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**Roger C. Schonfeld: JSTOR**

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## The Idea at Denison, the Project at Mellon

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WE BEGIN in late 1993, when a discussion before the Board of Trustees of Denison University alerted one trustee, William G. Bowen, to the possible demand for a digital library of scholarly journals. Shared with colleagues at the Andrew W. Mellon Foundation, of which he was president, and beyond, the initial idea matured rapidly into the basis for a major project. This chapter summarizes the influences that led Bowen to his idea, and it illustrates both how much thought went into the development of the proposed project and how rapidly the project began to congeal.

Denison University is an academically selective liberal arts college in Ohio, and Doane Library is one of the key landmarks on its beautiful campus. By the early 1990s, Doane's overcrowded and often-inaccessible stacks were no longer adequate. Denison's books, journals, and other library collections had filled all of the available space. There was no room to store new materials acquired for the collection. Responding to this need, the administration added the expansion of Doane Library to a list of capital projects on the horizon that it presented to the board of trustees in late 1993. President Michele Tolela Myers had to ask the board to find funds for a substantial and expensive library expansion.

The problems facing Denison's library had particular resonance with one of the trustees. In addition to being president of the Andrew W. Mellon Foundation, William G. Bowen was president emeritus of Princeton University and an economist specializing in nonprofit organizations. With William Baumol, he had written the definitive study of the economics of the arts, and even before becoming a university provost and president he had written on the economics of higher education. The 1966 Baumol-Bowen study had identified "cost-disease" as the core problem of nonprofit service-intensive organizations.<sup>1</sup> In most industries, new technology brings increases in productivity, allowing the same number of workers to produce more goods (or fewer workers to produce the same amount). A classic example is the assembly line, which

<sup>1</sup>William J. Baumol and William G. Bowen, *Performing Arts—The Economic Dilemma: A Study of Problems Common to Theater, Opera, Music and Dance* (New York: Twentieth Century Fund, 1966).

transformed industrial productivity. Baumol and Bowen showed that, because the service-intensive nonprofits are so reliant on labor, they are less able to take advantage of technology and thus they grow ever more expensive relative to the output of the economy as a whole. Indeed in some instances the amount of labor is irreducible: it will always take four musicians to perform a string quartet. Even though these socially beneficial organizations grow ever more expensive, we want them to flourish, and so a solution must be found to prevent them from becoming economically nonviable. The next year, Baumol would demonstrate that precisely the same phenomenon holds for academic libraries.<sup>2</sup>

### ACADEMIC LIBRARIES IN THE 1970S AND 1980S

By the 1970s, with inflation rampant in the United States, the cost-disease was beginning to translate in to real problems for libraries, which began to take up some suggestions for savings. But although many libraries began to automate operations, such as circulation, the early evidence of the savings that should have resulted was uncertain at best.<sup>3</sup> Much technology, such as databases like Dialog, brought increased scholarly utility, but also increased costs.<sup>4</sup> One prior success was in cataloging, where various subscription services allowed libraries to do without scores of redundant catalog staff around the country.<sup>5</sup> The Online Computer Library Center (OCLC) instituted a cooperative cataloging program, allowing electronic catalogs to be developed without local cataloging.<sup>6</sup> The success of automation and cooperative cataloging notwithstanding,

<sup>2</sup>William J. Baumol and Matityahu Marcus, *On the Economics of Library Operations* (Princeton, NJ: Mathematica, for the National Advisory Commission on Libraries, 1967).

<sup>3</sup>William J. Baumol and Sue Anne Batey Blackmun, "Electronics, the Cost Disease, and the Operation of Libraries," *Journal of the American Society for Information Science* 34, no. 3 (1983): 181–91.

Then again, some of the automation itself began only in fits and starts. See Harrison Bryan, "American Automation in Action," *Library Journal*, January 15, 1967, 189–96.

<sup>4</sup>For the state of the art, a useful source is Thomas H. Martin, *A Feature Analysis of Interactive Retrieval Systems* (Springfield, VA: National Technical Information Service, 1974).

<sup>5</sup>Even this case is somewhat simplistic. In fact, the subscription services arose concurrently with the modern notion of cataloging. It is unlikely that, in the absence of the card catalog services, so many libraries would have offered professionally cataloged collections.

<sup>6</sup>The cooperative cataloging system allowed the first cataloging record, often created by a librarian at the Library of Congress, to be downloaded into the catalogs of all other libraries that accessioned the title. Thus each book would be cataloged professionally only once nationwide, rather than hundreds or thousands of times, eliminating a huge redundancy. See Arthur T. Hamlin, *The University Library in the United States: Its Origin and Devel-*

they did nothing to reduce academic libraries' voracious demand for books and journals.

