In the Information Age, knowledge as the product of research and scholarship poses many trials that librarians and libraries are especially poised to answer in the coming century. Research institutions are part of an increasingly global ecosystem, where each is a node in a distributed network of tools and methods that strive to meet the challenges of big data through machine learning and crowdsourcing scholars. Advancing research will require educating communities of practice on how to deploy digital tools, and to share knowledge through digital publishing and the born-digital products of increasingly collaborative and public digital scholarship.
Advancing Research

• Big Data
• The Evolving Scholarly Record
• Digital Scholarship
• Interdisciplinary Collaborations
• Consultations and Support
Ana already covered Data Repositories and Open Date when she spoke about Open Scholarship.

What I’ll add is that “Big Data” is about volume, velocity, and variety. We now generate immense datasets that are much more difficult to store or analyze using conventional or off-the-shelf hardware and software. Instead of kilobytes or megabytes, the tools for big data must deal with terabytes and petabytes.

The speed at which data is created has also increased – for instance, the proliferation of Tweets and Facebook posts are just two types of data being generated by social media alone, data that can be used by researchers in a number of disciplines.

As for the variety – we have gone far beyond structured data in spreadsheets and tables to unstructured data including email messages, photographs and image files, postings on forums, and even raw video and audio uploads.
Library Publishing

- Open Access publishing funds
- Library Publishing Coalition
  - Dartmouth, Emory, Northwestern, Washington University in St. Louis
  - CMU is also a member
- Forms
  - Online Journals (typically OA)
  - eBooks [HTML, PDF, Kindle, ePub] (not always OA)
  - Digital Projects and Exhibits
  - MIT: IdeaCommons platform

Library Publishing

The Internet has revolutionized the original form of scholarly communication: publishing.

Digital formats have opened up a multitude of modes for open access to not only scholarship and research, but also the gray literature—the plans, papers, correspondence and other materials involved in the planning and execution of research.

Digital Publishing is less than 25 years old, and library publishing is far more recent. The Library Publishing Coalition only began as a project 4 years ago and as an organization 3 years ago this July.

The Library Publishing Coalition (LPC) promotes the development of innovative, sustainable publishing services in academic and research libraries to support scholars as they create, advance, and disseminate knowledge. Several members of the coalition are looking to develop a library publishing practice, while others such as Dartmouth and Emory
Collaboration

Library faculty and professional staff collaborating on research and scholarship with teaching and research faculty. Collaborative teams breaking down barriers between areas of expertise at different points in the research lifecycle and building partnerships with scholars of all types.

• Examples of Technical Expertise:
  - Data Visualization
  - GIS and Mapping
  - Multimedia production
  - Online Exhibits
  - Text Analysis and Text Encoding
  - 3D & Virtual Environments
  - Digital Publishing
  - Digital Storytelling
  - Network Analysis & Visualization
  - Statistical Analysis
  - Topic Modeling

Collaboration:

Digital Publishing is just one example of the services, support, and collaboration that libraries are increasingly offering their campus communities as part of evolving scholarly communications.

While libraries as a whole are service-oriented and their personnel remain dedicated to supporting their communities, the proliferation of new methods and technologies have required libraries to grow a range of technical and subject matter expertise. As the technologies of New Media and the Internet evolve so rapidly, experts must spend greater effort to remain aware of developing trends and learn new tools and methods. Such expertise when grown in the library becomes an asset for the entire campus, rather than being restricted within any one college or discipline.

This combination of expertise and experience is part of what drives the trending growth of digital scholarship centers in research libraries. These centers combine people, spaces, technology, and tools to provide
Library-based Digital Scholarship Centers:

Digital Scholarship broadly defined is the use of digital evidence and method, digital authoring, digital publishing, digital curation and preservation, and digital use and reuse of scholarship. Simply put, digital tools, data sets, and methods increase access as well as generate new possibilities for interactive use and reuse by researchers and student. They move beyond traditional print research by creating hybrid scholarship that uses multiple channels combining print and web-based text, video, audio, still images, and annotation; this can mean new modes of multithreaded, nonlinear discourse that only exist online.

Joan Lippincott, of the Coalition for Networked Information suggests that Centers in Libraries rather than faculty-led Institutes or those housed within Academic departments or Colleges provide a mechanism for the democratization of expensive technologies and a means to experiment with new forms of scholarship without making a personal or departmental monetary investment. DSC can focus on Humanities inquiries, but most work with Humanities, Social Sciences, and in some cases sciences. (Joan
Traditionally library-based DSCs have had a service-oriented mission, but in recent years many have been looking to collaborate more or offer support rather than operate as service bureaus.

These centers vary in size, number of personnel, whether they have faculty, their expertise, technology and tools available. The smallest have one consultant and the largest has several teams, sometimes with faculty housed in academic departments or institutes across campus.

However, as the joint ARL-CNI Workshop on Planning a Digital Scholarship Center last May (2016) suggested, these centers are always local. The character of an institution and the context in which its faculty and students work drives the form of these centers as they grow. This is but one of the continuing challenges – who to hire and which skills and tools to choose to better interest faculty and students in order to attract interest, grow a community of practice, and advance the creation of projects and tools that becomes self-sustaining. Many centers begin thanks to grants from the NEH-ODH or IMLS and other funders such as the Andrew W Mellon Foundation or Sloane Foundation. The challenge remains to create tools and projects that are sustainable, discoverable, and reusable by others regionally, nationally, and globally.

