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### Librarians Dream of Electric Cats: A Tech Team's Journey into the World of Emerging Technologies

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initiatives, building on **Patricia Pinkowski's** 2008 *ATG* article, "Trends in Consumers' Health Information Needs and Expectations."

It has been five years since the **Medical Library Association** and partners planned the 2013 conference, described in the overlying theme, "One Health: Information in an Interdependent World." Interest in One Health has by no means waned. In this issue, **Pamela Rose** surveys library and information aspects of the very interesting global, inter-related, and intersected areas that the **Centers for Disease Control and Prevention (CDC)**, <https://www.cdc.gov/onehealth/>) and other sites outline thusly: "One Health recognizes the health of people is connected to the health of animals and the environment...."

In the health sciences, journals are the predominant scholarly publishing vehicle, but books (eBooks and e-textbooks in particular) remain important and have been addressed by *ATG* articles over the years (including special issues of 2008 and 2011/2012). In this *ATG* issue, **Jie Li** and **Geneva Stagg** review one

aspect of the current eBook landscape. Their article is based in part on a poster presented at the 2017 **Medical Library Association's** annual meeting in Seattle, WA, entitled "eBook Package Subscription Model: Benefits for the Library or the Publishing Industry?"

The health education landscape is in a constant state of evolution, as demographics, institutional priorities, and national trends change. As some educational institutions close health professional programs, elsewhere programs are expanding or being newly established. In all cases, library services aim to address the schools' or programs' information needs and meet institutional priorities. In 2014, **Elizabeth Lorbeer** addressed the topic, "Where to Start? Opening Day Collections and Services for a Newly Founded Medical School." In this issue, she reflects on the first five years of the endeavor that may resonate and inform others.

Lastly, institutional and other repositories try to capture research and scholarly output with goals that include priorities of open sharing and preservation for posterity. In the 2014 *ATG* special issue **Lisa Palmer** wrote on "Cultivating Scholarship: The Role of Institutional Repositories in Health Sciences

Libraries." In this issue, she and co-author, **Dan Kipnis**, again address the theme of IRs in health sciences libraries. They overview the current medical IR landscape and share some trends that came to light as they analyzed results of a survey of medical school IRs they conducted (with **Ramune Kubilius**, compiler of this issue) in late 2017/early 2018.

Thanks to all of the authors for their contributions to this issue and to *ATG* editors for making this all possible! We hope that *ATG* readers will enjoy and benefit from reading the articles in this special issue. 🐾

#### Endnotes

1. Past *ATG* health sciences special issues: 2008: <http://docs.lib.purdue.edu/atg/vol20/iss5/>. 2011: <http://docs.lib.purdue.edu/atg/vol23/iss6/>. 2014: <http://docs.lib.purdue.edu/atg/vol26/iss2/>.
2. **Amy Affelt**, *The Accidental Data Scientist: Big Data Applications and Opportunities for Librarians and Information Professionals*, 2015, Medford, NJ: Information Today, Inc. **Heather Hedden**, *The Accidental Taxonomist*, 2nd edition, 2016, Medford, NJ: Information Today, Inc.

## Librarians Dream of Electric Cats: A Tech Team's Journey into the World of Emerging Technologies

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### Introduction

The **Ruth Lilly Medical Library's** Technology Team (Tech Team) came together at the beginning of 2015, under the guiding vision of Library Director, **Gabe Rios**. A 2018 interview with the Director was published in the *NEJM's LibraryHub*<sup>1</sup> that provides an overview of introducing emerging technologies into our environment. The original Tech Team was comprised of a Team Leader, a Library Systems Analyst, and an Emerging Technologies Librarian. The Team Leader and Library Systems Analyst had been working together, managing the library's website and social media. The addition of the Emerging Technologies Librarian was the catalyst that allowed us to move forward and create new services. In this article, the team expands on 3D printing, data visualization, virtual and augmented reality, who helped us along the way, and some funding resources.

Networking, collaborating, and partnering with colleagues and institutional entities inside and outside the institution and beyond the walls of the library is a sound survival strategy. The authors extend a special thank you to our

colleague **Jennifer Herron** for the innovative and creative contributions that she made as a key member of the Tech Team.

### 3D Printing, Entering the Fray, Finding Our Niche

Initially we explored 3D printing applications in health science libraries. The **New Media Consortium** Horizon Report 2014 Higher Education Edition, identified 3D printing as an important development in educational technology with a time-to-adoption horizon of 2 to 3 years.<sup>2</sup> The Tech Team started off with an environmental scan of 3D printing efforts at the **Indiana University School of Medicine** (nine campuses) and on the **Indiana University-Purdue University (IUPUI)** campus. We were able to meet faculty and staff in the radiology department and discuss potential roles for the library. Our scan revealed that our **IUPUI** University Library colleagues had received a **Library Services and Technology Act (LSTA)** grant to start their own 3D print lab. Connecting with colleagues at the University Library 3D print lab revealed that they had requests from the medical side of campus.

