Part II: Journal Articles and Short-Form Scholarship

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Researchers and scholars communicate informally, typically verbally and in person (lectures, symposiums, conferences), and formally through publications (peer-reviewed journal articles, conference papers, monographs, and edited collections). Short-form scholarship includes publishing research results and arguments as articles and conference proceedings, but newer online forms such as data sets, data visualizations, and blogs are becoming more common, accepted, and even expected. The oldest formal scholarly communication, the scientific article, appears in the journals of learned societies shortly after they were first published 350 years ago and has since become the gold standard for scholarly communication in the STEM (sciences, technical, engineering, and mathematics) disciplines. Although the article is also used in the social sciences and the humanities, these disciplines favor the monograph format.

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Since the 1970s a number of studies have described challenges to the article and journal in scholarly communications as a growing "serials crisis," in which the cost for subscriptions or access to bundled scholarly journals has continued to increase faster than the rate of inflation, requiring libraries to spend more on journals and less on book purchases, in turn helping to create the "monograph crisis" by the early 1990s. Over the past four decades, other challenges developed, in addition to rapidly rising costs—from the sheer volume of publications to exchange rate fluctuations (weaker US $), declining federal and state funding for higher education, reduced university budgets, and the convergence of US and Canadian research library choices in what they purchase/collect that effectively reduces the range of scholarship available to students and researchers.[1] All of these factors became part of a continuing series of crises that have lasted so long that scholarly publishing has been chronically weak and ill for decades.[2] In the 1990s this illness and the advent of the Internet helped spark the open access (OA) movement for academic publications, and today it increases the pressure to experiment with new economic models and to create and use born-digital scholarship as e-journals, e-books, and other hybrid or emerging forms of scholarship.

The Serials Crisis

The price of journal subscriptions has long been a point of discussion and anxiety; however, it took a spike in prices in 1986 and the subsequent ARL Serials Prices Project to help define the serials crisis by 1989. Mary Case, in her essay describing the first two decades of ARL's Office of Scholarly Communication, outlines how the crisis came to be understood only during a Mellon Foundation-funded study of journal subscription costs as part of the overall economics of research libraries that resulted in the 1992 report,

University Libraries and Scholarly Communication.[3] Since then, ARL staff and many other librarians, publishers, and scholars have continued to refine the discussion of the crisis. This state of affairs has lasted so long that many seem to have accepted it as the status quo; some go so far as to blog that the crisis is over[4] or ask if it even occurred.[5] But these crisis naysayers seem to be outliers, most of whom avoided responding to recent arguments that the crisis intensified with the "great recession" of 2007–2009;[6] they were very quickly refuted.[7] The argument over journal pricing remains heated even after sparking the rise of open access journal publishing, a recent heightened period of open access activism including journal boycotts by noted researchers, and the emergence of multiple variants of public and open access publishing.

The serials crisis has not been limited to only the price of journal subscriptions in the 25 years since the term was coined. Since the 1960s the exploding number of journals published, especially in the STEM fields, created such a massive body of scholarship that simply finding information became more difficult as the materials required an ever-increasing share of space and portion of the libraries materials support budget.[8] When impact factors were defined as a means to rank journals in 1969 they helped to create and emphasize hierarchies of prestige and pedigree among publications, yet finding something specific in the vast sea of information became more challenging, even when restricting the searches to the indexes and catalogs of "quality" publications. This massive increase in STEM titles meant that libraries had to choose which to purchase; even the best-funded could not buy everything, and many smaller colleges and universities faced near-impossible decisions over what to cut because no matter how many faculty were part of the selection process, some would continue to loudly argue that they were missing critical teaching and research resources. Although more and more STEM titles were left out of purchasing, the humanities and social sciences bore most of the brunt of these cuts.[9] Adding yet more pressure to this dysfunctional system, inter- and cross-disciplinary journals were launched to meet the growing, yet more narrow and specific, needs of rising multidisciplinary forms of academic research and teaching. However, because they were new, did not generate high impact factors, or were known to only a rarefied segment of the faculty, many of these publications did not make it into the libraries or later bundling plans of commercial publishers and aggregators.