Library-based Digital Scholarship Centers

- Case Western Reserve University
  - Freeman Center for Digital Scholarship
- Duke University
  - Murthy Digital Studio
  - Brandlecone Lab for Data and Visualization Services
- Emory University
  - Emory Center for Digital Scholarship
- Georgia Tech
  - Digital Integrative Liberal Arts Center (DILAC)
- University of Rochester
  - Digital Scholarship Lab
- Stanford
  - Center for Interdisciplinary Digital Research (CIDR)
  - Stanford Geospatial Center
- Vanderbilt
  - Digital Humanities Center
Key Digital Projects from these DSCs:

Project Vox concerns an important, relatively recent, scholarly development in philosophy: the acknowledgement that a number of early modern women have been unjustly ignored in our narratives of the history of philosophy. From Mary Astell, Lady Masham, Margaret Cavendish and Anne Conway in England to Émilie Du Châtelet in France, many women played significant roles in the development of modern philosophy, but their contributions have often gone unnoticed. (images, timeline, philosophers)

The Trans-Atlantic Slave Trade Database has information on almost 36,000 slaving voyages that forcibly embarked over 10 million Africans for transport to the Americas between the sixteenth and nineteenth centuries. The actual number is estimated to have been as high as 12.5 million. The database and the separate estimates interface offer researchers, students and the general public a chance to rediscover the reality of one of the largest forced movements of peoples in world history.
Additional Key Digital Scholarship Projects:

ReEnvisioning Japan: is an open-ended recuperative project based on an original collection of tourism, travel and educational ephemera in a wide range of media. Most of the objects in the collection are common use items; they all document personal experience, cross-cultural encounters, and changing representations of Japan and its place in the world in the early to mid 20th century.

Çatalhöyük Living Archive project is an experimental web application representing data from 21 years of excavation and analysis at that Neolithic settlement southeast of Konya on the Anatolian Plateau in present day Turkey. What you see here is a pilot—early stage work in progress that is paused temporarily the project teams seek resources to develop it further. Directed by Professor Ian Hodder of Stanford University, the project's overarching goal is the reorganization and open publication of all Çatalhöyük data so
Freedman Center: Freedman Fellows (Faculty, $15,000) - digital tools and processes

Part of a 5-year, 5 Billion dollar funding campaign

Two endowed, named librarians for the digital scholarship
Endowed geographic information systems librarian
Faculty fellowships ($1 M endowment, $60K/year for 2 years)
Graduate fellowships ($60k/year, min 2 years)
Undergraduate research awards ($10/year/min 2 years)
Interdisciplinary collaborative projects ($60 k/year/min 2)
Technical support/software and equipment $2 M
A unit dedicated to the strategic digitization of materials for use by scholars and for long-term preservation of special collections
Faculty workshops: $25 k/year/2 years min
Even more varied support: software, platforms, faculty, and methodologies hosted or supported by the libraries' (and/or their budgets).
These are the suggestions several of you advanced in the survey we sent out a short while ago. Those in red might be considered to relate to digital scholarship in its broadest sense.

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<th>workshops</th>
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<td>digital scholarship landscape</td>
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<td>multimedia design</td>
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<td>data visualization</td>
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<td>Digital Science package</td>
<td>testing the reproducibility of code</td>
<td>text and data mining</td>
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<td>(Elements, FigShare, Altmetric)</td>
<td>digitization and OCR assistance</td>
<td>UX Design</td>
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<td>GIS (ArcGIS, QGIS, Carto)</td>
<td>support for digital project creation and websites</td>
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<td>statistical analysis (R, NVivo)</td>
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Survey Comments

Summary
There’s an overall sense that the libraries are at a sort of tipping point.

Comments
• “I think [faculty] see us struggling to find our 21st Century footing.”
• “I think just having a strategic plan in place will be helpful—seems to be a need to unify our goals and efforts across the system.”
• “The library…needs to become the research hub on campus again, but now configured for the digital research age…. That involves it becoming far more tech savvy and also better at marketing what it does for the community…”
• “More collaboration across campuses (Pittsburgh, Qatar, Silicon Valley, Africa, whatever comes next).”
Survey Comments

• “Our campus has grown...the library needs to as well if we want to keep up with the demands and types of services that are needed in the 21st century...”

• “…create a service around connected learning. The idea that learning occurs at the point of need...unbounded by location. [...] a ‘hub’ where students can become members that discuss their research and ask questions. This ‘hub’ would also have ‘subject expert’ participation that would provide additional expert opinion. [...] Think of it as a LibRefBook (or Facebook for library research).”

• “Develop expertise in the ethics of information. [...] We should be on the forefront of helping people cope with ‘alternative facts’ and join with groups helping the federal government to identify, save and archive important data.”

• “…[focus] on sharing expertise with the Pittsburgh business and arts start-up communities...”
Advancing Research

We aspire to:

• Be global leaders in responding to the challenges facing libraries and librarians
• Move toward a global, distributed network of tools enabling evolving methods of discovery
• Help integrate machine learning, digital tools of analysis and information acquisition into new modes of knowledge