Saving money by making expensive staff redundant was the only way to combat the cost disease directly—by increasing labor productivity—but it was hardly the only way to restructure libraries to save money. Thinking more radically, some librarians began to wonder if “library growth [can] be curbed or halted,” moving toward a zero-growth model.<sup>7</sup> The “steady-state” collection model made the most sense within an efficient system of interlibrary lending (ILL) of nonlocal resources, which OCLC's national catalog helped to provide. Substantial efforts were undertaken to research the optimal balance between local and remote collections, given a variety of ILL arrangements.<sup>8</sup>

Other proposals, which were at least vaguely related, called for some sort of central lending library for periodicals. Two of the reasons for focusing on periodicals were the facts that their rising costs functioned as a “permanent prior lien” on the budget and that there were often local bibliographic entrance points in the form of A&I resources.<sup>9</sup> By the late 1970s, these ideas had coalesced into a proposal for a National Periodical Center (NPC), a central warehouse to store materials. It was predicted that the NPC would “reduce the number of back issues that each library must keep, thus relieving the pressure for expansion of library buildings”—and the vigor of one supporter's protestations to the contrary may indicate that it was intended to encourage massive subscription cancellations.<sup>10</sup> Indeed, some proponents were explicit about this,

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*opment* (Philadelphia: University of Pennsylvania Press, 1981), 208–9. Moreover, without OCLC, e-catalogs would not have been possible, and there is no question but that electronic catalogs have increased productivity, not to mention utility, for researchers. For a somewhat preliminary analysis of the potential to save costs, see Herman H. Fussler, *Research Libraries and Technology* (Chicago: University of Chicago Press, 1973), 65–66. For a historical overview of library cooperation, see David C. Weber, “A Century of Cooperative Programs among Academic Libraries,” *College & Research Libraries*, May 1976: 205–21.

<sup>7</sup>Daniel Gore, ed., *Farewell to Alexandria: Solutions to space, growth, and performance problems of libraries* (Westport, CT: Greenwood Press, 1976), 4.

<sup>8</sup>Some such studies include: [Scott Bennett], *Report on the Conoco Project in German Literature and Geology* (Stanford, CA: Research Libraries Group, 1987); T. Mackey, “Interlibrary Loan: An Acceptable Alternative to Purchase,” *Wilson Library Bulletin* 63 (January 1989): 54–56; and Bruce Kingma, “The Economics of Access versus Ownership: The Costs and Benefits of Access to Scholarly Articles via Interlibrary Loan and Journal Subscriptions,” in M. A. Butler and B. R. Kingma, eds., *The Economics of Information in the Networked Environment* (Washington, DC: The Association of Research Libraries, 1996).

<sup>9</sup>Fussler, *Research Libraries*, 37.

<sup>10</sup>*Scholarly Communications: The Report of the National Enquiry* (Baltimore: Johns Hopkins University Press, 1979), 13–15, 18–20, 160–64. This study received support from the federal government, the American Council of Learned Societies, and a number of foundations including the Andrew W. Mellon Foundation.

with one writing that such a library would offer “constructive encouragement to a participating institution to reduce its own acquisitions, with the knowledge that the unpurchased materials will, in fact, be available.”<sup>11</sup> The idea was appealing because it allowed for “remote” collections while fairly apportioning the costs (and not forcing research libraries to become the “remote” collections for smaller libraries).<sup>12</sup> But among the librarians supporting this proposal, there is no evidence of any examination of how the cancellations engendered by the NPC might raise the costs of, or put altogether out of business, scholarly periodicals.<sup>13</sup>

Others thought that the remote storage of library materials in less expensive off-campus facilities would be more realistic than altogether static local collections or the ambitious but unrealized NPC. Beginning in the late 1980s, a number of libraries began to develop such remote facilities, which were in essence closed-stack warehouses for books.<sup>14</sup> Indeed, the consortia movement really started with libraries uniting to facilitate resource-sharing via ILL and off-campus facilities; OhioLINK, a statewide organization of academic libraries, was a prime example.<sup>15</sup>

Even before Bowen’s arrival as president, the Mellon Foundation had also sought to find ways to offset the cost-disease for colleges and universities, and not least their libraries. In 1975, with the assistance of Mellon funds, the libraries of Columbia, Harvard, and Yale universities and the New York Public Library united to form the Research Libraries Group (RLG), a membership organization that would eventually deploy an online union catalog, that is, a collective catalog including the holdings of multiple libraries. One important aim of RLG was to find efficiencies in collections development, perhaps by coordinating the subject strengths of its constituent libraries to avoid unnecessary duplication of research materials.<sup>16</sup> With the savings that would result, the libraries would be better able to maintain their core mission of building robust

<sup>11</sup>Fussler, *Research Libraries*, 35.

<sup>12</sup>*Ibid.*, 38.

<sup>13</sup>Other possible flaws, seen by one author as fatal, were discussed in Sheila T. Dowd, “Fee, Fie, Foe, Fum: Will the Serials Giant Eat Us?,” in Sul H. Lee, ed., *The Impact of Rising Costs of Serials and Monographs on Library Services and Programs* (Binghamton, NY: The Haworth Press, 1989), 17–38.

<sup>14</sup>Danuta A. Nitecki and Curtis L. Kendrick, *Library Off-Site Shelving: Guide for High-Density Facilities* (Englewood, CO: Libraries Unlimited, 2001).

