This issue of *Synergy: News from ARL Diversity Programs* has a focus on science and technology. Three articles discuss issues that are germane to scientific and technological constituencies in research-intensive environments, and to the work of managing information and resources in libraries.

2010 ARL CEP Fellow, Eugenia Kim, recounts her experience working as an intern, providing support for the Data Curation Profiles (DCP) project led by the Purdue University Libraries. Kim then transitioned into a professional position at Purdue where she did extensive research around data needs of instructional faculty, as well as developing resources for Purdue librarians who were charged with supporting those research and data needs.

Kiyomi Deards, 2009 ARL Diversity Scholar, provides an update on ARL efforts to recruit students from diverse backgrounds into science and technology roles in academic and research libraries. Deards advocates for increasing library diversity in science, technology, engineering, and mathematics domains in order to better reflect evolving demographics of those student constituencies in higher education, as well as in response to increasing international student populations in US colleges and universities.

Last, former LCDP Fellow, Steve Adams, discusses a relatively new but important area of practice and inquiry—the Science of Team Science—and how librarians can and should insinuate themselves into the research process and be vital members of scientific research teams. Adams’ experience at an International Science of Team Science conference ignited his interest in seeing more library and information professionals engaged in this work and represented on national and international levels.

I’m certain you will enjoy reading these three articles on topics of emerging interest and that make the case for the value that library and information professionals bring to organizations that are research intensive. For more information about ARL Diversity Programs, please visit:

www.arl.org/diversity/

Mark A. Puente  
Director of Diversity and Leadership Programs  
mpuente@arl.org
About the ARL Diversity Programs

The **ARL Initiative to Recruit a Diverse Workforce**, funded by the Institute of Museum and Library Services and ARL member libraries, offers a stipend of up to $10,000 to each ARL Diversity Scholar in support of graduate library and information science education. ARL Diversity Scholars participate in the annual ARL Leadership Symposium, a research library visit hosted by the Purdue University Libraries, and a mentoring relationship with a research library professional. For more information about the Initiative to Recruit a Diverse Workforce, visit [www.arl.org/diversity/init/](http://www.arl.org/diversity/init/).

The **ARL/Music Library Association (MLA) Diversity and Inclusion Initiative**, funded by the Institute of Museum and Library Services (IMLS), MLA, and ARL member libraries, seeks to recruit diverse students with advanced degrees in music to careers in academic and research libraries. The program offers tuition support and a paid internship for up to one year in one of five partner music/research libraries. Other components of the ARL/MLA DII include a formal mentor program and support to attend the MLA annual conference where participants will receive specialized instruction in the areas of career development and effective job search strategies. More information about the program can be found at: [http://www.arl.org/diversity/arl-mla-dii/](http://www.arl.org/diversity/arl-mla-dii/).

The **ARL Career Enhancement Program (CEP)**, funded by the Institute of Museum and Library Services (IMLS) and ARL member libraries, offers MLIS graduate students from underrepresented groups an opportunity to jump-start their careers in research libraries by providing a robust internship experience in an ARL member library. Each CEP fellow participates in a six- to twelve-week paid internship in an ARL library, a mentoring relationship with a professional librarian while on campus for the internship, and an opportunity to attend the annual ARL Leadership Symposium during the American Library Association (ALA) Midwinter Meeting. There is also potential for academic credit for the practical intern. For more information about the ARL Career Enhancement Program, visit [www.arl.org/diversity/cep/](http://www.arl.org/diversity/cep/).

The **ARL Leadership and Career Development Program (LCDP)** is an 18-month program to prepare midcareer librarians from underrepresented racial and ethnic groups to take on increasingly demanding leadership roles in ARL libraries. The LCDP design includes: two LCDP Institutes, an opening and closing event held in conjunction with national professional meetings, a career-coaching relationship with an ARL library director or staff member, and a personalized visit to an ARL member library. For more information about the LCDP, visit [www.arl.org/diversity/lcdp/](http://www.arl.org/diversity/lcdp/).

