The Information Wars: Two Cultures and the Conflict in Information Retrieval, 1945–1999

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Abstract

In the generation after World War II a wide perception of an information crisis plagued all scientific professions. This crisis was an "information explosion" that scientists confronted from exponentially increasing numbers of publications. One significant result of this crisis was the emergence of the "information wars"—the professional battle between scientists (documentalists) and humanists (librarians) over information retrieval.

Scientists often blamed an unresponsive library community for failing to develop new techniques to ease the burdens that resulted from too much information. They believed card catalogs were too slow and inefficient, and they desired new automated systems for information retrieval. Librarians often resisted experimenting with these new computing machines because of their expense and technical complexity. As a result scientists began looking elsewhere for bold approaches to solve the information crisis.

The solution that scientists favored came from a relatively new professional group called documentalists. Typically emerging from a scientific background themselves, documentalists began using new punched-card computing machines to facilitate information retrieval for scientific needs. Documentalists believed that their profession represented the future of information retrieval and not that of the antiquated, humanistic librarian.

While the information wars have dominated the information professions over the past half century, as the millennium approaches, the two cultures of information retrieval are now becoming one. With the technological battleground shifted from the scientists-only realm of punched-card machines to the more inclusive and inexpensive technology of the personal computer and the Internet, librarians are emerging once again as the primary gatekeepers of knowledge.

World War II transformed the scientific discipline. Never before in such a dramatic, large-scale, and public way did the results of scientific activity play such an important role in shaping the outcome of world developments. Scientists themselves became national heroes as the nation's strength came to be determined equally by military might *and* by scientific capability. Yet even though some scientific communities seemed to "wear the tunic of Superman" and stand "in the spotlight of a thousand suns," a significant problem reaching crisis proportions plagued all scientific disciplines (Kevles, 1987).

This crisis was an information crisis—a problem of too much information that scientists confronted in the form of exponentially increasing numbers of books, journals, and conference papers (Bowles, 1999). This overload threatened to burden individual researchers with so much data that they feared they would spend all their time quietly reading to keep up with their colleagues. As a result they would be left unable to advance their own ideas, thus ending or curtailing the future progress of science.

The information crisis was one of the most significant intellectual concerns of the twentieth century. I believe this story is important to understand not only

because of its central place within the scientific discourse of its time but also because of the conflict it initiated over information retrieval. This conflict centered on the library as a professional battleground between librarians and a relatively new professional group called documentalists. At stake was which professional group would control the future of scientific information.

This conflict was most dramatically played out at Western Reserve University, now Case Western Reserve University, in Cleveland, Ohio. This institution housed one of the nation's leading library schools and documentation centers—the Center for Documentation and Communication Research (CDCR). The CDCR was often referred to as the "best known" of the academic information centers and the "world's most advanced information retrieval system." (On CDCR's significance see "U.S. Organizations," 1961; "Western Reserve Up-Dates," 1961; Kane, 1958; "Scientists Use," 1960; "Take-Off," 1963.) While in many ways this was a unique institution, the attitudes and beliefs held by its documentalists and librarians were a microcosm of a wider professional conflict. Jesse Shera, the dean of the library school (and ironically the driving force behind the creation of the CDCR), described the interrelationship between the information crisis, the emergence of the documentalists, and the threat they posed to the library profession in a 1960 annual report:

> To say that American librarianship today faces the most critical test of its brief history is not rhetorical exaggeration. The growth and increasing complexity of recorded knowledge has not only taken traditional library methods beyond any limits that they were originally designed to meet, but also it has brought into being a rival group who call themselves documentalists, information specialists, or some other name which seems to avoid the use of the term librarian. Thus has been created a schism within the profession that seriously threatens its unity, and that can result only in disastrous consequences to both approaches to the library problem. (Shera, 1960)

Other representative comments reveal the broad awareness of this conflict among the information professions. In 1956 Neal Harlow, a University of British Columbia librarian, wrote, "There has been such a revolution in bibliographic needs that our professional usefulness is being severely challenged." In 1963 a documentalist and manager of IBM's technical information center reported, "The IBM . . . Information Center was born from management's concern that the libraries serving its technical and professional personnel were not geared to the speed and complexity of present requirements (White, 1963). Also in 1963 William S. Budington, a president-elect of the Special Libraries Association wrote that there was a growing perception that scientists and engineers "were required to give birth and nurse the necessary gadgets" to solve the information crisis, and not the librarians with their "creaky procedures." In 1972 Marilyn Gell, a Virginia public librarian, wrote a modern fable called "The Passing of the Unicorn" in which this once proud animal (the unicorn representing the librarian) was threatened with extinction by "no-horners" (the modern beast representing the documentalists) who sought to "computerize its wisdom."