The 1992 Mellon study, *University Libraries and Scholarly Communications*, describes the origins of the crisis in detail and finds its key factors to be: scientific and technical journals tend to be more expensive; they tend to publish more issues per year, often with more pages; and they use more graphics, illustrations, and images than those of the humanities and social sciences.[10] In addition to escalating subscription fees, other aspects of the crisis include the bundling or aggregation of subscriptions, the practice of requiring authors to sign over their copyright, and the highly restrictive licenses that can even prohibit authors from using their own work in future publications and the classroom. This study became the basis for Mellon's allocation of grant funding in a number of interrelated projects, initially by digitizing journal back issues to increase access, then turning to digitizing special collections and other library resources, before moving into shoring up and strengthening the scholarly publishing system, especially with the most recent experiments to expand the digital infrastructure of university presses. The Mellon Foundation was not alone in its efforts; the National Endowment for the Arts (NEA) and National Endowment for the Humanities (NEH), among others, also contributed to experiments and advances in the system of

scholarly communication, but since the 1990s budget cuts for the NEA and NEH (public funding) have led to Mellon (private funding) coming to overshadow the rest. Mellon's commitment and resources help set much of the direction for current experiments and projects using the Internet and digitization to better promote scholarly communication.

Reactions to the Serials Crisis

Responses to the rising cost of supporting journal subscriptions included the collective response of library consortia, strengthening interlibrary loan, digitizing back issues, creating digital or e-journals, open access and public access publication, and experiments with alternative short-form formats. Library consortia are not new, but in recent years they have become increasingly involved in the purchase and licensing of electronic resources including databases and bundled journal subscriptions, first introduced in 1996 with Academic Press's "Big Deal." However, 15 years after these bundling options were introduced they were no longer as effective as they had been in increasing the ability of individual libraries to access resources, as members of consortia or individually. As Richard Poynder points out, the bundled option only worked for a short while as the large line-item purchasing limited the flexibility of library directors to apply their budgets and resources more selectively. By 2011 it was apparent that bundling had failed to curb costs—the cost of the bundled deals had risen from 50% of a library's purchasing budget to around 65%.[11] Poynder describes the response, "as publishers' journal portfolios got larger and larger as a result of industry consolidation, the Big Deals began to devour an ever larger portion of a library's budget."[12] Regardless, faculty continue to clamor for access but have only slowly started to embrace alternative publishing options such as OA journals or the voluntary deposit of even their pre-press publications in institutional repositories.

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Innovations in Digital Journal Publishing

In the 1980s librarian-futurists such as Martin Cummings and David Lewis believed that electronic publication of all journals and books was the future of a near-universal scholarly communication system. Cummings argues that electronic publishing would be used because of the advantages it would offer: "(1) more than one person can access and use the information simultaneously; (2) it is always available (e.g., never at the bindery, misplaced, or lost); and (3) it can be expected to be more durable than information on paper."[13] Cummings had expected electronic publications to be stored on optical or compact disks, but as with the experiments in putting magazines and journals on floppy disks, these media proved ephemeral. Donald Waters points out that by 2005 peer-reviewed scholarly journals were migrating "from print to electronic publication…at a particularly rapid pace" and that a growing number of "editors are treating the electronic versions of journals as the definitive versions of record."[14] Migrations to electronic journal or e-journal format helped make scholarship more accessible, searchable, and citable, but the exponential

growth of such journals (especially STEM) meant an increased risk of work being lost or overlooked, although journal aggregators and online full-text databases help mitigate against such loss. These newer e-journals began to offer enhancements beyond print and full-text searches as evolving technology enabled embedded images, illustrations, graphs, photos, video and animation clips, and hyperlinks to references and other sources. However, many libraries had to reduce or discontinue some of their print subscriptions to free up funds for new e-journal subscriptions, with others turning to the growing number of open access publications for their users as well. Regardless, Waters warned that libraries (and other subscribers) only licensed access to the "content stored on remote systems controlled by publishers" and that consolidation put this control into "fewer and fewer hands,"[15] necessitating not only some form of sustained access but also the creation of digital archiving services as access was not the same as ownership and material could be lost.