<sup>15</sup>David F. Kohl, “Cheaper by the (Almost Half) Dozen: The Ohio State-Wide Remote Storage System,” in Nitecki and Kendrick, *Library Off-Site Shelving*. Glenda A. Thornton, “Impact of Electronic Resources on Collection Development, the Roles of Librarians, and Library Consortia,” *Library Trends* 48, no. 4 (Spring 2000): 842–56.

<sup>16</sup>RLG also sought to catalog materials not represented in OCLC, and to catalog in ways that would be more useful for a research library.

research collections in the face of rising costs. Although RLG has provided many useful services for academic libraries, efforts to coordinate collections development required too many compromises to be effectively implemented.<sup>17</sup>

Despite the best efforts of so many, the 1980s brought only retrenchment to academic libraries. By the end of the decade, observers feared that academic libraries had reached a point of crisis.<sup>18</sup> The culprit was believed to be scholarly journals.

The economics of scholarly journal publishing is very similar to the economics of the creation and distribution of all sorts of information, from scholarship to entertainment. Academic journals, like movies, music, and newspapers, involve high up-front costs for creation, but low marginal costs for providing an additional copy to an additional consumer. Consequently, when a journal is sold on a fee-per-copy basis, its profit or loss is largely dependent on the number of subscribers.<sup>19</sup>

Beginning in the 1970s and accelerating to shocking proportions in the 1980s, the price of scholarly journals skyrocketed, especially in the sciences. Several factors, including exchange rates, paper costs, publishers' profit margins, and postage, combined to damaging effect. At the same time, new journals were constantly spawned in response to ever-increasing scholarly specialization.<sup>20</sup> Structural deficits at leading universities meant that library budgets were unable to keep pace with rising prices. Budget constraints forced cutbacks, first on duplicate subscriptions and then on primary ones.

As libraries canceled journal subscriptions in the face of rising prices, publishers experienced pressure on their profit margins. They were forced to raise prices even further.<sup>21</sup> In turn, libraries were forced to cut

<sup>17</sup>See Nancy Gwinn and Paul Mosher, "Coordinating Collection Development, The RLG Conspectus," *College & Research Libraries* 44 (March 1983): 128–40; and Hendrik Edelman, "The Growth of Scholarly and Scientific Libraries," in Richard E. Abel and Lyman W. Newli, eds., *Scholarly Publishing: Books, Journals, Publishers, and Libraries in the Twentieth Century* (New York: John Wiley & Sons, 2002). See also "The RLG Conspectus and the National Shelflist Count," in Thomas E. Nisonger, *Collection Evaluation in Academic Libraries: A Literature Guide and Annotated Bibliography* (Englewood, CO: Libraries Unlimited, 1992).

<sup>18</sup>Ann Okerson, "Of Making Many Books There Is No End," *Report of the ARL Serials Prices Project* (Washington, DC: Association of Research Libraries, 1989).

<sup>19</sup>See Gillian Page, Robert Campbell, and Jack Meadows, *Journal publishing* (Cambridge: Cambridge University Press, 1997), chapter 8.

<sup>20</sup>Roger Noll and W. E. Steinmueller, "An Economic Analysis of Scientific Journal Prices: Preliminary Results," *Serials Review* 19 (1992): 32–37.

<sup>21</sup>Although this phenomenon has been established most clearly for scientific, technical, and medical journals, even the most important humanities journals reported similar phenomena. The *American Historical Review*, which would be a key early component of

back further.<sup>22</sup> This spiral of price increases and journal cancellations plagued both libraries and publishers for many years.<sup>23</sup> In the aftermath, it should be noted, academic libraries spend a far greater share of their materials budgets on journals, as opposed to monographs, and on the sciences, as opposed to the humanities, than they did before. The situation as it stood was unsustainable, for both scholarship and the bottom line. The higher-education community felt it was being priced out of adequate library resources, even as college and university budgets were experiencing ever more pressure.

### THE MELLON FOUNDATION CONTEXT AND BOWEN'S IDEA

The increasing pressure on academic libraries had, by the early 1990s, become a significant concern of the Mellon Foundation. Founded in 1969, The Andrew W. Mellon Foundation was always concerned with the health of higher education, the arts and humanities, and research libraries, making grants for specific projects and endowing programs in these areas.<sup>24</sup> Although Mellon had supported some efforts to find savings for academic libraries for a number of years, the problems were getting worse. With a mission focused on the support of higher education and the humanities most specifically, Mellon leaders felt compelled to act as scholarly resources, especially in the humanities, became increasingly endangered.

Concerned that this cycle should be definitively documented before embarking on a grants program to alleviate it, the Mellon Foundation's research staff studied both the causes and the effects of this cost-escalating spiral. One alarming finding was that academic libraries were collecting a smaller and smaller percentage of scholarly output. Published

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JSTOR, has indicated that "with institutional subscribers, it's been a long, slow decline, and that continues," even in 2001, by some 50–100 subscriptions per year. Many of the losses were to high school libraries, small public libraries, and foreign academic libraries. Institutional prices were increased by one-third in the late 1990s as a result. Arnita Jones, interview with the author, September 20, 2001.