They also had many requests from engineering and informatics students, especially at the end of the semester when projects overwhelmed School labs. University Information and Technology Services (UITS) was also in the process of establishing a 3D printing lab. Both the University Library and UITS utilized Makerbot printers. The Herron School of Art was constructing a "Think It Make It Lab" on the Indianapolis campus during this time.<sup>3</sup> During the Tech Team visits to the other 3D print labs, we were careful to focus on collaboration and not competition; colleagues agreed and were generous with sharing experiences. The **IU-PUI** School of Informatics was also involved with 3D printing, and the Tech Team met with two faculty members, one of whom was working with a maxillofacial prosthodontics resident from the School of Dentistry on developing a process using digital imaging, design, and 3D printing to make a better-looking and better-fitting facial prosthetic for patients who have had cancer surgery or facial trauma.<sup>4</sup>

From our environmental scan, there was a clear interest and need for 3D printing and a

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huge potential for interdisciplinary collaboration. Our goals were to set a low barrier for 3D printing in order to expose as many medical students, staff and faculty to the technology and to act as a “gateway and innovation referral hub” for expertise and resources on campus. Our Director connected the Tech Team with **Kimberly Barker**, Emerging Technologies & Digital Initiatives Librarian at the **Claude Moore Health Sciences Library, University of Virginia**. She shared her experience with 3D printing and had success with her Cube 3 printer (small enough to be portable). Another useful resource was the **University of Florida’s** email discussion list on maker-spaces and 3D printing in Libraries <[librariumymakerspace-l@lists.ufl.edu](mailto:librariumymakerspace-l@lists.ufl.edu)>. Our Medical Library’s initial start-up cost in March 2015 was approximately \$7,000, which included a Cube 3, CubePro Trio, two 3D Sense Scanners — one handheld and one for the iPad, and a stockpile of filament. Quite unexpectedly, we were offered and agreed to house a Makerbot Replicator 5th Generation from UITS after another unit decided to purchase their own Makerbot printer. The experience of designing the space dubbed “The Nexus,” which would house the 3D print lab, was detailed in a 2017 article appearing in *Medical Reference Services Quarterly*.<sup>5</sup>

After creating some basic ground rules (mediated model of service) and policies, the 3D print service was soft launched in the fall of 2015. The Emerging Technologies Librarian obtained some presentation time at the medical student orientation and promoted the service with 3D print coupons. The Emerging Technologies Librarian lowered the 3D printing barrier further for students by directing them to resources for 3D print models (for example, Thingiverse...). While the focus of this article is on technology, what makes technology useful is the people behind, around, and using (and assisting others with using) the technology. The Emerging Technologies Librarian created an interdisciplinary 3D-print group that created a “brain trust” and a corresponding e-mail discussion list where questions could be asked and experiences and information shared. The team quickly learned that the printers can be temperamental and that the technology changes quickly. In early 2016, 3D Systems removed itself from the consumer market and discontinued selling Cube 3 printers. The filament for these printers is proprietary, and if stored too long, PLA and ABS filament becomes brittle, causing time-consuming jams and rendering them unusable. The Makerbot Replicator 5th Generation has been more reliable, and in the summer of 2017, an Ultimaker 3 was purchased and is working well. It has the ability to print a variety of materials and has dual print heads. For 2018, a Formlabs 2 SLA (stereolithography) printer was purchased and will enable us to print more delicate models. The 3D printing software such as Makerbot Print Software, Sculpttris, Blender, Maya, and Cura have a considerable learning curve. Available 3D

print models often have flaws that need to be fixed or tweaked. The Tech Team hired some part-time student workers with informatics or engineering backgrounds for this purpose. Also, be sure to talk to your organization’s legal counsel and even run policies by them if they are willing to review, and consider noise and ventilation issues.

