working with MLIS in field for 10 or more years), no significant differences, at least in the strongly agree category, were seen. The new librarians' results were that 14.29% disagreed, 50% agreed, and 35.71% strongly agreed on whether a science degree was important. Of the respondents representing those in the field for the longest time, 22.2% disagreed, 22.22 agreed, and 44.44% strongly agreed with the statement. As previously mentioned, many individuals obtain their MLIS after obtaining other Master's levels degrees or after several years of work experience. Three of our survey respondents in the age range of 31-54 had less than 1 year experience in a position requiring a MLIS, yet one also had an additional Master's in Genetics, one a Ph.D. in Pharmacology, and one had two BS degrees. Obviously, then, a new librarian does not necessarily mean a person who is young in age and/or experience. Many factors that relate to having prior life and career experiences are important and should be considered. One of the authors had been working in the library field without a MLIS for 20 years. The learning opportunities from positions held at academic libraries, a medical library, and other special libraries during these years were invaluable to her in establishing her new role as an Engineering Librarian. The other author has been working in positions requiring an MLIS for over 10 years, 7 years within academic science libraries, but had no library experience prior to obtaining her MLIS. Both authors are close in age and fall near the middle of the 31-54 year range. Our education and experiences are different; however we have in common the MLIS.

To further explore opportunities for and attitudes toward additional educational and learning methods besides a formal science degree, all respondents were asked to "share any comments that you may have on the need for a science subject-specific background for your current position." Here are some of the points they make:

- "The willingness to help/provide service is more important than any kind of formal degree."
- "A will to learn about the sciences is necessary no matter what kind of educational background the librarian possesses."
- "Work experience in a non-academic, corporate environment provides perspective on how information is being used in the real world."
- "The academic environment is becoming increasingly complex and interdisciplinary; therefore, the science librarian has to adapt to various subjects since typical liaison responsibilities include more than one academic department."
- "Science blogs are one means of staying informed of relevant developments."
- "Having previous non-professional work experience or an internship in a science library is very useful for learning about science librarianship."

Several librarians, including those with and those without a science degree, mentioned the critical qualities that a science librarian must possess in order to maintain a high quality of professionalism. These include:

- Understanding the terminology/language of the relevant scientific fields.
- Understanding the flow of scientific literature (i.e. scholarly communication process)

- Having credibility with faculty.

Both groups expressed positive comments about the usefulness of a science education. Even if they felt that the degree was not a requirement, they implied that their work is or would be easier and more fulfilling to them with this kind of formal background. One respondent stated, "…it's certainly not an absolute requirement...I'm grateful for it, though." Another respondent with degrees in Geography and Urban Planning said, "At times I wish I had more subject knowledge especially in chemistry - but I find that willingness to help is the primary requirement for this job."

ADDDRESSING THE DEBATE

The debate becomes one of opinion, with those who believe that a science degree is a requirement for their work or position and others who feel that relevant and sufficient experience can be gained without the science degree. These contrasting viewpoints are also reflected in the "debate" literature. Not only do some believe that the science degree is a requirement, but, taking it a step further, they also believe that the science degree is more important than the MLIS for employment in an academic science library. Stuart (BA History) and Drake (BS Economic Analysis) neither a formal science undergraduate degree, writing an article in 1992 titled, "Sci-Tech Libraries of the Future," are vehement about the importance of the science degree. They argued, "The quality of information services provided to scientists and engineers is less effective when the librarians serving them have little or no experience in these disciplines…Perhaps the time has come to seriously consider dropping the library degree as a requirement for science and engineering library positions. Libraries could focus their energy on developing recruitment programs which identify and attract freshly minted scientists and engineers directly into the ranks" (Stuart and Drake, 1992).

To some extent, their proposal to drop the MLIS as a requirement has come true in the present day academic library. Wilder's analysis of the 1998 Association of Research Libraries (ARL) survey discovered that between 1990-1998, there was a definite 'rise' (72% of all hires during that time period) in "Functional Specialist" positions within academic libraries (defined as specialists who do not necessarily possess an MLIS degree), which "accounted for nearly one-quarter of all hiring in 1998" with "about 55% (having) MLIS degrees" (Wilder, 1998). Neal writes in his article, "Raised by Wolves" that, "Academic libraries now hire an increasing number of individuals to fill professional librarian positions who do not have the master's degree in library science…they hire staff to fill librarian positions who hold a variety of qualifications, such as advanced degrees in subject disciplines, specialized language skills, teaching experience, or technology expertise" (Neal, 2006). Neal does not imply that this is necessarily a negative trend; rather, he advises those of us in the library profession to carefully track this development.