**Synergy: News from ARL Diversity Programs** is a forum in which to share information about programs and opportunities centered on careers in research libraries.

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Mark A. Puente is the Director of Diversity Programs for the Association of Research Libraries (ARL), a position he has held since March 2009. Puente came to ARL from the University of Illinois at Urbana-Champaign where he was Coordinator of Digital Projects and Special/Gift Collections for the Music and Performing Arts Library.
Eugenia Kim holds an MS in Information Science from the University at Albany, SUNY and a BS in Electronic Media, Arts, and Communication from Rensselaer Polytechnic Institute. Her primary research interest is in digital dance preservation. She was a 2010 ARL Career Enhancement Program Fellow, a 2011 REACH21 scholarship recipient for the Spectrum Leadership Institute (ALA), an ASIS&T 2011 New Leaders awardee, and the 2010–2012 webmaster for SIG DL. As a visiting Data Services Specialist at Purdue University Libraries, she provided support to subject librarians by helping them engage in data-related services such as writing data management plans, assessing data needs of faculty researchers, and providing presentation materials on data resources. She also participated in the ARL e-Science Institute as a member of the Purdue team.

Data Inreach: Building and Maintaining an Infrastructure to Support Data Curation

“What is data curation?” These were the first words out of my mouth when I read an email from Mark A. Puente, ARL Director of Diversity and Leadership Programs, announcing that the Purdue University Libraries was looking for an intern. A grant from the Institute for Museum and Library Services (IMLS) funded the position and Scott Brandt, Associate Dean for Research, and Jake Carlson, Data Services Specialist, co-led the project with a focus on developing the website and workshop for the Data Curation Profiles project (DCP). Although I was familiar with creating websites, the term “data curation” had never been mentioned in any of my classes or by any librarians with whom I had spoken.

The posting came out while I was serving my internship at Columbia University as an ARL Career Enhancement Program (CEP) Fellow. As such, I immediately turned to the very knowledgeable colleagues in my department to ask their opinions about “data curation.” Of all the comments, the one I remember most was “Data curation is likely going to be a major future trend.” I truly respect the people that I worked with that summer, and their viewpoints on the value of data curation motivated me to apply for the position. It also helped that Purdue had a strong relationship with the ARL Diversity Programs; my friends in the 2009–2011 class of ARL Diversity Scholars spoke highly of their visit to the campus. I interviewed via Skype from China in August and started the remote internship in September. Admittedly, this was an unusual arrangement but it was certainly representative of Purdue’s innovative approach to librarianship.

The internship consisted of two main projects: to create an annotated bibliography of data curation literature and to configure the Data Curation Profiles (DCP) website. The very nature of the DCP Toolkit is that it is a resource for librarians in assessing data needs rather than a direct service for faculty. As such, my projects were focused on helping other librarians learn about data curation rather than the actual act of curation. After the internship was over, Jake and I co-authored a poster for the 2011 University of Massachusetts and New England Librarian e-Science Symposium titled “Demystifying the Data Interview.” The content was inspired by the varying definitions of data curation terminology that I encountered while writing the bibliography. Despite its simple nature, it ended up being popular with multiple audiences and downloaded regularly from the e-Scholarship@UMMS and Purdue e-Pubs repositories. As of April 9, 2012, there was a combined total of 273 downloads.

In 2011, I applied to and joined the Purdue Libraries as a Visiting Assistant Professor of Library Science and Data Services Specialist after an intense national search. I was fortunate enough to continue working with Scott and Jake as they have very liberal and broad perspectives on data curation. Although I shared the same title as Jake, we had very different specializations within the Libraries. From the beginning I spent most of my time interviewing other library faculty about their data support needs and contributing as a team member for the ARL e-Science Institute while Jake continued to develop tools and conduct research on data-related topics.

