Academic libraries today are complex institutions with multiple roles and a host of related operations and services developed over the years. Yet their fundamental purpose has remained the same: to provide access to trustworthy, authoritative knowledge. Consequently, academic libraries—along with their private and governmental counterparts—have long stood unchallenged throughout the world as the primary providers of recorded knowledge and historical records.

Within the context of higher education especially, when users wanted dependable information, they turned to academic libraries. Today, however, the library is relinquishing its place as the top source of inquiry. The reason that the library is losing its supremacy in carrying out this fundamental role is due, of course, to the impact of digital technology. As digital technology has pervaded every aspect of our civilization, it has set forth a revolution not only in how we store and transmit recorded knowledge, historical records, and a host of other kinds of communication but also in how we seek and gain access to these materials.

Jerry D. Campbell is Chief Information Officer and Dean of University Libraries at the University of Southern California, Los Angeles.
Even before the Web was introduced, academic libraries had started to create digital libraries of trustworthy information.

Even before the Web was introduced, academic libraries had started to create digital libraries of trustworthy information. After the appearance of the Web, many of these digital collections were made accessible through the Web, and their growth accelerated. As the volume of this digital information grew and the Web matured, respected voices began to articulate the emerging possibility of a wholly digital library. These visionaries foresaw a time in the near future when high-quality, accumulated knowledge of all formats would be available in digital form on the Web. Soon, analyses showed that indeed this grand vision was becoming a reality, with the major formats that constitute the body of scholarly knowledge well on their way into digital form—all, that is, except monographic literature. Because of monographic publishers' reluctance to embrace digital technology and because of copyright restrictions, monographs appeared to be a roadblock to this vision.

But few roadblocks have long withstood the onslaught of digital technology. The cultural revolution in our information-seeking habits simply drove through the monographic roadblock. As Clifford Lynch observed as early as 1997: “Now that we are starting to see, in libraries, full-text showing up online, I think we are very shortly going to cross a sort of a critical mass boundary where those publications that are not instantly available in full-text will become kind of second-rate in a sense, not because their quality is low, but just because people will prefer the accessibility of things they can get right away. They will become much less visible to the reader community.” The reality was that case of access significantly affected users’ willingness to consult a particular source of information. This circumstance drove academic libraries to exploit every means available in the classroom or on the Web to teach students how to assess critically the Web-based information they were determined to use.

Then, in December 2004, an astounding announcement was made by Google, the leading search-engine provider.

As part of its effort to make offline information searchable online, Google Inc. (NASDAQ: GOOG) today announced that it is working with the libraries of Harvard, Stanford, the University of Michigan, and the University of Oxford as well as The New York Public Library to digitally scan books from their collections so that users worldwide can search them in Google. “Even before we started Google, we dreamed of making the incredible breadth of information that librarians so lovingly organize searchable online,” said Larry Page, Google co-founder and president of Products. “Today we’re pleased to announce this program to digitize the collections of these amazing libraries so that every Google user can search them instantly.”

With as many as fifteen million volumes potentially included in the project, Google’s announcement promised that a critical mass of trustworthy monographic literature would, in less than a decade, be added to the burgeoning resources on the Web. In addition, in response to the announcement, the French and Germans indicated that they would consider similar projects, and more recently, the rival search engine Yahoo announced a new multi-agency project, called the Open Content Alliance (http://www.opencontentalliance.org/), that would include scanning large numbers of monographs. Although these four projects may not solve the problem of unreliable information on the Web, they will, if completed, provide the Web with a substantial authoritative record.

In retrospect, Google’s announcement stands as a marker, one of Malcolm Gladwell’s tipping points, after which many...
world cultures crossed a psychological divide concerning information on the Web. Suddenly, all but the most hardcore seemed to believe—with attitudes ranging from eagerness to resignation—that eventually the Web would “have it all.” Thus, deep into the digital age, academic libraries have relinquished much of their fundamental and sustaining role. For most people, including academicians, the library—in its most basic function as a source of information—has become overwhelmingly a virtual destination.

Need for a New Mission
As this change has rushed upon us, academic libraries have continued to operate more or less as usual. Though this may be partially assigned to institutional inertia, another factor is that many necessary and important legacy operations remain in place. These include providing physical access to and related services for all those monographs and other published media awaiting scanning by Google and others. Library print-based resources may be in less demand than resources on the Web, but they are still in some demand. In addition, many libraries maintain (or are devoted to) rare book and special collection operations, which are unlikely to change their basic mission even as business declines. Similarly, libraries have many valuable nonpublished and not-yet-digitized holdings that are critical for research in many areas. Simply put, even a revolution as rapid as this still requires a transition period—during which current library operations remain necessary.

