

Running Head: E-SCIENCE AND LIBRAIES

E-Science and Libraries:
An annotated bibliography

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LI835: Information Transfer in the Disciplines

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E-Science and Libraries: An annotated bibliography

Armbruster, C. (2008). Cyberscience and the knowledge-based economy, open access and trade publishing: From contradiction to compatibility with nonexclusive copyright licensing. *International Journal of Communications Law and Policy*, (12). 22-38.

This article explores the impact of digitally networked "cyberscience" on knowledge distribution and scientific publishing. Patterns of scientific inquiry based on digitally networked peer production and open sharing of information, Armbruster argues, are fundamentally incompatible with traditional models of scholarly publishing based on the "pursuit and enforcement of exclusive intellectual property rights" (p. 24). Armbruster proposes an alternative model based on the "decoupling of certification and dissemination" (p. 25) in the knowledge distribution system. Dissemination, in Armbruster's model, is taken over by "Guild publishing" (i.e. open-access, nonexclusively licensed electronic publication by academic departments, research institutes and professional organizations) while a new knowledge industry emerges to address the "certification of knowledge" (p. 24) (i.e. peer review, monitoring and re-evaluation of knowledge claims.)

Armbruster's article provides an excellent exploration of the issues involved in successfully navigating the shift towards open content, open access and open source models of knowledge production and distribution. It is vital that librarians understand these issues and become informed participants in the debates on the future of the

academic knowledge economy – as major players in the academic publishing cycle, advocates for their patrons and institutions, and defenders of access to scholarly information.

Atkins, D. E., Droegemeier, K. K., Feldman, S. I., Garcia-Molina, H., Klein, M. L., Messerschmitt, D. G., et al. (2003, January). *Revolutionizing Science and Engineering through Cyberinfrastructure: Report of the National Science Foundation Blue-Ribbon Advisory Panel on Cyberinfrastructure*. Washington, DC: National Science Foundation. Retrieved September 29, 2008 from www.nsf.gov/cise/sci/reports/atkins.pdf.

This National Science Foundation (NSF) report, generally referred to as the "Atkins Report," presents the findings of a panel charged with evaluating current investments in "cyberinfrastructure" (i.e. distributed computer systems for collaborative scientific research) and recommending new directions in the development of such systems. Since its publication it has become the roadmap for the National Science Foundation's efforts to enhance the US cyberinfrastructure and has led to the establishment of the NSF Office of Cyberinfrastructure (OCI).

The report identifies "digital libraries" as an important resource for the collection, storage, organization, sharing, and synthesis of the large volumes of data associated with the cyberinfrastructure. These processes, they state, will "require new paradigms for information classification, representation (e.g., standards, protocols, formats, languages),

manipulation, and visualization" (p. 20). It is unclear, however, whether the panel envisions a role for actual library professionals in the development of these libraries. It is important, therefore, for librarians as a profession to take active ownership of these issues and secure their role as information specialists in the new research environments.

Collins, L., Martinez, M., Mane, K., Powell, J., Kieffer, C., Simas, T., et al. (2007, October). Collaborative eScience libraries. *International Journal on Digital Libraries*, 7(1/2), 31-33.

In this article Collins et al. describe the incorporation of collaborative workspaces into digital libraries supporting e-science programs. They describe prototype communities under development at the Los Alamos National Laboratories that utilize Web 2.0 technologies (blogs, collaborative authoring tools and discussion forums) to create "social" spaces for scientific communication and collaboration.

This article highlights one of the most important roles of the librarian or information professional within e-science – that of facilitating communication and information sharing among researchers. While the infrastructure for data sharing and distributed experimentation is progressing rapidly, accompanying communication and knowledge sharing systems are less highly developed. Library professionals, with their experience in virtual collaboration systems and knowledge management, should be at the forefront of helping develop and implement these systems.