Some people possessing a science degree, or even an advanced degree in another subject area, may view the MLIS as an unnecessary "hoop to jump through" to qualify them for an academic science librarian position, thereby causing a possible alienation, to use Neal's words, within the "culture of the profession." In fact, a respondent in the survey for this article went so far as to say, "I feel that my library science degree is of minimal importance to my job. In contrast, my background in the science is quite valuable to my job." The reasons why someone decides to pursue a career in library science may affect their overall perspective on the profession. Neal makes the observation that ideally, the pursuit of obtaining the MLIS is "a positive orientation to

a new professional adventure" due to a "profound interest in and commitment to the service goals of librarianship" but that the pursuit could just as easily be "a reflection of a personal disappointment and compromise"; i.e. not able to secure a position in their original profession due to "limited opportunities" or "a problematic fit between previous job [non-library] and personal aspirations" (Neal, 2006).

DEVELOPING CORE COMPETENCIES AND EXPERIENCE

Responses to the question, "Rate your agreement as to the importance of the following resources to your continuing knowledge in your role as a Science librarian," indicate a high regard for mentoring, collegial collaboration and relationships in the science librarian's career. This question was asked in order to ascertain the degree of importance placed on the types of activities and resources being utilized for obtaining ongoing, professional knowledge.

TABLE 5. Rank of Resources Contributing to Continuing Knowledge

Contributing Resource and/or Activity	**Percent of 'Strongly Agree' & 'Agree' Combined**
Professional Organizations & Conferences	88%
Mentor and colleague collaboration	80%* *highest "strongly agree' response
Current Awareness Literature	82%
Listservs / Blogs / Websites	77%
Instructional Activities	77%
Independent Study	75%
Professional Development Workshops	66%
Continuing Education Courses	66%
Committee Work	40%

Survey responses (Table 5) indicate that collaboration with colleagues via mentoring, conferences, and professional groups are ranked as the two strongest contributors to knowledge development activities. "Mentor and Colleague Collaborations" received a slightly lower percent of combined Agree/Strongly Agrees (80%) than the combined 88% of "Professional Organizations and Conferences;" however, "Mentor and Colleague Collaborations" received the highest percentage of Strongly Agrees than any of the other categories. Librarians' work activities have been continuously redefined due in large part to rapid changes in technology. The

creation of seamless information environments and the increasing use of collaborative technologies; one-to-one, one-to-many and many-to-many exchanges are greatly impacting the day-to-day work of librarians. As such, there has been an increased awareness and a push for pursuing opportunities that allow for more cross-disciplinary collaborations. Neal points out that academic librarians have come to recognize the need to take a more active role in "broad collaborations both on campus and externally by expanding their teaching activities, innovatively implementing and using technology, and getting more involved with research teams" (Neal, 2006). Although our survey did not ask respondents to elaborate on the colleagues with whom they were collaborating, one natural group for academic (including science) librarians to forge relationships with are the teaching faculties within their institutions. It has been the experience of the authors that collaboration with departmental faculty can build and enhance working relationships within their academic institutions, thus increasing opportunities for "faculty to discover the extent of what the library and librarians have to offer (them and) their students" (Callison, Thomes and Budny, 2005). Including and involving librarians into the projects and programs that impact students demonstrates that we are perceived to possess "credibility" with our teaching faculty. Collaboration with fellow science librarian colleagues has likewise allowed for valuable professional development. Importantly, these interactions have been both with science librarian colleagues who do not possess a science degree and those that do. An emphasis on the will to learn what a librarian can about an unfamiliar subject is really essential and was brought to light by a few of our respondents. One said, "Although I don't think it is necessary that science librarians have a background in the sciences, it is necessary for them to have the will to want to learn about the sciences, if they don't have the background. Taking classes in departments or just sitting in on departmental seminars has added to my knowledge and expertise with my departments. For though I have a background in the sciences, my departments concentrate on areas other than those I specialized in during my undergraduate experience." Shortly after beginning her position and supporting the Materials Science and Engineering department as part of her new role, one of the author's colleagues promptly suggested that she read the 1998 ASM-American Society for Metals title by Harry Chandler, *Metallurgy for the Non-Metallurgist*. These types of popular works in the sciences provide another means for those lacking a science degree to learn more of the terminology of the subject in question.