<sup>22</sup>But rather than saving costs, these cancellations often resulted, ironically, in higher costs, for ILL and document delivery rather than traditional subscriptions, according to some scholars. Carol Tenopir and Donald W. King, "Setting the Record Straight on Journal Publishing: Myth vs. Reality," *Library Journal* 121 (March 15, 1996): 32–35.

<sup>23</sup>Just a few years later, a Mellon Foundation senior advisor, the Princeton economist Richard E. Quandt, published a formal model to explain what had been taking place, "Simulation Model for Journal Subscription by Libraries," *Journal of the American Society for Information Science* 47:8 (1996): 66–67.

<sup>24</sup>See *Report of the Andrew W. Mellon Foundation, 1969–1993*.

in 1992 as *University Libraries and Scholarly Communications*, the study also contained an investigation of how developing technologies might ameliorate the problem, by “suggest[ing] a model for the library of the future that may differ sharply from the traditional one.”<sup>25</sup> Even if it was not then possible to say with any specificity what the model should be, it was clear that new technologies might permit (or force) the adoption of better methods of distribution that could stand up to evolving economic climates. Overall, Tony Cummings and his co-authors saw some possible stumbling blocks but much potential for innovative solutions.

With renewed confidence that its staff understood the environment, the foundation altered its grant making for academic libraries. In the foreword to *University Libraries*, Bowen indicated some likely impacts:

Specifically, we are examining the possibility of evaluating systematically some of the “natural experiments” in new modes of electronic publication and dissemination . . . and we might simultaneously encourage the development of some carefully structured experiments designed to address some of the open questions of quality, means of access to materials, convenience, and cost.<sup>26</sup>

Richard Ekman, the foundation’s secretary (now at the Council of Independent Colleges), and Richard E. Quandt, a Princeton economist and one of the foundation’s senior advisors, embarked on a systematic evaluation of preexisting natural experiments.<sup>27</sup> Having surveyed the terrain, Ekman and Quandt presented their findings to the Mellon board of trustees.<sup>28</sup> The trustees approved a program of grants, run by Ekman and Quandt, to encourage a series of “self-conscious natural experiments” on how technology could help the system of scholarly communications find efficiencies while, if possible, increasing scholarly utility. Although this program would encounter some measure of resistance,<sup>29</sup>

<sup>25</sup>Anthony M. Cummings, Marcia L. Witte, William G. Bowen, Laura O. Lazarus, and Richard H. Ekman, *University Libraries and Scholarly Communications* (Washington, DC: The Association of Research Libraries for the Andrew W. Mellon Foundation, November 1992), 7.

<sup>26</sup>Page x.

<sup>27</sup>This survey was eventually published as Richard H. Ekman and Richard E. Quandt, “Scholarly communication, academic libraries, and technology,” *Change* 27, no. 1 (January 1995): 34–44.

<sup>28</sup>Richard H. Ekman and Richard E. Quandt, “Potential Uses of Technology in Scholarly Publishing and Research Libraries,” discussion paper presented to the trustees of the Andrew W. Mellon Foundation, December 13, 1993 (unpublished).

<sup>29</sup>See, for example, Albert Henderson, “The Growth of Printed Literature in the Twentieth Century,” in Richard E. Abel and Lyman W. Newlin, eds., *Scholarly Publishing: Books, Journals, Publishers, and Libraries in the Twentieth Century* (New York: John Wiley & Sons, 2002), 6–7.

it would also foster a great deal of innovation. Under their leadership until 1999, this program made awards that totaled \$19 million.<sup>30</sup>

When Bowen was mulling the proposed library expansion at Denison in late 1993, the economic problems of academic libraries—and possible cures for their ills—had been on his mind for years. At Princeton, Bowen had seen unceasing pressure to build additions and annexes to Firestone Library, and he knew that similar pressures affected academic libraries everywhere.<sup>31</sup> In working on the study of academic libraries and preparing for the Ekman-Quandt program, Bowen and other staff at the foundation had been mulling the application of technology to academic libraries. As Louis Pasteur said several times, “chance only favors the prepared mind.”<sup>32</sup> But for the foundation’s work at the time and Bowen’s own interest in cost-disease, Bowen might not have thought twice about the need to expand Denison’s Doane Library.

The cyclical pressures to construct or expand university and college libraries as collections grew continued steadily, but only rarely had librarians and administrators acted to alleviate them. Perhaps these pressures were largely ignored because, constituting capital costs, they were often viewed as inevitable. Certainly, academic communities perceived libraries to be at their very heart, and the size of a library was often perceived as a measure of academic quality. With his mind “prepared,” however, Bowen saw a special opportunity.