Looking back, it seems that I was destined to work in what I call “internal outreach” from the beginning. In Issue 7 of Synergy, all three authors discuss their experiences working with
researchers to address their data needs. Before an institution can reach that point, however, there must be buy-in and cooperation of their library personnel in order to make a data curation program successful. This may require assessing what data services support that librarians need, educational activities to prepare staff for data curation activities, or simply clarifying the strategic data goals of the institution. Whatever the specific needs may be, a data librarian needs to be able to communicate and collaborate with colleagues in order to successfully create a streamlined system for providing data services. As such, these interactions contribute to an approach for internal outreach.

At Purdue, there is a “triangle” relationship, of sorts, between the departmental faculty, subject liaison librarians, and the research department, which includes the Data Services Specialists. This relationship is grounded in the fact that subject liaisons already have established relationships with and background knowledge about the faculty, but that they may also need support for data reference consulting. Subject liaisons may also partner with research department members for more in-depth projects with faculty researchers. Meanwhile, the research department also conducts investigations of data resources for librarians both within and external to Purdue. These include the DCPs, Databib, and institutional collaborations such as the Purdue University Research Repository (PURR), which was built in partnership with the Office for Vice President of Research and Information Technology at Purdue (ITaP).

With all of this activity, it is very easy to drop lines of communication and lose track of who needs to be involved at which times. A good example of this was the construction of our e-Science Strategic Agenda as part of the ARL e-Science Institute exercises. Each institution in the Institute was given freedom to determine how they carried out their activities. In the case of Purdue, it was very important that all the librarians and related personnel understood what the agenda was about since it would ultimately impact them. We were very fortunate that our Dean of Libraries, James Mullins, was on the steering committee for the e-Science Institute and therefore supportive of our plans for maintaining internal communication. Over the course of eight months, we sent out open invitations to view the informational webcasts, held brown bag presentations on the latest progress of the agenda, asked library administrators to help with brainstorming solutions, and solicited volunteers to help carry out parts of the Agenda.

Another large initiative I worked on was the “Listen-Focus-Initiate” project. This consisted of a series of meetings and discussions with librarians across all subjects to understand the common and disparate data support needs of each division (Health and Life Sciences; Humanities, Social Sciences, Economics and Business; Physical Sciences, Engineering and Technology). By directly interacting with each division, the research department was able to get a fuller picture of what day-to-day data activities are taking place and how to develop and provide better data services. Some of the benefits of this project have been a re-definition of our data services model as well as providing resources for librarians such as presentation slides on resources such as PURR. Other outcomes include showing a series of Digital Archives Specialist webinars from the Society of American Archivists on topics such as metadata.

Oddly enough, internal outreach activities can sometimes help meet external outreach goals. When I arrived at Purdue, there were no webpages that helped to differentiate between the research department and data services, and the Distributed Data Curation Center (D2C2) website needed updating. As a result, there was internal confusion as to the relationship between the three entities. I produced three new web presentations for each entity clearly identifying the different objectives. Because the websites are all public, librarians could point their users and external colleagues to these resources as well.

When developing data policy and services, it is easy to get caught up in cultivating administration and faculty relationships without maintaining internal communications within the libraries. For institutions with only a single or few data librarians, collective belief in data services as part of the libraries identity and “training the trainer” can be very helpful. For the library community, maintaining open dialogue between different institutions can lead to improved practices. Whatever the scope, it is important to remember that data curation cannot take place in an institution if all the relevant librarians are not informed nor prepared to engage in it; that is where “inreach” comes in.

Endnotes

3. “Purdue University Research Repository.” Purdue University. 2011. https://research.hub.purdue.edu/
Changing the Way We Think: Diversity to Drive Scientific Innovation

As a profession we affirm that librarians should reflect the diversity of the communities we serve, and, over the past fifteen years, faculty and students of color within university science and technology departments have steadily increased. These changes demonstrate the need for increasing the diversity of science librarians. Scientific diversity has accelerated due to: increased connectivity and collaboration between researchers, rapid worldwide communication of groundbreaking research, and the creation and analysis of big data sets. Science and technology are crucial for maintaining global competitiveness creating an increased need for research support. Librarians offer many relevant services including: bioinformatics, data visualization, metadata creation, information management, data management both physical and virtual, literature research and citation management, and fact checking. As demand for these skills has increased so has the demand for information professionals with science backgrounds.