These examples (from a university librarian, a documentalist, a special librarian, and a public librarian) serve as contextual indicators that this professional conflict was a national phenomenon and not localized to a specific institution or group of practitioners. The preceding statements also reveal that a technological debate was central to this conflict, as documentalists wanted to use new punch-card computing machines to solve the information crisis, while a majority of librarians seemed to resist the new devices.

Why was there a professional conflict between documentalists and librarians? One main reason was that librarians were typically humanists and documentalists were scientists. The difference in professional background is not a trivial one. Many have referred to the science–humanities distinction as one of the most significant intellectual chasms of the twentieth century. This phenomenon was first brought to widespread attention in the 1950s by British scientist-novelist C. P. Snow; he described the split as the "two cultures." Snow argued that all Western intellectual activity was splitting into two polar groups. Humanists or literary intellectuals were at one pole and scientists were at the other. Between them was a "gulf of mutual incomprehension—sometimes . . . hostility and dislike, but most of all a lack of understanding" (Snow, 1961).

Historian of science Alan Rocke (1998) recently commented that the conflict between scientists and humanists is a cultural divide that continues to the present. Rocke claimed that one result was something called "the science wars"—the debate over how scientists and humanists understood the making of science. Using similar terminology, I argue that when the history of information during the last half of the *twentieth* century is analyzed, it is a story best characterized as the "information wars." Librarians, with their strong background as humanists, lost part of their identity, power, and

profession in their battle against the documentalists and scientists. They lost this battle because of such cultural obstacles as the privileged position of the sciences in relationship to the humanities and because they resisted the coming of the computer to the library.

Calvin Mooers, who coined the term *information retrieval*, represents one of the best examples of this conflict. Mooers, inventor of the Zatocoding system for information retrieval, not only identified but was also a key participant in the conflict between the two cultures of information retrieval. As a mathematician his disdain for the capabilities of the humanistic librarians was often apparent. In a private letter to library school dean Jesse Shera in 1957, Mooers expressed his concern over what he saw was the emergence of "two cultures" at the American Documentation Institute conferences. On the one side were the people who were building the "machines of the future," and on the other side were the librarians (Mooers, 1957). What he thought was unfortunate was that the machine people could "peer into the mysteries of the library" and understand and improve upon the activities found within. Yet the librarians were unable to do the same with the machines. Mooers said librarians found his machines "repugnant," his devices "antagonized" them, and the librarians were left "baffled" (Corbitt, 1993). Charlotte Mooers shared her husband's perceptions of librarians. She recently recalled that most of the people to whom Calvin explained the Zatocoding system did not understand it, but she confessed "quite frankly the people who didn't understand it *the most* were the librarians" (personal communication, 21 May 1998). It was true that Mooers wanted to develop a machine to replace the librarian in the search for information. The librarians naturally were repulsed by this idea, but Mooers joked that librarians "took offense against the idea even though they weren't able to fully formulate why they were offended by it" (Corbitt, 1993).

Neither librarian nor documentalist emerged from this professional warfare the victor, and both suffered serious setbacks to their disciplines. For example, neither the renowned library school nor the documentation center at Western Reserve University exist today. However, as our millennium ends, the two unique cultures represented by the documentalists and the librarians are now becoming one, as the technological battleground has shifted from the scientists-only realm of punch-card machines to the more inclusive and inexpensive technology of the personal computer and the Internet. The following is the story of the scientific information crisis, the resulting information warfare, the use of weapons of automation, and an emerging information détente.

A Scientific Information Crisis

In their anthropological study of the life inside a scientific research center, Bruno Latour and Steve Woolgar examined the daily existence of a scientist in the laboratory (1986). While they were not surprised to learn that scientists read published material, they were unprepared to discover the "central prominence of documents" and the "vast body of literature emanat[ing] from within" the laboratory. They found that the scientists were "compulsive and almost manic writers" and that the laboratory surrounding them was a "hive of writing activity."