In addition to collaborating with teaching faculty, formal mentoring programs and informal mentoring relationships with other library professionals can also play a powerful role in the work experience of new hires; even if the new hires are "seasoned" professionals. Mentors provide essential encouragement and support to their colleagues via these mentoring relationships. The value of mentoring is reflected in some of the survey responders' comments, such as "more learning is done through mentors than through formal education programs" and "a lot of learning really takes place through on the job training and other experiences on the job." Professionals in related science and technology fields, such as IT, also view mentoring as means for success. Margaret Hilton's 2001 research summary for the *Monthly Labor Review* states that, "Those IT (information technology) professionals who were able to build communications ties with experienced workers in their field had the most successful job performance" (Hilton, 2001). Both of the authors consider themselves fortunate to have had several excellent mentors establish supportive relationships with us in the beginning of our careers. As we have progressed within the profession, these collegial interactions have continued to evolve and expand and have allowed us to mentor in kind. Mentoring can also take on a greater significance in certain institutional environments, because science librarians may not be within the same building as other librarian colleagues. For instance, the survey also asked for a description of the physical space in which they work. Work locations ranged from a department, separate

from the main library (37.1%) and a science collection incorporated within the main library (28.6%). Depending upon their respective physical work spaces, either limited or ample opportunities will exist for frequent interactions with faculty, students, and colleagues. Mentoring relationships, in this instance, can help strengthen professional relationships by increasing opportunities for communication.

Of the three categories involving more "traditional" or formal means of knowledge obtainment (Independent Study, Continuing Education, and Professional Development); "Independent Study" received the highest percentage (75%) of Agree/Strongly Agrees. Whereas 66% of the respondents Agreed/Strongly Agreed that "Continuing Education" and "Professional Development Workshops" were contributors, they also received the highest percent, 35% combined of Strongly Disagree/Disagree and Neutral responses.

"Committee Work" was also considered to be a lesser contributor to learning activities with only 40% Agree/Strongly Agree (combined) and 23% Strongly Disagree/Disagree (combined); yet a large percent (97.1%) responded that "Committee Work" was required in their current position. The majority (more than 90%) indicate that "Reference", "Instruction", and "Collection Development" are also part of their current responsibilities. As revealed in another survey question asking them to, "Estimate the percentage of total time spent at all job-related duties that involve knowledge of science resources," 42.9% of the respondents calculated that 26-50% of their duties involve the knowledge of science resources; an equal percent (42.9%) reported a much higher percentage, calculating 51-75% of their time is spent on activities requiring a knowledge of science resources. Naturally, the responsibilities and duties that any particular science librarian will have at his or her place of employment will vary and may reflect how they perceive themselves as learning and developing within their positions.

In the article, "Leaving Science for LIS: Interview and a Survey of Librarians with Scientific and Technical Degrees," Hallmark and Lembo point out that, "The challenge of producing qualified science librarians can be addressed either by attracting scientists and engineers to schools of LIS or by educating LIS students and graduates in science-technology disciplines" (Hallmark and Lembo, 2003). How much of being "qualified" can be reached through relying on these other resources and activities (Table 5) by the science librarian without a science degree - and who further did not have exposure to science subject specialty training as part of the MLIS program - continues to be an issue for discussion and further research. One survey respondent mentions the value she place on her science degree but also praises a colleague who does not have a formal science degree but had previous work experience in a science library. She says, "My general life long interest in science certainly helps inform my approach to working with students and others. While I do not have in depth knowledge related to many of the questions or issues I work on, the vocabulary is familiar and my background gives me a basis to begin my librarian science related tasks. While I feel that my science degree and additional comp sci [computer science] courses helps me in my position, I can say with certainty that the chemistry librarian here does an excellent job and does not have a science degree, but did have a fellowship in a science library."

JOB SATISFACTION

Job satisfaction can naturally be seen as one indicator of continuation within a position or career. Interestingly, when asked if they are planning to continue working as a science librarian, none of the survey respondents for this article responded "very unlikely" or "somewhat unlikely," and only 8.6% were uncertain. The majority replied that they do plan to continue working as a science

librarian; with 22.9% saying it was “somewhat likely” and 68.6% saying it was “very likely.” A 1998 survey of librarians’ job satisfaction, by van Reenen, found that librarians who planned to be working in the same library five years hence were “significantly more satisfied than persons with other plans,” and that “experienced employees were more satisfied than those with less experience.” The factor that consistently scored the highest ratings in job satisfaction was “working directly with customers” (van Reenen, 1998). Whether or not science librarians we surveyed find satisfaction in their direct dealings with patrons was not measured. However, the majority do appear to be interacting directly with patrons via their reference and instruction duties (Table 5). The largest response (82.4%) for the question asking respondents to “Describe your non-formal background in science?” was that they discuss science related information needs with their patrons (Table 6). Collection development duties were also ranked high (97%) in answer to the question regarding responsibilities of their positions. Although the survey does not rank how the science librarians enjoy these duties or even how they rate their importance, the fact that they are involved in decisions on the types of materials their institutions are collecting is relevant to their need to learn what areas their researchers are involved in. As far as satisfaction, Hallmark and Lembo also report that “scientists-turned-librarians had no idea that the library profession was so interesting, challenging and enjoyable..” and that since the “…general public (still) continues to (view) librarians” in a stereotypical fashion…”it is up to the individuals within the profession to locate, recruit (and retain) the likely candidates who can play a critical role in our field” (Hallmark and Lembo, 2003).