Government and private organizations prioritized maximizing diversity on the theory that the more different points of view considered the more accurate the final conclusions will be. Some of the funding available to promote diversity and the success of minority groups in the sciences appear on the list of “Funding Opportunities for Women and Minorities” compiled by the University of California, Berkeley, Office of Special Projects. In spite of these efforts, some science and technology departments still have one or fewer faculty of color. Depending on the discipline other departments may have ~50% faculty of color but only one or two token female faculty. As such, women are considered a minority within the science and technology communities. The extent to which women are minorities varies by discipline, however, even in fields with a high number of female scientists, compensation and career advancement severely lags behind male counterparts.

To meet goals for increased enrollment universities are aggressively recruiting foreign students from Asia and India; this is especially true in the sciences. This trend is reflected in some departments with graduate student populations with approximately fifty percent of recruits in students of color. The National Science Foundation projects that by 2019, minorities will make up 42% of science and engineering postsecondary enrollment. These numbers are somewhat deceptive because much of the growth is not from underrepresented groups in the United States, but from the recruitment of foreign students. Accordingly, the need to engage students who are not only students of color, but who may also be from a foreign country, is clear.

The Association of Research Libraries’ ARL Annual Salary Survey 2010–2011 reports that there are 1229 individuals working either as subject or computer systems specialists in member libraries within the United States, not including professionals in law and medical libraries. Approximately 17% or 213 from this group are members of an ethnic minority. No minority statistics are available for Canadian ARL libraries. Even if we assumed that all of these individuals worked in science and technology, it’s clear to see that we don’t reflect the ethnicities of our student populations.

Through the Initiative to Recruit a Diverse Workforce (IRDW), ARL has been contributing to the recruitment of librarians of color with backgrounds in science, technology, engineering, and mathematics (STEM) fields since 2006. Eight of the twelve members of the 2011–2013 IRDW cohort have STEM backgrounds ranging from physics to bioinformatics. Part of the funding for cohorts starting in 2006 was...
specifically earmarked for recruiting librarians with STEM backgrounds. The 2006, 2007, 2008, 2009, 2010, 2011 cohorts recruited seven, eleven, eight, twelve, and eight librarians respectively with degrees in STEM fields for a total of forty-six librarians in a six-year period. Librarians recruited during this period without a science or technology background were required to take a course in science and technology resources.

In a 2005 survey of currently employed science librarians by Beck and Callison, 70% of the thirty-five respondents had taken a course in science/technology resources. While 70% also agreed or strongly agreed that a science degree was important to their work, the willingness to learn and provide help stood out as key character traits. This knowledge of science and technology resources is facilitated in the IRDW program requirements. The completion of a course in science and technology resources is key to introducing library school students without a science background to the terminology and philosophy of the sciences and is one way to increase the number of potential science and technology librarians.

ARL’s IRDW can be viewed as a vital first step to the recruitment and retention of science librarians of color by providing a support system that stays with library school students from the moment of acceptance into an IRDW cohort, through job placement and, subsequently, as emerging professionals. The mentoring, both formal and informal, and the ever-broadening community of practice made up of participants from ARL’s diversity initiatives provide mentoring, opportunities for success, collaboration, and career development. These components also demonstrate ARL’s commitment to diversifying the professional library workforce.

Demand for science and technology librarians will only increase as big data, bioinformatics, and cheminformatics become increasingly vital to researchers. Recruiting librarians of color with science and technology backgrounds, or those willing to take courses in these areas, will ensure a strong, diverse pool of candidates eligible to apply for science and technology-based positions.

Job titles and duties may change, but the core work of managing and providing access to scientific information, regardless of format, will remain the same. Through concerted recruitment and retention efforts the number of trained science and technology librarians will grow while, at the same time, increasing diversity in libraries to better reflect and enhance the communities served.

Endnotes

5. Ibid.

Recommended Readings


Committee on Underrepresented Groups and the Expansion of the Science and Engineering Workforce Pipeline; Committee on Science, Engineering, and Public Policy; Policy and Global Affairs; National Academy of Sciences, National Academy of Engineering, and Institute of Medicine.