The scientists' written reports became the central product of their research, as the entire working day seemed to revolve around the production of written material. Every discussion between the scientists, no matter how brief, always focused on the published literature including informal discussions, telephone conversations, and official presentations. Latour and Woolgar were perplexed in the confrontation with this "strange tribe" and their "omnipresence of literature." By 1945 this literature overload threatened to strangle future scientific progress and became a major concern for the scientific community.

Because of the centrality of documents to the scientific profession, any threat to the information retrieval and dissemination system was regarded as a significant problem. As the publication of journal articles, books, and conference papers began to overwhelm the scientists, they came to the conclusion that they were experiencing an information crisis. Like any other finding in the laboratory, scientists used their written output to convince others of this assessment. The immediate goal of this persuasion was to stimulate work directed at finding a solution to the problem. These concerns quickly spread throughout all scholarly disciplines—particularly engineering.

Why did this problem appear to emerge so suddenly after 1945? There were three key reasons. The first reason was World War II. As one observer wrote, the war "wrecked" the scientific communication system (Bernal, 1944–45). Indeed, the scientific mobilization and effort for the war was directed single-mindedly toward military success. As a result scientists had little time to publish their work, and much of that work was classified as secret. Thus, when the war was over and the government lifted the secrecy ban, a large body of research was made available through publications.

Second, the Cold War played a key role in heightening the sense of an information crisis. The dramatic and visible success of the Soviet *Sputnik* satellite in 1957 demonstrated the real possibility that American science and engineering were falling behind that of their Communist counterparts. Furthermore, evidence of a vast centralized information network at the Soviet All-Union Institute of Scientific and Technical Information (VINITI), greatly concerned U.S. scientists. Reports indicated that this institute employed twenty thousand abstractors and translators to effectively disseminate information to Russian scientists and engineers. Assisting their work in this was a rumored massive punched-card machine feared to be the computer equivalent of *Sputnik*. Through this centralized information service it appeared as if the Soviets might have solved the information crisis itself.

Finally, the information crisis that emerged after 1945 was in part the result of the natural perception by contemporaries that scientific growth was out of control. As historian of science Derek J. de Solla Price (1963) observed, exponential growth was such a central feature of scientific activity that it is "the fundamental law of any analysis of science." The result was his often-quoted, astounding fact about the scientific discipline: "80 to 90 percent of all the scientists that have ever lived are alive now." This statement was as true in 1660 or 1945 as it is today. However, when this natural state of exponential growth was coupled with the circumstances surrounding the end of World War II and the emergence of the Cold War, this situation became a true "crisis."

Chemists were particularly concerned. For many years the chemical profession knew the value of organizing its published information. *Chemical Abstracts* had long provided summaries of the world's chemical literature and, even today, boasts the largest resource on chemical information. But the growing amount of published literature threatened to overwhelm the editors of this abstracting journal. In 1949 editor E. J. Crane (1949) examined the publication increase in his journal because he thought this would be a "reasonably good yardstick" to measure the increase in research in other fields. He made the following findings:

- The *Journal of the American Chemical Society* increased its number of articles by 63 percent from 1947 to 1948.
- *Industrial and Chemical Engineering* increased 45 percent in 1948.
- *Physical Review* had a backlog of over eight hundred papers waiting to be published.
- The *Journal of Biological Chemistry* increased 63 percent from 1947 to 1948.
- *Chemical Abstracts* planned to increase its coverage of the literature by 21.1 percent

Herein lay the heart of the crisis. If most scientific journals were increasing by as much as 60 percent in a given year, and *Chemical Abstracts* planned only a 21 percent increase, then how many significant articles would be overlooked and ignored? Crane concluded, "Chemical publication is literally booming. I have never seen anything like it."

Other chemists agreed with Crane and were equally concerned. For example, one chemist (Richardson, 1951) claimed that there was "too much current literature on chemistry . . . and it is not properly organized." A biochemist (Archibald, 1952) argued that the "volume of literature . . . is increasing so rapidly . . . that lack of appreciation of what has been achieved by others is limiting markedly our scientific productivity." The editor of *Chemical & Engineering News* argued that his editorial work was more "hectic" than his predecessors, claiming that from 1929 to 1950 the journal increased in size by 760 percent (Murphy, 1951).