### The Nexus and Data Visualization

The Nexus is our student collaborative learning space on the 2nd floor of the library. The idea behind the space is “ideas coming together by students working together.” The Library Systems Analyst was the primary point person who coordinated with the Library’s Business Manager, interacted with the construction team, and worked with the Advanced Visualization Lab (AVL) to bring the space to fruition. The main feature of the lab is an IQ Wall<sup>6</sup> which was installed in collaboration with the AVL. The wall is comprised of eight 55 inch, high resolution, Planar screens in a 4X2 configuration, stretching sixteen feet across the room. The IQ Wall has a touch overlay making the entire expanse touch sensitive. The total expenditure for the wall was approximately \$90,000, and the final installation was completed in the summer of 2016. In addition to the IQ Wall, a 98 inch touch enabled Planar screen and mobile stand were purchased for a special projects room. Total expenditure for the 98 inch was around \$40,000. The Tech Team has hosted Data Visualization classes utilizing the Nexus collaborative learning space and the IQ Wall, a successful medical student peer-to-peer session on the use of concept mapping for studying clinical and basic science topics, and have given several “Tech Talks” on topics such as 3D printing, augmented and virtual reality, and artificial intelligence. The IQ Wall is also a good platform to mirror what someone is seeing in VR. That way, those not wearing the VR headset can still experience what the wearer is seeing and share the experience. This past spring, videoconferencing and recording capabilities were added to the IQ Wall in collaboration with UITS Learning Spaces. It is hoped that this added capability will allow streaming of events and give the students an opportunity for collaboration across our nine campuses.

Despite the great events hosted in the Nexus using the IQ Wall, student use is underwhelming. The spirit of the Nexus is a collaborative learning space, not dedicated classroom use. The challenge is to get our library users to see the possibilities and find new innovative ways to utilize the IQ Wall. For example, we added Solstice, a software solution to project mobile apps onto the IQ Wall, making it excellent for group study.

### Virtual and Augmented (or is it Mixed?) Reality — the Next Frontier

In 2016, the Library Systems Analyst attended **South by Southwest (SXSW)** in Austin, Texas. This experience reignited a prior interest on his part in Virtual Reality. At **SXSW** there were multiple VR sessions relating the technology to use in medical practice. Further research indicated that VR is an

established technology that has been utilized in health and medicine. The Tech Team purchased two HTC Vives in spring of 2017. After exploring the possibilities, regular sessions VRidays (Virtual Reality Fridays) were held starting in November of that year. A group of graduate students used 3D Organon VR Anatomy to study vertebrae and the complexity of the Brachial plexus. Others are also excitedly examining Organon for its uses. The Library Systems Analyst purchased a high end MSI laptop which allows VR to be taken “on the road” and the portability has proved valuable to expand the technology to **School of Medicine** campuses beyond Indianapolis.

### Funding

Buy-in from both the Library Director and **School of Medicine** leadership is crucial. The **Ruth Lilly Medical Library** has been exceedingly fortunate in having generous donors for our technology efforts. Our colleagues at **IUPUI** University Library secured a **Library Technology Services Act (LSTA)** grant for their 3D printing lab and utilized the same grant for a Virtual and Augmented Reality Lab. Librarians from the **Greenblatt Library** in Augusta, Georgia secured funding for their Creative Technology Lab from a **National Network of the Libraries of Medicine Southeastern/Atlantic Region** grant. The **Institute of Museum and Library Services** offers grants. Your organization or institution may offer grants, or it may be possible to partner with others. If your technology plans can be linked to innovation and technology transfer, that may be an avenue to pursue. A great example is Digital Health @HSL, Health Sciences Library, **University of North Carolina**. It might also be worthwhile to talk to companies that make 3D printers to see if there are educational discounts available.

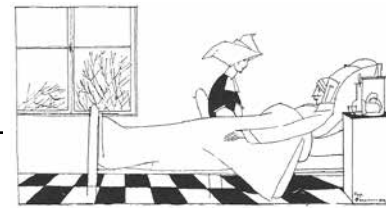
### Closing Thoughts and Future Challenges

No two academic medical libraries are alike. Funding and priorities for innovation vary. To anyone seeking to be innovative with technology in a library space, be bold, don’t be afraid to fail, learn from your mistakes. It takes a certain amount of fearlessness. Go to conferences outside of the library box. **South by Southwest** was one example given here, another is **RAPID + TCT** (3D Printing and Additive Manufacturing Event). Go to library conferences, interact with like-minded colleagues, liberally exchange and share ideas and shape them for your environment. Reach out to your broader campus and community. We all work with some smart people, many of whom generously share their expertise.

Acknowledgements to the 3D Print Group “Brain Trust” and to **Mike Boyles** and his staff at the Advanced Visualization Lab for being great partners, and to **Todd Kirk** with the UITS Student Technology Center Labs, a great resource and co-chair for the 2018 Health Technology Symposium (featuring 3D printing). None of this would have been possible without a supportive and visionary library director and **School of Medicine** leadership. 🌱

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# Current Trends and Opportunities in Health Sciences Library Metadata



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The efficient management and discovery of library resources have always been of concern to catalogers and metadata librarians working in health sciences libraries, but the past several years have changed many of the systems and workflows employed to do so and created opportunities for applying existing skillsets to new challenges. This article examines how the dominance of electronic resources in the health sciences has shifted cataloging workflows and priorities. It also examines efforts currently underway to bring cataloging practices and standards into better alignment with modern web standards. Finally, it identifies new roles for metadata librarians and catalogers that have emerged in recent years in health sciences libraries that leverage existing skills and library metadata for new

initiatives and collaborative opportunities that reach beyond the borders of traditional technical services activities.