In 1993 the Mellon Foundation began experimenting with new approaches to reinforce the work of research libraries to support scholarship and higher education in general; these included "online, stand-alone, and hybrid technologies, applied to a range of arts and sciences fields in a variety of institutional settings (from small colleges to large research universities)."[16] Mellon emphasized "electronic publishing" broadly by providing grant support to a number of institutions exploiting new technologies in wide variety of approaches in part as a response to the growing crisis in scholarly publishing. In 1994 Mellon began to support the creation of e-journals as well as the digitization of back-issue journals; this meant, among other things, grants to MIT to establish an e-Journal, *The Chicago Journal of Theoretical Computer Science*, which did not restrict the use of its content, making it a very early completely open access publication. Mellon in concert with the NEH helped Johns Hopkins University Press to make their 40 scholarly journals available digitally through Project MUSE (formerly the University Press Ebook Consortium), greatly enhancing their accessibility, but only within those institutions that paid to subscribe to these works. The use of a paywall helped Project Muse recover costs, so within a few years it had expanded to include other scholarly presses and journals as part of its subscription-restricted content as a "leading provider of online journals in the humanities and social sciences." [17] In 1994 another much more ambitious program was begun, the Journal Storage project (JSTOR); it was conceived of as a means to reduce the costs of (physical) storage, and to enhance access and usage of academic articles by digitizing journal back-issues in the humanities and social sciences.[18] JSTOR began by page-scanning series to supply 600 dpi images as downloadable PDFs in a database, but also began experimenting by adding SGML tags in 1995 to aid in indexing and discovery, providing an example for future digital works to emulate.[19] By 1996 JSTOR had grown to include 100 scholarly journals in a number of fields, with more publishers beginning to recognize the practical advantages to having their materials contained in the database to augment print publication.

In April 1997 a conference largely supported by the Mellon foundation was held at Emory University in which a large number of papers discussed issues surrounding electronic publishing, including: "journal pricing and user acceptance, patterns of use; technical choices and standards, licenses, copyright, and fair use; and multi-institutional cooperation."[20] The great success of JSTOR led to the creation of the ARTSTOR project, another database whose creation would parallel, complement, and even extend the mission of JSTOR to provide textual content by "organiz[ing] and distribut[ing] electronic archives of art

images, manuscripts, and relevant scholarship."[21] By 1999 JSTOR had been created as a stand-alone, not-for-profit enterprise, and by 2000 its institutional subscriptions made it self-supporting and a model for future e-journal publishing, especially more recent efforts to create only digital and not print editions. Digitization made more materials available to students and faculty, but, because of paywall restrictions, not to independent scholars or most of the general public who had been part of the earlier visions of the digital future and are part of contemporary references to lifelong learning and citizen-scholars. However, starting in the fall of 2011, JSTOR began to incorporate this mission by making more public domain content freely available to the public,[22] and in 2014 began offering its JSTOR Daily articles freely and publicly.

The early experimentation with digital versions of magazines and journals distributed on floppy disks and CD-ROMs were only of limited success and short-lived, but the success of digitized (PDF) articles in JSTOR and Project Muse helped those who wanted to increase access to and use of journals to pursue more born-digital formats. Commercial and not-for-profit publishers made their digital journals more available to an academic audience by establishing their content behind paywalls or through subscriptions similar to the existing big bundle options, but others attempted more ambitious open access plans. Unfortunately, of these early experiments, only half of the 86 OA journals being published in 1995 were still active by 2001 as the initial two to five years of "enthusiasm" waned, strongly suggesting that alternative funding was a necessity for sustainability. [23]

A number of other online journals and experiments with short-form scholarship have been much more successful. HighWire Press, affiliated with Stanford University since 1995, started with the *Journal of Biological Chemistry* (JBC Online) and later added *Science*, the *Journal of Neuroscience*, and *Proceedings of the National Academy of Sciences* (PNAS); it now numbers at least 1,700 journals, accessed through institutional and member subscriptions. Since the late 1990s other significant STEM e-journals have been created and thrive today. In the medical field, PubMed Central (PMC), the NIH's full-text database, was founded in 1996; BioOne (1999) a nonprofit publisher and full-text aggregator offers more 180 titles in *BioOne Complete*, as well as its OA journal, *Elementa: Science of the Anthropocene* through library site subscription. PLOS, the Public Library of Science, was founded in 2001 and reorganized into an OA publisher in 2003 by using article processing charges (APCs) paid by authors (or their institutions) [24] to allow unrestricted access and reuse of its content (articles) under a gold open access model [25] within its journals *PLOS Biology* (October 2003), *PLOS Medicine* (2004), and several others.