The scientific information crisis was not confined to the chemical discipline; it was also a concern of many leading scientists from 1945 to 1963. For example, an engineer at the Stanford Research Institute described the "technical literature problem," a biologist at the American Institute of Biological Sciences identified the "critical problem of research publication," the president of the American Society for Metals complained of the "literature jungle," the director of the National Science Foundation described the "information problem," and the director of the Oak Ridge National Laboratory specifically called all of these problems "the information crisis." The engineer was Charles P. Bourne. The biologist was John A. Behnke. The American Society of Metals president was Walter Crafts. The NSF director was Burton W. Adkinson. The Oak Ridge National Laboratory director was Alvin M. Weinberg.

Implicit in this concern over the information crisis was an attack upon the library. The best-known spokesman of this attack was Vannevar Bush, the main architect of science policy during World War II. Bush was actually the first to define the information crisis in the postwar era. As J. C. R. Licklider (1965) stated, "Vannevar Bush . . . may be said to have opened the current campaign on the 'information problem.' " In 1945 Bush wrote his now legendary article in *Atlantic Monthly* called "As We May Think." While many scholars, such as

Michael Buckland (1992) and W. Boyd Rayward (1994), now rightly argue that Bush's ideas were not nearly as novel as once believed in terms of his Memex, the article was important for crystallizing the concerns of the information crisis for a wider scientific and technical audience. Bush said (1945), "The difficulty seems to me not so much that we publish unduly . . . but rather that publication has been extended far beyond our present ability to make real use of the record." Ten years later Bush (1955) published the article "For Man to Know," saying, in what became a popular and often-quoted phrase, "Science may become bogged down in its own product, inhibited like a colony of bacteria by its own exudations." The product of science to which Bush referred was the publication.

Bush consistently tied his concerns about the information crisis to an attack on the library. He (1953) believed that the library was unable to meet the needs of scientists and felt that librarians were inadequate guides to the relevant literature. Bush shifted blame away from scientists by saying that they were not publishing too much, but that librarians were not managing their output effectively (1945). Colin Burke (1994, p. 119) has suggested recently that "Bush wanted a fundamental reform of the library to make it conform to the concepts of the new scientists and engineers," using machines to allow scientists to simply "bypass the library." These criticisms of the library and of the librarians' reluctance to find a solution became widespread.

What further intensified the information crisis was a bit of interesting irony. As scientists were leveling attacks against the inefficiencies of the library, the library was itself becoming of increasing importance to the scientist. And yet, scientists believed that the library was an overwhelmed and outdated institution that was failing to cope with this outpouring of information. To the rescue came not the librarian, but a new information professional—the documentalist with a commitment to the automation of information for the specialist.

Information Warfare: Conflict in the Library

In *When Old Technologies Were New*, historian Carolyn Marvin examined the early history of electric media (electric light and the telephone) and postulated that its history was less a story of the evolution of instruments and more about social groups negotiating power. Issues surrounding these groups concerned who was "inside" (the professional electricians) and who was "outside" (the public), who had authority and who had none. Marvin observed (1988) that "new media intrude on these negotiations by providing new platforms on which old groups confront one another." This media could "change the perceived effectiveness" of one of these competing groups. For example, a group that possessed the latest technical know-how could define themselves as experts and use this status as a claim to authority. This type of social conflict and power negotiation also became central to the early history of the computer and of information processing. A new professional group (the documentalists) threatened to wrest the control of information away from the traditional group in power (the librarians) by using a new electronic media (the computer).

During the late 1950s the conflict over which professional group was best suited to control information was portrayed on the silver screen by two of Hollywood's most popular stars, Katharine Hepburn and Spencer Tracy. Their 1957 film *Desk Set* took place at a fictitious television studio called the Federal Broadcasting Company, where Hepburn worked as a reference librarian. Tracy played a "methods engineer," one of the leading experts on "electronic brains" in the country, who had been hired by the broadcasting company to automate and replace the jobs of the reference librarians. When Hepburn's character first saw the electronic brain, she said it was "frightening" and was a "monster machine." When she learned of Tracy's character's professional background, she immediately reached for a cigarette and whispered to another librarian, "I only smoke when there is a crisis. . . . He is an engineer."