New technologies of the sorts that Ekman and Quandt had been studying could be used to help libraries like Doane. Specifically, Bowen thought that some of the library resources could be effectively “miniaturized” using computer technology so that they would no longer have to be held in physical form. Bowen knew that the storage problem affected many schools beyond Denison. Focused principally on teaching, most of the Doane collection would be redundantly stored at hundreds, in some cases thousands, of other college libraries across the country—

<sup>30</sup>Perhaps the most significant grant made under this program was to Johns Hopkins for Project Muse, but grants were also awarded in support of Project SCAN at the University of California, the *Bryn Mawr Classical Review*, and the *College Art Association Review Journal*. For a retrospective, see Richard E. Quandt, “Mellon Initiatives in Digital Libraries: 1994–1999,” April 2002, Unpublished manuscript on deposit at the Nathan Marsh Pusey Library, the Andrew W. Mellon Foundation. Some intermediate outcomes of the foundation’s program in this area are collected in Richard Ekman and Richard E. Quandt, eds. *Technology and Scholarly Communications* (Berkeley: The University of California Press, 1999).

<sup>31</sup>William G. Bowen, “The Princeton Library: Report of the President March 1986,” in *Ever the Teacher: William G. Bowen’s Writings as President of Princeton* (Princeton: Princeton University Press, 1987), 270, 279.

<sup>32</sup>Louis Pasteur, *Œuvres*, ed. René Valléry-Radot (Paris, 1922–1939), vol. 7, 131.

libraries that would also benefit from the project. Even if the costs of miniaturization were far higher than the savings that accrued to Denison alone, such a digital system could be distributed nationally to several hundred institutions, taking advantage of what would presumably be its low marginal costs. The concept's scalability was particularly appealing because the low marginal costs that were anticipated meant that the savings would increase with the scope of the project.

So before Denison's board considered any action, Bowen asked library staff to determine what parts of the collection were consuming so much stack space. The study concluded that the breakdown was 64 percent books, 23 percent scholarly journals, and 13 percent government documents.<sup>33</sup> Earlier in 1993, President Clinton had signed a law mandating the distribution of large numbers of government documents electronically, which might reduce or eliminate the need to continue collecting such documents locally. But, as always, book and journal distribution and storage relied on the same format—print. And print materials were continuing to eat up stack space as omnivorously as ever.

Journals presented a unique opportunity, compared with other print materials, for a creative approach. In the case of books, copyrights were held by a mélange of authors, publishers, and literary estates, the negotiations for which could be difficult and costly. The backfile of an important journal, on the other hand, might stretch back a hundred years or more, and it seemed likely that the rights to each set of these volumes was held by a single publisher. Consequently, Bowen believed that a single negotiation with the publisher could secure the rights to a hundred volumes of important materials. Although not quite "one-stop shopping," a single negotiation for a hundred volumes was believed to offer the advantage of substantially reducing the cost of creating the database.<sup>34</sup> Bowen may also have believed at this time that the microfilm company UMI held the rights to most of the journal backfiles, which, if it had been true, would have indeed resulted in one-stop shopping for the project (a possibility that is treated at greater length in chapter 2). Journals alone occupied nearly a quarter of the total shelving in Doane Library, their ever-lengthening backfiles growing inexorably at approximately 3 percent per year, even though Doane was already

<sup>33</sup>"Library Space Use," unsigned memorandum, December 22, 1993, Denison University librarian's office.

<sup>34</sup>One prominent observer believes that this advantage in moving journals online has constituted a complementary impediment in the development of electronic books. Clifford Lynch, "The Battle to Define the Future of the Book in the Digital World," *First Monday*. Available at [http://www.firstmonday.dk/issues/issue6\\_6/lynch/index.html](http://www.firstmonday.dk/issues/issue6_6/lynch/index.html).

filled beyond capacity.<sup>35</sup> And many of Doane's important journal backfiles were stored in inaccessible parts of the library, which only compounded the bibliographic difficulties of accessing the journal literature.

It was not as if miniaturization strategies for containing expansion pressure at libraries were novel. Profit-seeking corporations had microfilmed extensive collections of journal backruns (and other library materials).<sup>36</sup> Librarians had purchased millions and millions of reels. But readers hated to use microfilm.<sup>37</sup> The reels were difficult to read, of varying quality, and required machines that were often in short supply, in awkward locations, and susceptible to breakdowns. The film itself was at times frustrating to use, and it could not be printed out as easily as paper could be photocopied. Responding to reader resistance, librarians were unwilling to replace paper backfiles of journals with microfilm. So even though microfilm might have saved an immense amount of space over conventional storage, the film became a supplement, and a costly one at that.<sup>38</sup>

Bowen thought that a digital application could miniaturize printed journal backfiles, yet bring increased access and functionality. He assumed at the time it would use CD-ROMs, then the optimal format, which could store thousands of pages on a small disc.<sup>39</sup> If the digitally stored backfiles could achieve greater user-satisfaction than microfilm, the paper versions could be moved to remote storage or deaccessioned altogether. With some large amount of Doane's space freed up, Denison

<sup>35</sup>Doane purchased 2000 journal volumes, for about 400 additional feet of shelf space, per year. This amounted to 133 new shelving units annually beyond the 4,636 then devoted to journals. "Library Space Use," unsigned memorandum, December 22, 1993, Denison University Librarian's office files.

<sup>36</sup>Probably their purpose in doing so was to allow collection building at new or growing libraries as much as it was to permit space-saving at existing collections. But savings was clearly in mind. See Peter Ashby and Robert Campbell, *Microfilm Publishing* (London: Butterworths, 1979), 129–31.