TABLE 6: Non-formal Background in Science

Discuss with patrons their science related information needs	82.4%
View/listen to popular science pieces on television, radio, and/or internet	79.4%
Read science section of newspapers	70.6%
Read popular science publications	61.8%
Participate or have participated in science related activities, such as non-credit courses or science fairs	58.8%
Read parts of textbooks and/or reference books	55.9%
Have family members that work in science-related field	50%
Have science-related hobbies	50%

At least 50% or more of the respondents replied positively to the other categories (Table 6), indicating a broad range of ways that they stay abreast of scientific developments. Respondents provided additional information regarding "other" non-formal science interests. Several mentioned volunteer work. For example, one respondent volunteered as an interpretive nature leader and another volunteers as a museum docent. Others are active with community groups, including one librarian who served as a board member for a state flora survey. Another person simply stated, "I have always had an interest or curiosity to learn 'how things work.'" Over half (50%) of the respondents have hobbies or family members that revolve around the sciences. One of the author's family is comprised entirely of 'scientists': medical professionals and engineers - including her husband (computer scientist); thus she was surrounded, and continues to be immersed, in science topics and methods on a daily basis.

ROLE OF THE HIRING INSTITUTION

Questioning academic institutions on the reasons why they hired librarians without a science background should be a subject for more study. It is doubtful that academic libraries would reply that they had zero applicants with science backgrounds; but that for overriding reasons, the candidate without the science degree was a better match for their particular situation. Institutions must be considering these "other" qualifications, rather than just educational backgrounds, if for no other reason than that their job announcements consistently list an increasing number of expectations. Osorio studied this in a 1999 article, "An Analysis of Science-Engineering Academic Library Positions in the Last Three Decades." He looked at the years, 1976, 1986, and 1998 to evaluate the text of job ads. He concluded that "…a remarkable increase in required, preferred, desired qualifications and job responsibilities has occurred in the last three decades" (Osorio, 1999). Hiring institutions could also recognize that all of a candidates' experiences, rather than just a certain degree alone, are what is needed to make a good employee. Hilton's analysis of reports to the National Academies of Sciences substantiates that "Recruiters and employers recognize the power of learning through experience. In job advertisements and in IT workforce committee testimony, employers often stressed that demonstrated ability and experience were the most important hiring factors – college degrees and ranking were secondary factors" (Salzman, 1999).

The need to attract graduates to work as science librarians appears urgent when coupled with broader workforce concerns as they relate to professional education, cultural perceptions, aging workforce, and retirement. These issues should neither be underestimated nor viewed with apprehension; however, they should be monitored. Although this article has briefly touched upon some of these trends and how they may impact the available pool of candidate for science library positions, those trends are complex in nature and deserve additional, in-depth study.

SERENDIPITUOUS SCIENCE LIBRARIANS: MAKING THE ACCIDENTAL PURPOSEFUL

Emphasis has been placed on the perspectives regarding the educational background of academic science librarians. However, science librarians should possess traits that one would want in any employee; dedication, reliability, flexibility, and honesty. Modern librarians, including science librarians, are analogous to detectives; they need to have strong interviewing and listening skills, the ability to present the facts and verify citations, the know-how to conduct research using the appropriate resources, and the willingness to spend the time needed in seeking answers. These investigative librarians will detect that the student needing a document entitled CAMP is really referring to Current Advances in Materials and Processes, and not Computer Architecture for Machine Perception. Science librarians could be seen as explorers; possessing a mix of the competencies, skills and experiences needed to navigate their information seekers through the information labyrinth in order to discover the wealth of resources available to address their information needs. In this role, librarians are not just experts dispensing information, but guides who can recognize and create opportunities for enhancing the library experience of their patrons. In addition, science librarians, like other librarians, are called upon to have teaching skills to direct users to the particularities of various modern databases and their interfaces and to recommend which databases would be most relevant to the needs of their particular institution's users. Librarians need to recognize the various learning styles and cultures of their users in order to best direct them towards becoming more self-sufficient in their research.