Steven Adams is currently the Life Sciences Librarian at Northwestern University. Previously, he was the Biological and Life Sciences Librarian (2003–2011) and Interim Psychology Librarian (2007–2011) at Princeton University; and Reference Librarian at the Atlanta University Center Library (2000–2003). He was a fellow in the ARL Leadership and Career Development Program (LCDP) Vanguard Class (2009–2010). His interests include developing new roles for science librarians, scholarly communication, research networking tools, and modernizing outreach and instructional services in academic libraries.

Exploring Roles for Librarians in the “Science of Team Science”

As academic librarians and their professional associations work to assess and respond to new and developing institutional roles, there is also a need to track national and international trends that may mirror or forecast local trends. The Science of Team Science (SciTS) is a new field of inquiry that is steadily gaining momentum locally, nationally, and internationally. This article provides background information on SciTS, explains how this field and librarianship are interwoven, and makes a case for why librarians should follow and contribute to this new area of research.

Background

Many of the major scientific and medical quandaries of today (cancer, AIDS, climate change, sustainability, etc.) demand that researchers collaborate across disciplinary, professional, and institutional boundaries. The National Science Foundation (NSF), the National Institutes of Health (NIH), and other agencies, both public and private, are rewarding cross-institutional and cross-disciplinary collaborative research when evaluating grant applications. As a result, the expectations of campus administrators are changing and a culture shift is underway. This transformation is presenting challenges to research institutions. Scientists are now expected to collaborate in ways that are not always familiar or comfortable to them, however, tenure and promotion criteria have not yet evolved to account for faculty contributions to team research efforts and large-scale collaborative discoveries. As a result, choosing a team-based approach to research can be perceived as a riskier choice for some junior scientists than for those who are tenured and well-established. These and numerous other barriers must be addressed as scientists are asked to expand beyond the traditional single-investigator approach to scientific research.

To help bridge the gap between these new expectations and more traditional modes of research and dissemination, and increase the efficiency and productivity of research groups, a
new field of study has evolved: “The Science of Team Science.” One seminal article defines SciTS as “an emerging research field gaining traction to provide evidence-based guidance about effective practices for team science for practitioners and funders.” Another team of authors frames SciTS as follows:

The emerging field of the science of team science draws together diverse disciplines to better understand and inform the collaborative processes and outcomes of team science. Team science can be conducted within a single, focused discipline, or can span different disciplines.

SciTS truly reflects the cross-disciplinarity espoused in this definition. This field includes the work of scholars from the natural and physical sciences, engineering and technical sciences, and the behavioral and social sciences, including: medicine, communication studies, sociology, international affairs, public policy, computer science, business management and leadership, information science, and numerous others fields.

Enter the Librarian

Librarians and their professional associations have been working diligently to ensure that libraries remain relevant within the milieu of rapid change and disruptive technologies. This has resulted in a proliferation of initiatives and publications promoting collaboration with campus groups, scholarly communication reform, open access to publicly funded research, institutional repositories, and e-Science/cyberinfrastructure projects. Librarians are developing, implementing and assessing strategies for reinventing the profession and building linkages to and between groups with mutual interests.

The leadership at Northwestern University Library (NUL) has made collaboration with faculty and campus leaders a top priority and librarians are encouraged to participate in “communities of practice” on campus. Hence, I was asked to attend the 3rd International Science of Team Science Conference an event sponsored by Northwestern’s Clinical and Translational Science Institute.

My first observation from this event was that many panel, poster, and session topics were related to e-science and research networking tools (such as SciVal Experts, VIVO, Symplectic, etc.) It was also striking that the “measurement and evaluation of team science” conference track included work by library and information science (LIS) faculty and librarians, cited information science literature, or relied on systems that are purchased and maintained by libraries (e.g., Web of Science, Scopus). SciTS scholars analyzed bibliometric indicators (e.g., impact factors and citation data) to assess the impact and effectiveness of scientific teams and cross-disciplinary collaborative research. Meanwhile, information scientists are collaborating with publishers and scientists on local and national research networking systems that assist scientists in finding collaborators, both within and across disciplines. Examples of these include Cornell University Library’s VIVO, Elsevier’s SciVal Experts, and CTSA’s Direct2Experts. These systems use linked open data, a hot topic at library conferences and seminars.