Courant, P. N., Fraser, S. E., Goodchild, M. E., Hedstrom, M., Henry, C., Kaufman, P. B., et al. (2006) *Our Cultural Commonwealth: The Report of the American Council of Learned Societies Commission on Cyberinfrastructure for the Humanities and Social Sciences*. New York: American Council of Learned Societies. Retrieved October 2, 2008 from http://www.acls.org/uploadedFiles/Publications/Programs/Our_Cultural_Commonwealth.pdf.

This report lays out a framework for cyberinfrastructure initiatives in the humanities and the social sciences. It was commissioned by the American Council of Learned Societies in the wake of the NSF Atkins report (Atkins et al., 2003) to expand the focus of cyberinfrastructure development beyond its concentration on the hard sciences and quantitative research. The report looks at the potential for cyberinfrastructure in the humanities and social sciences to "enhance teaching, facilitate research collaboration, and increase public access to (and fair use of) the record of human cultures across time and space" (p. 2).

In contrast to the NSF report, this report addresses the role of libraries more directly. Recommendations affecting libraries include the development of public and institutional policies that foster openness and access, cultivation of leadership in support of cyberinfrastructure within the humanities and social sciences communities, encouragement of digital scholarship, development and maintenance of open standards and scholarly tools, and the creation of digital collections. These recommendations clearly reflect existing trends within the library profession and further advances in

cyberinfrastructure for the humanities and social sciences are likely to be developed in part through library-led initiatives.

David, P. A. (2004). Towards a cyberinfrastructure for enhanced scientific collaboration: providing its 'soft' foundations may be the hardest part. *Oxford Internet Institute, Research Report, 4*. Retrieved Sept 30, 2008 from <http://129.3.20.41/eps/le/papers/0502/0502002.pdf>.

Most investigations into the development of cyberinfrastructure for scientific collaboration focus primarily on technical and engineering concerns. In this article, however, David asserts that the success of the e-science enterprise relies as much on the development of a socio-institutional infrastructure that supports collaboration as it does on engineering breakthroughs. He argues that issues of legal access, governance, and intellectual property make the creation of inter-institutional social and legal agreements just as difficult as the technical considerations. These "soft" concerns must be carefully considered during the cyberinfrastructure development process.

As a profession with a tradition of collaboration and development of collaborative protocols, librarianship can potentially serve as a useful model to help address some of these issues. Furthermore, librarians, as institutional representatives with expertise in intellectual property issues and experience working with other disciplines and institutions, are in an ideal position to help inform the creation of the "reliable and transparent

agreements for the governance of collaborative work" (p. 8) needed for a productive cyberinfrastructure.

Hey, T. & Trefethen, A. E. (2002). The UK e-Science Core Programme and the Grid. *Future Generation Computer Systems*, 18. 1017–1031.

As director of the UK's Core e-Science programme, Tony Hey is responsible for the managing development of the "middleware" (interoperability protocols and software infrastructure) for Britain's national e-Science initiative. In this article Dr. Hay provides an overview of e-science initiatives in the UK and discusses issues in the development of a national (and international) e-Science infrastructure (referred to as the Grid). The article provides a good sense of the monumental scale both of e-Science infrastructure projects and the types of scientific projects being planned.

Many factors involved with the creation of an e-Science infrastructure will be familiar to those in the library professions. Issues of data management, metadata development and archiving are integral to the development of collaborative scientific processes, and as custodians of their institutions' intellectual property librarians should take a role in the development and maintenance of the information systems underpinning these processes.

Hine, C. (2002). Cyberscience and social boundaries: The implications of laboratory talk on the Internet. *Sociological Research Online*, 7(2). Retrieved October 1 2008 from <http://www.socresonline.org.uk/7/2/hine.html>.

One important element of the e-science paradigm is the expansion of scientific communication via information and communications technologies (ICTs). As a model for potential interactions, Hine investigates the usage and communication patterns in an already established online scientific forum. She examines how social and professional boundaries are shaped by the medium, looking at how scientists establish credibility and trust in the absence of peer review or direct knowledge of each other. She also investigates whether online interactions reflect formal scientific communication patterns or less formal collaborative discussions. She finds that scientists' online interactions represent a hybrid communication form – somewhere between formalized scientific discourse and informal laboratory interactions. Credibility, she argues, can be displayed by both these registers: by drawing on established scientific authority and displaying appropriate affiliations and identifications on the one hand, but also by being able to "talk the talk" (§ 5.2) – i.e. displaying of intimate knowledge of laboratory technique and culture in casual discourse.