<sup>37</sup>Stephen R. Salmon, "User Resistance to Microforms in the Research Library," *Microform Review* 3, no. 3 (July, 1974). The industry itself explained resistance as resulting at least somewhat to microfilm's aesthetic inferiority to bound printed items. See Ashby and Campbell, *Microfilm Publishing*, 94–97.

<sup>38</sup>Sometimes, however, librarians deaccessioned and discarded printed materials, and microfilm did not prove to be an adequate replacement. For a passionate, if at times overstated, account of these losses, see Nicholson Baker, *Double Fold: Libraries and the Assault on Paper* (New York: Random House, 2001).

<sup>39</sup>In 1994, CD-ROMs were a common medium for the storage of electronic scholarly resources, largely because they could store hundreds of times more data than the previous standard, the floppy disk. Abstracting and indexing services, especially, were distributed on CD-ROMs, with regular updates. Bowen had seen and used several CD-ROM products that worked well, and as a result he envisioned using the medium as a workable, existing technology to serve the need that he had identified at Denison.

would have enough empty stacks for years of new book acquisitions. Prospectively, new journal issues could conceivably go straight to digital storage, rather than occupying shelf space. In the near term, delaying expansion of the library could allow Denison to save, or redeploy, the more than \$5 million that would otherwise have been necessary for the building project.<sup>40</sup> By digitizing journals, Bowen saw a way to bring economic efficiency to academic libraries, a small but significant advance in battling cost-disease. This efficiency would be realized without sacrificing the quality of their intellectual resources; indeed it might enhance them. The new resource would be, as he liked to say, quoting the management mantra of the time, "better and cheaper."<sup>41</sup>

### IMAGINING A PROJECT

On receiving the Denison report, Bowen immediately turned to colleagues. He drew in advisors from the Mellon Foundation and elsewhere to confirm that, on its face, his idea to digitize the backfiles of scholarly journals was feasible. Because there was no established market for digitized journal backfiles, Bowen had a great deal of latitude to explore options. He was largely unconstrained by prior assumptions and therefore could, as we will see, at times reverse course.

Even while seeking broad advice, Bowen was beginning the search for a grantee. It is important to keep in mind that Mellon generally works through a grantee that takes responsibility for developing a project proposal and managing all of the work of the project. At this time, Ekman and Quandt were meeting with representatives of potential grantees in beginning to develop their program in scholarly communications. In the same way, Bowen's earliest consultations, and those made by others at the foundation, were made in the hopes of identifying a grantee rather than of gaining large amounts of internal expertise with which to develop a project plan. But while they did not produce a grantee immediately, these conversations challenged, and led to the alteration of, many of Bowen's working assumptions from Denison.

We should begin with Denison's own reaction to Bowen's idea. Though scale effects were envisioned as key to the project's potential savings, it

<sup>40</sup>The dollar figure is from William G. Bowen, "The Foundation's Journal Storage Project (JSTOR)," in *Report of the Andrew W. Mellon Foundation 1994* (New York: Andrew W. Mellon Foundation, 1995), 26.

<sup>41</sup>William G. Bowen, "JSTOR and the Economics of Scholarly Communications," Speech to the Council on Library and Information Resources, Washington, DC, September 18, 1995. Revised version online at [www.mellon.org/jsesc.html](http://www.mellon.org/jsesc.html). For a critical perspective, see Baker, *Double Fold*.

had enormous appeal even with a much smaller scope. The study of Doane's stack space noted that if the Mellon Foundation opted not to pursue a journals digitization project, other options remained. Denison might even consider undertaking the project on its own or in partnership with another college, wrote University Librarian David Pilachowski (now at Williams).<sup>42</sup> Even though, in retrospect, such a small-scale effort would have been financially impractical, Denison's consideration illustrates the appeal of the initial idea.

To better understand the technology, Bowen's first consultation on his return from Denison was with Ira Fuchs. In 1985, President Bowen had hired Fuchs to be Princeton University's vice-president for Computing and Information Technology. When he was at the City University of New York, Fuchs was one of the founders of BITNET, a forerunner of the Internet that eventually linked together the computing systems at more than one thousand universities. Fuchs would quickly become a key player in the emerging initiative, eventually joining the foundation as a vice-president. Bowen and Fuchs met as soon as possible, on a Saturday morning, to discuss how the project could develop.

Bowen had already begun to consider the size of the project, and he was determined that it be large enough to demonstrate the feasibility of a digital library of academic journals. If it contained too few journals, it would not be useful to researchers and consequently would be received as a research project, rather than as a useful scholarly resource. Bowen believed that only with 10–20 titles—that is, 500–2000 years of journals—could a digital library of academic journal backfiles be a useful scholarly resource. Back-of-the-envelope calculations led Bowen and Fuchs to the immediate realization that an enormous digitization effort, scanning a million or more pages, would be a key component of such a pilot project. Fuchs remembers that “at this point I certainly knew Bill well and I knew that, unless I thought that the laws of physics made it impossible, you don't say that it can't be done. But no one had ever done anything like it on that order of magnitude.”<sup>43</sup> The technical challenge and scale of such a digitization project were appealing to both Bowen and Fuchs.