Often heard in informal collegial discussions are the statements, “I didn’t start out to be a librarian, it sort of happened by “‘accident’” or “I didn’t plan on becoming a _____ librarian.” It is more likely that cultivated approaches, rather than “accidents,” are occurring; and that these methods result in professional and career success. We agree with Friedel that, “Serendipity…does not simply refer to “happy accidents.” Insight is every bit as important as the accident. Simply to stumble upon something of value …requires a mental capacity that goes beyond the obvious” (Friedel, 2001). A philosophical stance would be to say that preparedness meets opportunity, thus striving to be prepared creates a self-fulfilling prophecy or as Louis Pasteur stated, "In the field of observation, chance favors only the prepared mind." As a collective group, librarians tend to actively support and engage in the continuous learning process, as it is deeply entrenched in the library profession. The authors collectively agree that our profession motivates us—if a problem is becoming persistent within our profession, we want to help resolve it. We allow our MLIS to act as our authority.

Science librarians who may be perceived to lack subject authority by the communities they work with, because they do not have a science degree or that they entered the field serendipitously, in actuality bring a unique perspective and other strengths to their position. These librarians can confer, collaborate, and contribute in a myriad of ways. Many of the survey participants, regardless of their educational background, feel that the desire and motivation to learn about the sciences is a crucial quality to successfully perform their duties as a science librarian. One could speculate that science librarians feeling unsure in a work situation will make the conscientious effort that is needed in order to explore and understand an unknown science subject area. The library profession serves us well in this effort, as it is designed to equip us with the types of research competencies that are needed to both teach others as well as to build upon own knowledge base. Possessing knowledge of information resources and retrieval skills, reference librarians help to find information for their users on any number of topics and subjects. As subject specialists, whether in the humanities, sciences, social sciences, law, medicine, business, etc., librarians strive to know about the prominent journals and researchers in the field. Librarians trained in understanding how documents are organized and classified are proficient at retrieving information, and can advise researchers on the appropriate subject terms and keywords to use in searching both controlled language databases and web search engines. Librarians also become adept at recognizing what a researcher needs; and that when a researcher asks, "Do you have the Journal of Thermology?" what she really wants is the journal titled Thermology. Experienced librarians knows that a library user's concept of "one stop shopping" should really mean "first stop shopping," and that true customer service hinges on our ability to reveal obscure links and resources.

Even though they might not be an "expert" in any one field, librarians can gain much from their interactions with their users. Reference transactions will spark an interest in the librarian, prompting the desire to learn more on the topic; leading to an opportunity to follow-up with the user. The process of developing relationships with users is what will establish librarians as approachable authority figures.

To be seen as a legitimate profession, Neal describes the need for ”cultural authority” that he contends may be or may be not achieved in library science programs alone. If librarians are obtaining their “socialization into the profession,” Neal suggests that other professionals coming to work in academic libraries, the “untamed librarians” will also need to be provided many opportunities by library administration in order for all “employees to ‘pack’ together more routinely.” Subject librarians need to keep abreast of their own specialty, but being aware of other fields and subject resources is necessary and valuable in this ever interconnected and

interdisciplinary world. The key for science librarians, as with many other library specialties, is to acknowledge that the field necessitates a commitment to ongoing training and professional development.

As the library profession continues to evolve and adapt to new needs, the goal for academic libraries will be to hire science librarians who are able to cultivate their skill sets, backgrounds, and experiences in order to benefit the organization. Evidence continues to support the importance of the role of mentors, a foundation in the field of librarianship, and opportunities to study subject specialty resources.

What has been gleaned from studying the survey results for this article does not really resolve the debate on whether or not a science degree is a necessary ingredient for an academic science librarian. Points have been made to redirect and focus the discussion on the host of factors and skills sets that science librarians should possess, foremost being a strong interest in both the sciences and the research needs of our scientists.

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APPENDIX

TEXT OF THE EMAIL SENT WITH QUESTIONNAIRE:

We are targeting academic science librarians who have been hired to their current positions during the time period 2003 to the present. Are we describing you? If so, would you consider taking a few minutes to complete this survey? Or, if we are not describing you, would you kindly consider forwarding this email to an eligible colleague?

Our goal is to gain insight into your background - what kind of formal education do you possess and how has this been an influence in your daily duties as a science librarian?

The questionnaire should take no more than 15 minutes to answer. These responses are confidential. Survey results will be presented in an article on the topic that will be appearing in a special issue of Science and Technology Libraries.

For questions or comments please contact:

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