Despite the happily-ever-after Hollywood ending with the librarian and the engineer falling in love, the film raised a number of important issues concerning the future of the information professional in an increasingly computerized society: a fundamental conflict between the humanistic librarian and the scientific information professional; the fight for control of the library; and the librarians' fear of automation. These themes were fictionalized versions of what was actually occurring in the conflict between the documentalists and librarians.

Documentalists were not new to the post-1945 period. Irene Farkas-Conn, Robert V. Williams, and W. Boyd Rayward have expertly analyzed the history of documentation that extends back to the turn of the twentieth century. Founders such as Paul Otlet in Belgium and Watson Davis in America made significant advances in organizing information (Rayward, 1997, 1975). One of the first Americans to become interested in the documentation field was Watson Davis. Davis began his career as a civil engineer at the National Bureau of Stan-

dards while simultaneously becoming one of the first journalists to report on scientific developments. Working for the Washington *Times-Herald* in the 1920s alerted him to the significance of scientific communication, and he became interested in documentation as a way to solve the difficulties associated with a growing amount of information. In 1933 he headed the Science Service in Washington, D.C., which attempted to popularize science and gain funding for it. In 1937 Davis called together thirty-five of his colleagues to meet at the National Academy of Sciences. According to his daughter Charlotte Mooers, Davis proposed the formation of the American Documentation Institute (ADI) to research new ways of disseminating scientific information to a wider audience through microfilm technology (personal communication, 21 May 1998). He said that he liked using the term "documentation" because it had an international reputation (owing to Otlet) and was inclusive of all forms of intellectual activity. This included librarians and humanists and was "not specifically limited to the fields of the physical and natural sciences (1935)."

By the post–World War II period those who called themselves documentalists narrowed their customer base primarily to serve the sciences. Scientists were the ones most vocal about the information crisis, and during the heightening of the Cold War, government contracts for scientific activities were flowing quickly. Colin Burke wrote, "The achievements in handling tons of documents during World War II allowed the first documentalists to seize the new opportunities of the Cold War and to gain the funding they had begged for during the 1930s" (1994, p. 112). Thus the documentalists wanted to tame the information crisis by becoming the main professional group for controlling information. They based their claim on the growing perception that traditional librarians were not responding to the information needs of scientists. The documentalists seized this opportunity, regardless of the veracity of this perception.

If this meant an intense struggle with librarians, then documentalists were ready for the fight. For example, examining a passage from Farkas-Conn's history of the documentation movement, we can easily see contentious warlike imagery. She wrote, "Like soldiers on the front, [documentalists] had to be preoccupied with the battle, of winning a skirmish; only a few could think of the grand strategy of winning the war, let alone consider the even greater overall plans, the larger societal concerns of establishing peace among the warring parties" (1990, p. 196). Her use of warlike imagery in these descriptions accurately represents the belligerent relationship between these two professions. Farkas-Conn also noted that by 1952 ADI experienced a transition from a new "vital force [which] came from the people who found that traditional library and bibliographic methods were inadequate for the management of scientific and technical information" (1990, pp. 183–184, 186). The real difficulty was that the documentalists and librarians had vastly different backgrounds and outlooks about how to manage scientific information and what to do about science in crisis. Let us examine four of these differences.

First, the importance of the documentalists' and librarians' backgrounds has already been suggested. The documentalist typically emerged from a science or engineering school with an interest in information. Allen Kent, one of the CDCR directors, commented that not only did most documentalists have scientific backgrounds but many were specialized as chemists. He reasoned that chemists had advantages over professionals in other fields because of their understanding of molecular structure notation systems. He believed that this enabled them to be one step ahead of others interested in information searching and especially those like librarians who sought to use outdated alphabetical indexing systems (personal communication, 20 March 1998).

By contrast, librarians had backgrounds in the humanities. This was a career path that documentalists believed librarians turned to because they were "self-consciously inadequate in science" (Shera, 1967). Whether or not librarians were inadequate in science is to be debated, but psychological and vocational profiles given to librarians in the 1950s indicate a strong interest in humanistic endeavors. In 1952 Alice I. Bryan (pp. 29, 31, 35, 43) studied the professional profiles of 2,400 public librarians and concluded that their interests were most comparable to artists, musicians, and writers. Of the 2,395 librarians surveyed, 92 percent were female. The most "significant feature of the age distribution" was what she called the "middle-age bulge," with the median age being 42.3 years. Most of these women, about 75 percent, were unmarried. Bryan gave the female librarians the GAMIN personality test. Her findings were that they were submissive, lacked self-confidence, and had feelings of inferiority. A similar study in 1957 (Douglass) found librarians far more attracted to aesthetics than to science or technology. Such profiles illustrate the different professional and personal interests between documentalists and librarians. Most important, this difference was viewed as a weakness by documentalist-scientists.