In addition to the challenging digitization effort, the journals database would also require software to operate it. Fuchs believed that such software either existed or could be created, and he promised to take responsibility for investigating the options. In chapter 3, we shall see that

<sup>42</sup>David Pilachowski, “Periodical Storage Space and Mellon Idea,” email to Denison President Michele Tolela Myers, December 15, 1993, in the Denison University Librarian's office files.

<sup>43</sup>Ira H. Fuchs, interview with author, November 2, 2000.

he would eventually lead Mellon to adopt software created for the TULIP project.

Fuchs advised Bowen that, for the purposes of distributing such a digital library, CD-ROM was an increasingly outdated technology that had limited scalability. The wealthier colleges and universities had already begun an ambitious effort to link together all computers on campus, including those in faculty offices and student dormitories. For example, under Fuchs's leadership, all Princeton's administrative and academic buildings were networked by 1989; the student dormitory network was just being completed in 1994. Campus networks like the one at Princeton were, in turn, linked to larger networks, such as BITNET and the Internet. If a CD-ROM-based project were successful, it would involve distributing thousands of CDs to each of hundreds of universities and colleges. Even if this were logistically possible, it would not eliminate the redundancy across institutions. At each college and university, stack space and reshelvers would simply be replaced with CD-ROM jukeboxes and well-paid technical staff. But, if Bowen's journals project were made available remotely over an interinstitutional network, a user with the proper software could access the journal backfiles from a dormitory room, an office, or a computer lab at any college or university in the country. Network distribution, suggested Fuchs, could thus eliminate redundancy while increasing accessibility.<sup>44</sup>

Bowen and Fuchs concluded their first meeting on the subject with a sense of excitement. If the project they were discussing proved successful, it would be a real demonstration that large-scale digital libraries were feasible. At the same time, their planning revolved around the premise that digital libraries could be cost-effective. Success could help libraries and administrators see the relevance of technology to their needs, both budgetary and scholarly.

With Fuchs confirming the technical promise of the journals project, Bowen discussed it with Mellon Foundation Secretary Richard Ekman, among others. In an effort to avoid unnecessary duplications of effort, Ekman agreed to see what he could learn about undertakings similar to Bowen's proposal. He then held two important conversations with Bill E. Buchanan of the International Archives Institute (IAI) and Richard DeGennaro, the Roy Larsen Librarian of Harvard College.

In late December 1993 and early January 1994, Ekman spoke with Buchanan of the IAI, which had been creating searchable indices and

<sup>44</sup>For some of the advantages of CD-ROM, most of which were largely irrelevant to the emerging project, see Page, Campbell, and Meadows, *Journal publishing*, 351–53.

tables of contents that linked to digitized page images of books.<sup>45</sup> Ekman and Buchanan roughed out the costs of Bowen's journal project, foreseeing the conversion of fifty-year backfiles of twenty academic journals, a total of approximately one million pages. The principal cost variable was whether the output was digitized page images or searchable text. If the former, they thought the entire conversion would cost about \$80,000; if the latter, around \$2 million. (These different approaches are examined with greater care in chapter 2.) In other words, the estimated cost per page ranged from \$0.08 to \$2. They also discussed CD-ROM, local campus networking, and the emerging Internet as distribution possibilities. Because Bowen was not so much interested in creating new technologies as in deploying them for a practical purpose, it was reassuring to find that others were undertaking somewhat similar projects.

Several weeks later, on January 19 or 20, Bowen went to the New York Public Library to learn about its experience with both journals and digitization. Bowen concluded that "not even the NYPL knows that it has everything in good order," so that a digitized journal backfile would actually make an immediate contribution to preservation. He left the library concluding that "bitmapping is everywhere now."<sup>46</sup>

Also on January 20, Ekman spoke with Richard DeGennaro in order to learn about Harvard's work on digital projects.<sup>47</sup> They spoke mainly about the Periodicals Content Index (PCI), which was an electronic bibliographic index of important arts and sciences journals. To create PCI, publisher Chadwyck-Healy was relying on copies of journal backfiles held at Harvard, inputting the tables of contents. With the tables of contents available in electronic form, Harvard hoped it could move the journal backfiles themselves off-campus to a less expensive satellite location, to be paged back to the library when needed. In essence, PCI was initially conceived with the identical purpose as Bowen's journals project—space savings—though PCI included only the bibliographic indexing as represented in tables of contents. When he heard about Bowen's idea, DeGennaro noted that, because faculty had found PCI to be an inadequate replacement to on-campus browsing of journals, Harvard had proposed to expand PCI. The proposal was strikingly sim-

<sup>45</sup>Richard Ekman, "Telephone Conversation with Bill Buchanan, International Archives Institute, Inc.," memorandum to William G. Bowen and Richard E. Quandt, January 4, 1994.

<sup>46</sup>William G. Bowen, "Scholarly Communication: Journals on CD-ROM," memorandum to file, January 20, 1994.