## Workflows

The growing footprint of electronic resources in library collections has necessitated changes in the way those collections are managed by catalogers and metadata librarians. A 2017 *Library Journal* study revealed that 88% of library collections spending in North America is toward electronic-only or electronic/print combination products.<sup>1</sup> Health sciences collections tend more toward journals than monographs, and electronic formats have had an especially large impact on journals. For example, over the last five years, electronic formats accounted for 99% of **Galter Health Sciences Library & Learning Center's** collections spending. Gone are the days of physical carts of new arrivals waiting to be cataloged.

Although print backlogs have nearly disappeared, different kinds of cataloging backlogs have sprung up in their place that require new skills and workflows. Batch record uploads have edged out individual title-by-title cataloging and become the norm, requiring catalogers to rely on tools such as MarcEdit, Excel, OpenRefine, and even command line approaches for high-level metadata analysis and cleaning. After resources are cataloged, they require ongoing attention to assure access is maintained, subscription coverage is reflected, and platform changes are handled. Although this is commonly viewed as the realm of electronic resources librarians, the work of navigating the library catalog, updating MARC records, troubleshooting linking problems, and tracking down title changes lends itself to catalogers and metadata librarians. The management of electronic resources is a never-ending and highly collaborative process.

Library systems have also evolved to better integrate the workflows associated with e-resource management. For example, **Galter Library** uses **Ex Libris's** Alma platform, which utilizes electronic collections and portfolios for managing e-resource package, coverage, and linking information, allowing for improved integrations with traditional bibliographic metadata. Alma also offers the Community Zone of shared records, electronic collections, and portfolios for easy access to shared records and centralized management of e-resources. Although the completeness and currency of many records leaves much to be desired, the concept of globally shared records incorporating vendor updates in the ILS has dramatically altered e-resource workflows. Whole packages with corresponding MARC records and linking and coverage information can be activated

for discovery in the catalog with the click of a button, and in some cases removed just as easily. Although enhancements to records in the Community Zone can be undertaken, core metadata is often viewed as "good enough" to allow for the discovery of resources.

In place of the cataloging duties replaced by the availability of records in shared environments, catalogers have shifted focus to other projects. Many libraries have begun prioritizing their unique physical and electronic collections for metadata work. Catalogers also spend time identifying and rectifying gaps in the shared catalog and resolving higher-level cataloging problems in areas such as legacy catalog records, serials title changes, and authority work. Cataloging work and database maintenance are interdependent, and the continuous improvement of library metadata is only growing in importance as libraries work to make resources discoverable to broader audiences via aggregators, external web search engines and the Semantic Web.

## Linked Data

Initially the World Wide Web was developed to link documents. The Semantic Web advances this concept by linking the data and information that resides in the documents and identifying the relationships among them. Hence, the use of the phrase "Linked Data" to describe how the Semantic Web works.<sup>2</sup> The Semantic Web also contains datasets, including library catalogs and authority files such as VIAF, LC/Names, MeSH, LCSH, etc. Furthermore, the Semantic Web provides links between the data elements (i.e., entities) that reside in these documents and datasets. If libraries are to participate fully in the Semantic Web, they must use the technologies that support it along with metadata schemas that are able to manage linked data.<sup>3</sup>

In moving toward the Semantic Web, the library community (including health sciences libraries) hopes to replace their current metadata standard, MARC, with a linked data-based schema. For libraries MARC has been the standard for library cataloging and metadata creation for the past 50 years, and it has served the community very well. With the developments in computer and web technologies over the past 30 years, the environment in which libraries operate has changed significantly.<sup>4</sup> Within this new environment the limitations and inadequacies of MARC have become obvious. MARC does a good job of enabling communication between humans, but it does not enable effective communication among modern computers, which is what optimizes the discovery and exchange in the new World Wide and Semantic Web environment.

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## Endnotes

1. **NEJM LibraryHub.** "Dipping a Toe into Emerging Technologies: A Librarian shares his experience introducing innovations like 3D printing and virtual reality to medical school." Accessed June 8, 2018. <https://libraryhub.nejm.org/article-hub/2018/05/dipping-toe-emerging-technologies/>
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