A second key difference between documentalists and librarians was their institutional base. The "scientific information center" was the institutional home of the documentation movement. By 1961 there were approximately 221 of these centers in the United States, supported and funded by government, industry, or academia and employing more than 6,000 personnel (Simpson, 1962). Many scientists rejected the library because they did not want an information repository that simply stored data "as a warehouse is used for storing bales of cotton." Instead they wanted a place where data were correlated and distributed to users with specific needs. It was here that many scientists believed the "libraries have failed and failed badly." Many scientists considered the librarians' classification scheme too vague, and some documentalists feared the library would become science's Waterloo.

Third, the customers for these institutional centers also were very different. While librarianship by very definition was inclusive of all people who sought information, the documentalists' service was much more exclusive. A course brochure from the Center for Documentation and Communication Research read: "Documentalists serve, in particular, the interests of research and scholarship; they are not concerned with popular, recreational, or lay interests" (Program for Documentation, 1961). Allen Kent (1961) argued that, in contrast, librarianship was a "passive activity that [could] cope with the general needs of adults and children, but not with the active industrial and governmental requirements of a modern society." In short, the documentalists wanted to deliver to an elite customer base the ability to control and make sense of information in a way that was unavailable to the public. Librarians, on the other hand, were concerned not just with scientists' needs but also with the needs of humanist scholars and with even what some regarded as the "lowest" form of information request—popular reading from a lay audience.

Finally, these two professions had differing notions of what constituted information. Librarians were the defenders of the book as the basic unit of information, while documentalists believed the data contained in books, research papers, technical reports, and governmental studies were the unit of information. This concept of information was implicit in their name—documentalists. It was the document or specific fact that was privileged, not its surrounding context—the book or journal itself. It was impossible, they believed, to effectively communicate the essential information contained within a book through only a title and author on a 3×5-inch library card. Librarians responded by saying that it was the "enemies of libraries" who "tend[ed] to believe that the only things that matter in any book are discrete paragraphs of information." Librarians believed that without the context of the entire book, the individual fact could mean nothing (Crawford & Gorman, 1995). But the documentalists ignored these concerns and continued to attack the book because it lagged three to ten years behind the most up-to-date information (Bree, 1963). For example, Lowell A. Martin (1955) argued, "This is an age of rapid communication; the book by its very nature is slow in bringing its message." Documentalists did not want to do away with the book; rather they wanted the book to exist as a "reservoir" of knowledge.

In each of these oppositions (science–humanities, information center–library, elite–public, and fact–book), the documentalists occupied the culturally privileged position, thus solidifying their source of power. It was in this way that such a young "outside" profession was able to erode much of the status of a long-established "inside" profession to become the new "insider." To make matters worse, there was one further distinction between librarians and documentalists that probably represented the most important aspect of their professional conflict—technology. Documentalists were zealous advocates of new computer technology. Librarians did not simply prefer the card catalog over the computer; they frequently recoiled in fear from the prospects of automation.

Weapons of Automation: The Librarian and the Fear of Computers

The history and tradition of librarianship is long and distinguished. It extends over two thousand years, back to the Alexandrian Library and Eratosthenes. Throughout this history libraries have often been at the forefront of new and revolutionary technology. Historian John Higham (1979) wrote, "We have forgotten how revolutionary a dictionary catalogue of loose cards was when introduced at the Harvard Library in 1861." In 1876 librarians established themselves as a professional organization with the founding of the American Library Association. Libraries grew quickly by becoming an essential organization for meeting the information needs of America's growing industrialization (Harris, 1995). After World War II a few librarians even believed that it would be the library profession that would "take the incentive and attempt to provide leadership" in the search for the solution to the information crisis. Some predicted that in solving this crisis the "library profession [would]

make a major contribution" to its own profession and at the same time benefit all society (Egan & Shera, 1949).