As more and more scientific discourse moves to ICTs a large body of archived information becomes available to researchers. As such, it is important for librarians to understand the nature of scientific discourse in these channels. As with any informal communication medium, matters of credibility and trust become paramount in analyzing this information. While this study doesn't provide any easy formulas for establishing the

credibility of any particular piece of information, it does provide a framework for how these issues are negotiated within the scientific community itself.

Jankowski, N. W. (2007). Exploring e-science: An introduction. *Journal of Computer-Mediated Communication*, 12(2). Retrieved October 1 2008 from <http://jcmc.indiana.edu/vol12/issue2/janakowski.html>.

This is the introductory article to a special issue of the *Journal of Computer-Mediated Communication* focusing on social scientific research on e-science. Jankowski begins with a useful overview of the history and development of modern e-science initiatives. He follows with a summary of the research included in the journal. Subjects of particular interest to library professionals include the development of typologies of e-science initiatives; the mapping of disciplinary differences in the adoption and utilization of e-science techniques; and issues of intellectual property, ownership and control.

The primary value of this article to librarians (beyond its useful background information) is as a reminder that e-science initiatives are situated within existing contextual and disciplinary frameworks that will have considerable impact on the way these technologies are adopted and utilized. The new collaborative paradigm doesn't mean that librarians should forget their understanding of disciplinary differences – rather it requires them to expand them into this new realm.

Lougee, W., Choudhury, S., Gold, A., Humphrey, C., Humphreys, B., Luce, R., et al. (2007). *Agenda for Developing E-Science in Research Libraries: Final Report and Recommendations to the Scholarly Communication Steering Committee, the Public Policies Affecting Research Libraries Steering Committee, and the Research, Teaching, and Learning Steering Committee*. Washington, D.C.: Association of Research Libraries. Retrieved October 2, 2008 from http://www.arl.org/bm~doc/ARL_EScience_final.pdf.

This report, prepared by the Association of Research Libraries Joint Task Force on Library Support for E-Science, represents the library community's first formal statement on the role of libraries in e-science. The report focuses on the educational and policy roles of research libraries in collaborative research initiatives and develops a framework to begin partnering with other organizations to contribute to "strategic areas of technology development and new genres of publication" (p. 3).

Areas of focus include the creation and maintenance of digital repositories, new processes of scholarly communication, and the challenges of providing information services to virtual communities. More fundamentally the report acknowledges that "nearly all aspects of the research library's classic functions and roles are influenced by these new methodologies" (p. 6), and that we need to "engage the broader community in a fundamental reassessment of the research library's role and structure, in effect, in redefining the research library for a new era" (p. 5).

Wright, M., Sumner, T., Moore, R., & Koch, T. (2007, October). Connecting digital libraries to eScience: The future of scientific scholarship. *International Journal on Digital Libraries*, 7(1/2).

This article introduces a special issue of the *International Journal on Digital Libraries* focusing on digital libraries and e-science. It provides a good overview of recent discussions of e-science within the (digital) library community. The authors begin by pointing out that the basic information management infrastructure is common to both the e-science and digital library communities and that librarians can provide valuable insight and skills in information management and preservation, as well as guidance on policy issues regarding access and intellectual property. Additionally, as major players in the scholarly communication cycle, libraries can provide the knowledge and framework for the creation and elaboration of scholarly communication structures to help support distributed collaborative research (see also Collins, et al. 2007). Finally, Wright et al. discuss the possible role of libraries in helping develop the collaborative systems and infrastructure to move e-science beyond its focus on large-scale, well-funded "big science". Through the development of generic data sharing systems and by providing collaborative support to researchers, libraries can help open up the e-science paradigm to include smaller scale projects and new disciplines.