To enhance the accessibility and discoverability of many of these digital publications, in 2003 the *Directory of Open Access Journals* (*DOAJ*) was founded as a comprehensive directory of journals that conform to the Budapest Open Access Initiative definition of "open access" [26] by supporting the rights of users to "read, download, copy, distribute, print, search, or link to the full texts of these articles." [27] As of June 1, 2015, the *DOAJ* includes: 10,596 journals, 6,385 searchable at the article level; 134 countries; and 1,912,328 articles.[28] Beyond the directory, the number of searchable online databases of scholarly journals have expanded to also include: the Academic Journals Database, Open Access Journals Search Engine, Genamics, JURN Directory for the Arts & Humanities, the British Library's Zetoc, and RoMEO Journals database, among others. But the vast majority of these databases appear to be STEM, many funded on the gold access

model using APCs or author-provided subventions. Some projects have led to completely OA web-based platforms run by scientists themselves, such as arXiv for the physical sciences and bioRxiv for the biological sciences. The acceptance of APCs also led to the rise of "predatory" open access publishers and stand-alone journals, which in 2015 the academic librarian Jeffrey Beall lists at 825 publishers [29] and 701 journals,[30] respectively.

Some of the first experiments in providing digital access used the back-issues of humanities and social science journals, but these disciplines have generally been much slower in adopting e-journals and remain resistant to public access and open access. Regardless, first the Humanities and soon thereafter the social sciences became the testing ground for not only digital humanities projects, but also new digital publishing initiatives beginning in the 1990s. The Public Knowledge Project (PKP) was founded in 1998 and created the Open Journal Systems (OJS) as an online, freely available, open-source journal management and publishing platform, initially in Canada, as an alternative to paying publishers for access. The Mellon Foundation selected several institutions to receive grants in 2008 to support humanities and social science publishing initiatives in e-journals: the *Journal of the Society of Architectural Historians*; the American Philological Association for the electronic version of *L'Année Philologique*; and the University of York for the online journal, *Internet Archaeology*, to commission articles based on four US archaeological projects.[31] The University of California Press (UCP) started *Collabra* in 2014, while it will begin by publishing open access STEM titles using an APC variant as its economic plan, UCP plans to expand to social sciences and the humanities over the next three years. Beyond *Collabra* (and its open monograph publishing system, Luminos), UCP is also experimenting with payment plans that enhance the typical gift-economy model and shift the reward back to scholars-as-participants (authors, reviewers, and editors) with a pay-it-forward community approach to its APCs to support OA publication. Open access publication at large is a far more nuanced discussion that extends beyond the e-journal, even though green or gold access are an aspect of how many publishers (with PLOS one of the best examples) are handling payment and access to content, as opposed to the paywall or subscription-based access of Project MUSE and (most of) JSTOR content. Most recently Mellon funding is being used to help support the Hypothes.is Project "to enhance its open source software platform and implement annotation services within Project MUSE; Michigan Publishing's *Journal of Scholarly Publishing*; Scalar, the multimedia authoring and publishing application developed at the University of Southern California; and MLA Commons, an online platform for scholarly collaboration and networking."[32]

Institutional Archives and Repositories

The proliferation of born-digital e-journals required a new form of preservation and the practice of archiving these digital publications in institutional repositories (IRs) developed in the 1990s. Kathleen Fitzpatrick points out that no single institution could archive everything, and that attempting to do so is beyond the means of even the best-funded research libraries, yet preservation is even more critical for born-digital works.[33] In 1998 the LOCKSS (Lots of Copies Keep Stuff Safe) program was started at the Stanford University Libraries as a way to safeguard digital assets. LOCKSS was also supported with funding from the Andrew W. Mellon Foundation, the National Science Foundation, and the Library of Congress before it became self-sustaining in 2004. CLOCKSS (Controlled LOCKSS), with servers at Rice,

Indiana, and Stanford universities, is a not-for-profit joint venture of libraries and publishers to ensure long-term access to digital scholarly publications. A similar archive is the Scholars Portal, founded in 2002 by the Ontario Council of University Libraries as shared infrastructure and collections among 21 provincial university libraries. Another outcome of Mellon funding is Portico, created in 2002, as a digital archive serving the academic community by helping it transition from print to digital content.

Between Short- and Long-Form

Born-digital research output has also gone beyond the early PDFs of article page-scans and HTML essays to formats that fall between the article and the monograph. Georgetown University Press offers a Digital Shorts product that is a peer-reviewed and professionally copyedited essay that falls between 10,000 and 40,000 words. Palgrave Macmillan uses its Pivot line to sell 25,000–50,000 word essays that are far longer than an article, yet remain shorter than monographs. MIT Press has gone yet another direction is selling excerpts (perhaps better thought of as "teasers") of its monographs as stand-alone products. These new formats have not been as successful as the university press might like, but they are similar to the use of blogs and some forms of social media in that they provide more immediate work to the public and suggest greater experimentation will come in the near future.

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