But by the 1950s the librarian represented the " 'old guard' in information retrieval" to a majority of library users (Shultz, 1961). No longer could they maintain their position at the forefront of new technology, in large part, because of the expense of computing machines and the technical background required to program them. Few traditional librarians had the opportunity to learn about new mechanized approaches to manipulate information. While the special librarians of the prewar years were advocates of new library mechanisms, even they became more technologically conservative after the war. Farkas-Conn (1990, p. 206) wrote that by the 1950s librarians came to "adamantly oppose automation."

The new automated bibliographic techniques established by the documentalists were presenting professional image problems for librarians. A. J. Goldwyn (1963) questioned, "Will the library of tomorrow need a librarian, or will the librarian be the dodo . . . the technologically displaced ghost." Alan M. Rees (1964a) called the librarian's problem a "personal crisis in the form of the challenge of automation," noting the unnerving fear that the "phantasmagoria of librarian-type robots" would soon displace them (Rees, 1964b). As a result librarianship had a stigma attached to it. No one, it seemed, wanted to be a librarian. The reason that documentalists preferred titles like "manager of technical information" was that "to be tarred" with the name librarian would mean a "loss in salary and status" (Rees, 1964b). So while the scientists faced an information crisis, the librarians were in the midst of an identity crisis. The source of this crisis was their fear of automation. "In countries like the United States, the advent of the 'information age' has provoked major debates about the future of books and libraries and has stimulated wild flights of imagination and fear" (Harris, 1995, p. 294).

Fear was a word frequently used to describe the librarians' reaction to computers. Jesse Shera (1967, p. 749) explained that "fear is especially strong . . . when the innovation [the computer] comes from [outside] the occupational group or subculture." As a result librarianship had a growing antiquated image. Librarians were fearful of the documentalists' "invasion" into their social space wielding a weapon of automation that they could neither combat nor understand.

The so-called "antiquated" librarians did not even trust the language used to describe these machines. *Searching algorithms, random access storage, Zatocoding, zone bits,* and *digital computing* represented an incomprehensible, threatening language and set of ideas for the professional librarian. The computer—or as some librarians referred to it, the "bête noire of the library profession," the "diablus ex machina," and the "Pandora's chest from where all evil swarms"—became a symbol of the librarians' failure to rescue a scientific enterprise in crisis (Shera, 1961).

The documentalists urged librarians not to fear mechanization since the only thing that would be lost was the "drudgery" of the repetitive operations of their work (Bristol, 1952). IBM representative H. S. White (1963b) implored his librarian audience, "Don't be afraid of machine equipment." But the librarians believed that even if the computer could relieve them of "burdensome detail," they would lose control of their profession to the outsiders. Shera revealed that behind all these concerns lay the "fear of loss of professional identity." Concern was generated not only by the machine itself but also by a number of articles proclaiming that machines would soon be in control in the library. For example, R. R. Shaw (1954) titled his article "Will Machines Take Over?" and *Chemical Week* published "Machine Age in the Library" (1954). Shera responded to these articles with one of his own in *Science*, called "Librarians against Machines" (1967).

But it was not necessarily the fear of the mechanical aspects of automation that concerned the librarians. Ralph H. Parker (1965), a documentalist at the University of Missouri, wrote, "When we hear expressions of fear of the machine, what is really meant is that we fear other men's use of it." It would be inevitable, according to Parker, that the computer would replace the menial tasks of the librarian. He was optimistic about the future because the "automation of records in libraries will free librarians, whether they wish it or not, to become truly professional." Phrases like "whether they wish it or not" are important. How could librarians maintain professional status if a group of outsiders dictated the conditions of their professional status?

The results of the librarians' resistance to automation during the 1950s were felt throughout the library profession for the next three decades. In many places across the United States library education did not survive. From 1978 to 1991 fourteen of the most prestigious library schools shut down, including the University of Chicago (the first school to offer a Ph.D. in library science), Columbia University, and Case Western Reserve University (Paris, 1991). This might not seem devastating to nonlibrarians, but imagine what would happen to the engineering profession if MIT and

Stanford shut down their programs. These library school closings represented a very serious problem in the profession. Numerous reasons have been given for the failure of these programs, including lack of funding, a tight job market, academic isolation, complacent library school leaders, and poor quality of the schools. But the failure to understand the technological transition brought on by the computer has been singled out as one of the central reasons that librarianship has suffered (Foster, 1993). In *The Closing of American Library Schools* Ostler, Dahlin, and Willardson (1995) argued that while the nation was changing to an "information society, library school leaders on the whole failed to recognize and adapt in any significant way to this fundamental societal change."