<sup>47</sup>DeGennaro had previously served in similar positions as director of libraries at the University of Pennsylvania and the Andrew W. Mellon director of the research libraries at the New York Public Library. Richard Ekman, "Telephone Conversation with Richard DeGennaro, Widener Library, Harvard University, Thursday, January 20, 1994," memorandum to file, January 25, 1994.

ilar to Bowen's idea: Harvard would digitize the page images of articles from thirty journals indexed by PCI, then link them electronically to PCI for use at Harvard. Scholars and students would have electronic access to the entire journal, which now could surely be sent off-campus. DeGennaro sent Ekman this August 1993 Harvard proposal to build out from PCI. "By improving intellectual access to crucial journals," the proposal predicted, "Harvard will be able to store the original off-site in the Harvard Depository, an archival storage facility."<sup>48</sup> The Harvard proposal was strikingly similar in both purpose and approach to the Mellon plan.<sup>49</sup>

It is worth pausing for a moment to reflect on the components of the Harvard plan and whether it could have succeeded. Its major distinctive feature was its campus-specific character, as opposed to the broad distribution envisioned by the Mellon plan. By making the journals available only at Harvard, the university seems to have believed that it could rely on the "fair-use" provision of the copyright code, which forgives certain copyright infringements that are viewed as reasonable, rather than obtaining formal permissions from journal publishers.<sup>50</sup> The Mellon project, in contrast, intended to seek permissions from publishers and to distribute the project widely in the hope of creating a self-sustaining business model. The Harvard plan did not appear to have had such a vision for itself.

Indeed, Ekman noted this difference from a slightly different angle. He wrote that Harvard's goal "is not to use a grant to get into a 'production' mode, but rather to familiarize Harvard's senior library staff with scanning . . . rather than microfilming."<sup>51</sup> Like so many projects at the time, Harvard's proposal was for learning rather than doing. Even for one of the wealthiest universities, an ongoing "production mode" was too expensive, at least when producing just for itself. Mellon's traditionally suprainstitutional approach obviated this problem and encouraged scale. Note, finally, that Harvard's lack of interest in production

<sup>48</sup>Harvard University Library, "A Proposal to Preserve and Improve Access to Periodical Literature Through Linking Digital Images to an Electronic Index," August 1993.

<sup>49</sup>It was impossible to find any evidence at all to indicate that Harvard's August 1993 proposal came to the attention of anyone at Mellon before this point in early 1994. Therefore, it seems that the Harvard proposal did not inform Bowen's idea to "compress" journals to save space, but was rather a remarkable coincidence.

<sup>50</sup>It seems to have been believed that reformatting already-owned journals for campus-specific educational use was reasonable under the guidelines of fair use.

<sup>51</sup>Richard Ekman, "Harvard University Library's Proposal to Preserve and Improve Access to Periodical Literature Through Linking Digital Images to an Electronic Index," memorandum to file, January 24, 1994.

in all likelihood made it inappropriate as an early partner for Mellon's journals project, which possibility was never considered after this point.

Nevertheless, the extensive discussion about PCI with DeGennaro led Ekman to contact Chadwyck-Healy to seek more information about its bibliographic index to the journal literature.<sup>52</sup> While Ekman's minute of the conversation did not mention the journal project explicitly, the conversation focused on the components of PCI, demand for it, and its future plans, all critical to the Mellon effort to understand the context for its emerging journals project.

### SUMMATION

Making use of technology to save space and reduce costs offered a striking combination of Bowen's background, librarians' needs, Mellon's mission, and the blossoming technology of the time. Once the idea was brought back from Denison to the Mellon Foundation, the initial round of consultations involving Bowen, Ekman, and Fuchs reached several implicit conclusions. The digitized journals would be distributed widely, so that any savings that resulted could be shared broadly. Scanning and software would be important components, and the scale of scanning would be almost without precedent for academic purposes. Ekman had found that there was other work, and indeed deep interest, in digital libraries involving humanities journals.<sup>53</sup> As January 1994 came to a close, Bowen was convinced that the pilot project would be technically feasible.

While foundations often craft programmatic initiatives, it was most unusual for Mellon to propose a specific project on the order of JSTOR. In this case, Bowen was especially excited because, if successful, his idea would prove that technology need not be a drain on academic budgets, but could in fact be used to find new efficiencies. As a result of the internal generation of a project that fit solidly within Mellon's programmatic interests, foundation leadership—most especially Bowen—had a sense of ownership perhaps unmatched in Mellon projects. This sense of ownership would prove to be a key success factor as a number of impediments were subsequently confronted and overcome.

<sup>52</sup>Richard Ekman, "Telephone Conversation with Douglas Roseman, Executive Vice President, Chadwyck-Healy, Inc., Monday January 24, 1994," memorandum to file, January 24, 1994.

<sup>53</sup>Another key consultation that was a part of this initial thrust took place in February, when Bowen, along with Ekman and Quandt, met with Karen Hunter of Elsevier Science. This meeting, and Elsevier's larger role in this history, are described in chapter 3.