At the end of the conference, it was clear that librarians and the SciTS have overlapping interests and skills. It was fascinating to hear non-librarian scientists and scholars, however unintentionally, make the case and express the need for initiatives that library deans and other advocates have been promoting for more than a decade.

There are multiple points of entry for librarians who find SciTS of interest. We can join team-based projects in this cross-disciplinary field, develop initiatives to support team-based research on or between our campuses, or, as Rick Luce suggests, work as embedded “Informationists” on research teams.

The Challenge

A final observation from the conference, the motivation for writing this article, is that there were discussions taking place that would have benefitted from a more extensive librarian presence. Although librarians possess expertise important to the SciTS field, few were present and even fewer were presenting or playing an active role beyond poster presentations. Spaces like the SciTS conference provide opportunities for librarians to broaden our influence. A committee of SciTS leaders plans this conference and their objective is to highlight research they feel is most groundbreaking. In order for librarians to get invited to participate more fully in these important conversations we will have to be more active in this community and produce SciTS research that attracts attention beyond traditional venues for library scholarship.

However, as Garritanno and Carlson observed about subject librarians providing data services or working on e-Science initiatives, capacity-building and training will be necessary.
before many librarians are able to participate in projects as full partners with science faculty. Anna Gold has made similar applicable observations about data librarians and suggested that:

…data librarians will need to forge embedded working relationships with research teams, rather than working through more distal relationships with faculty that are common in larger university research libraries.

The charge to make an impact in new contexts challenges traditional science librarians. Library administrators are also under pressure to hire and develop employees who can help broaden the library’s reach on campus and beyond, which is not an easy or straightforward task. However, it is important to remember that this era of collaborative science is difficult for all involved (deans, faculty, graduate students, granting agencies, etc.) Like our colleagues, we will have to be agile and proactive about developing our expertise and sharing it via collaborative exchange. I believe the Science of Team Science is ripe for the contribution of our profession and that our increased participation will be mutually beneficial to our fields.

Endnotes and Further Reading

Call for Applications

ARL/Music Library Association Diversity and Inclusion Initiative

Overview

Librarians from racial and ethnic minority backgrounds are underrepresented within the field of music and performing arts librarianship.

With funding from the Institute of Museum and Library Services (IMLS), the Association of Research Libraries (ARL)/Music Library Association (MLA) Diversity and Inclusion Initiative (DII) seeks to address the growing need for professional staff in music and performing arts libraries who better reflect evolving demographics of students and faculty in music and performing arts higher education.

ARL and MLA—along with partner libraries including the University at Buffalo, SUNY; University of California, Los Angeles; University of Illinois at Urbana-Champaign; University of North Texas; and University of Pittsburgh—seek to recruit students from traditionally underrepresented racial and ethnic minority groups to participate in this three-year program. The goal of the ARL/MLA DII is to create a diverse and well-qualified cohort of new LIS professionals equipped with skills, knowledge, and abilities to address the transformative professional roles in music and performing arts libraries in the 21st century.

The ARL/MLA DII provides generous financial support for minority candidates to pursue the master’s in library and information science degree while gaining valuable, “hands-on” experience in a large academic music library environment. Through programmatic activity, participants will receive additional support to ensure a successful transition into the professional LIS workforce. As Marianne I. Gaunt, Vice President for Information Services and University Librarian, Rutgers University, and member of the ARL Committee on Diversity and Leadership, noted, “It’s a great collaboration in an important area. There is so much creative work happening in music and the performing arts that we need a well-prepared, diverse cadre of librarians ready to enhance library services for this community!”

For additional information about the DII and links to the application form, please see:

http://www.arl.org/diversity/arl-mla-dii/

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