Allen Kent prophetically wrote in 1961 that the "division between librarianship and documentation was not healthy for either." Today documentalists no longer exist. By the early 1960s the term *documentation* itself acquired an old-fashioned image, and in 1963 the profession began to consider a name change, eventually settling on information science (Farkas-Conn, 1990, p. 191). Like the library profession prestigious documentation centers also closed, most notably Kent's own CDCR, which closed its doors in 1971. To announce its passing the university magazine ran just a small announcement, "Documentation Center Absorbed." This hushed closure was buried between news of upcoming campus films for students and an editorial note of when the next issue would appear. How sad that an institute once called a leading information center in the Western world was reduced to a news item that was given no more importance than a local film schedule—all within a span of sixteen years, from 1955 to 1971. The closures of both the library school and CDCR at Case Western Reserve were symbolic of the futility of the information wars. If the information professions could not work together, it was clear that their futures were in jeopardy.

Information Détente: Two Cultures Becomes One

In thinking about the "science wars," Alan Rocke (1998) concluded, "A final suggestion is this: The warriors on both sides of this conflict should calm down, actually read the works of their opponents, and always be intellectually generous to colleagues in different specialties. We are all cultivating the same vineyard." While the larger scientific and humanistic communities have yet to heed this advice, the information professions raised the white flag and have made significant gains at bringing the information wars to an end.

In a note of optimism, Robert V. Williams (1997) wrote that the "fracturing of the information profession" might eventually lead to "greater 'healthiness.' " I agree. Librarians are overcoming their fear of computers, and the two cultures, at least within the realm of information management, may eventually become one. It appears that unlike in the 1950s the library professionals of the 1990s, for the most part, are embracing the new technology. In a decade technologically defined by the personal computer, online databases, and the Internet, librarians are taking an active role and no longer passively resisting technological change.

Some traditional librarians still offer resistance. Just before he died in 1982, Jesse Shera (1983) offered a final warning about the computer. It "must be kept in its proper place as a tool and a slave, or we will become sorcerers' apprentices, with data, data everywhere and not a thought to think." This statement crystallizes the heart of the traditional librarians' fear, concern, and distrust of computers—the fear of servitude to a machine. Early in the 1990s one observer at Michigan State University said that while Internet technology was of interest to librarians, it was also "frightening at the same time" (Charbuck, 1993). In 1992 Charles Robinson, a Baltimore librarian, commenting on the rigid unchanging library profession, stated, "Most of us, quite naturally, will resist the changes that are necessary."

But less traditional librarians know that "virtual, digital libraries are emerging—regardless whether traditional libraries want them to or not" (McClure, Moen, & Ryan, 1994). They believe that librarians should help shape these developments and not simply respond to them. They could either be "dragged kicking, screaming, and whining into a new digitally based information age or they [could] take the lead in making this new information environment better than the last" (McClure et al. 1994, p. 336; Gardner, 1995, p. 15).

Most librarians are now enthusiastically embracing computer technology and using it to increase the status and capabilities of their profession. The *Chicago Tribune* (Swanson, 1995) referred to librarians as some of the "most enthusiastic travelers on the information superhighway." New librarians are increasingly seeing computers not as a threat but as an economic and professional stimulus. Graduates from library schools frequently take jobs in nontraditional library settings with a strong technological emphasis to their work. The result has been a reinvigoration for the library profession.

A librarian at the University of Texas exclaimed, "There's new zip to the stereotypical profile of a librarian" (Murphy, 1997; Schneider, 1996; Thomas, 1995; and Blades, 1994.)

Because of the librarians' acceptance of new technology, even scientists now accept and rely upon the profession of librarianship. At the latest Library of the Future, located at the heart of the Case Western Reserve University campus, humanist and scientific researchers alike are told that the first step for any successful research career is to "get to know the reference librarian in your subject area" (Welcome, 1996; Gopalani, 1997). Understanding the issues surrounding the information crisis in the generation after World War II can assist our planning for other libraries of the future as well as the future of information access. The mistakes made in the past were most notably the absence of the librarian's voice in issues relating to automation and information. We cannot afford that voice to be silenced again, nor can we allow the information wars to claim another victim. The librarian must remain our primary gatekeeper of knowledge.

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