Assuming that such a transition may take another decade (which would almost double the current life span of the Web), we must look to the longer-term future. Academic librarians are asking, and the academy must also ask: “What then?” Should the academic library be continued? If so, what will be its purpose? If serving as the world’s primary source of trustworthy knowledge has in the past been the fundamental purpose of the academic library as a group, they do not constitute a fundamental purpose for the future library, and they lack the ring ing clarity of the well-known historic mission in which they are rooted. However, considered individually and investigated more closely, some or one of them may indeed prove to hold the key to the future of the academic library.

Providing Quality Learning Spaces
Early in their history, libraries were endowed by colleges and universities with some of the most beautiful, uplifting, and noble spaces on campus. Usually devoted to reading or meeting, such spaces served and still serve symbolically to reinforce the spirit of learning and to imbue the knowledge-interaction experience with a powerful sense of importance. This is true whether the medium of interaction is a book, a computer, a lecture, a peer, or another resource.

Libraries have also included significant amounts of storage space for books. With their ever-growing collections, many numbering in the millions, libraries have placed a periodic, recurring demand for more space on their host institutions. This is simply a reality of dealing with the ongoing process of acquiring thousands, tens of thousands, or hundreds of thousands of books each year.

Over time, the way that library spaces have been used has changed slowly but also significantly. In recent years, library spaces have been altered to accommodate the increasingly digital environment and to adapt to changing research and study styles. Although the academy has raised the space question more generally as its emphasis has shifted to how people learn and how space can be utilized to better facilitate learning, library space has rarely been addressed or mentioned in considerations of this type.

Librarians, however, have understood the implications of the learning space issue for libraries and have opened their own discussions within the library community. It may be that as scholarship becomes more interdisciplinary and classrooms become more virtual, colleges and universities will need more high-quality, library-like space for student interaction, peer learning, collaboration, and similar functions. But it may also be that institutions will need the space for other priorities. Thus, although it is highly likely that library space in prime locations will be utilized increasingly less for storing book collections, how such space will be repurposed is less certain. Consequently, until discussions take place within the broader academic community, it will remain unclear what part the physical library space will play in a context where virtual communities and activities are increasingly utilized and prominent.

Creating Metadata
As libraries carried out their historic purpose, they evolved a set of technical services to provide bibliographic control of books, journals, and other information formats. Although “bibliographic control” is a dated phrase, it refers to a fundamental truth of human knowledge: as the volume grows, principles of organization must be applied in order for knowledge to be used. As long as the predominant medium of knowledge was print on paper, the principles of organization were applied manually by librarians in the process known as cataloging. For many years, this process was effective, but it was also costly, was highly duplicative from library to library, and did not scale well as knowledge expanded. Ironically, the introduction of digital technology to cataloging in the 1970s extended the practice of creating bibliographic records manually by providing a means for such records to be shared, thereby reducing costs and duplication. Manual cataloging shared through electronic distribution is still the means by which bibliographic control is achieved for the majority of printed resources today.

As digital libraries began to develop, librarians initially applied manual means to “catalog” digital resources because of the need to make more objects on the Web addressable. Since cataloging
was no longer an adequate description, the digital resource addresses came to be known as metadata. Within the Web environment, however, new organizing principles began to emerge, and unlike cataloging, these new principles were no longer necessarily applied best by manual means, nor were they necessarily created from the same elements. There were too many digital objects and data that were simply data. Precisely what kind of organizing principles will eventually be employed and what role humans will play in the process are still being discovered—these are key aspects of the science in the field of library and information science.

In addition, librarians have been slow to recognize the validity of some kinds of data as appropriate for libraries. This has most often been the kind of data that results from the computational sciences, social sciences, technology, and medicine. Perhaps because the original library purpose revolved around manuscript or published writing, this new form of data—which did not represent words, graphics, sounds, or videos—was not judged to qualify as “library” material. This lack of interest, accompanied by a lack of technical skills, contributed to jeopardizing the survivability of much of this type of data and forced many scholars to get into the digital library business in order to save, use, and manage their own data. In other cases, scientists wanted to control closely the design and functionality of such libraries and often distrusted the librarian’s inclination to strive for reducing complexity and customization. This began to change only in the year 2002, with the introduction of the idea of institutional repositories (see below).

Thus, if librarians are involved at all, it is already clear that their role with respect to metadata will be vastly different from their old cataloging role. As libraries and other agencies continue to make information accessible via the Web, there will be considerable need within the academy for the development of portals, tools, and strategies customized for precision research on the vast Web. But it is not clear how long this need will exist or whether such portals, tools, and strategies should be developed by librarians. So far, most major developments in these areas have taken place outside of libraries, in the commercial database or portal world, and this trend is likely to continue. If colleges and universities determine that librarians should be involved, this could constitute a solid platform for academic libraries in the next generation.

Offering Virtual Reference Services
Library reference services, which originated around the needs and characteristics associated with print on paper, became the main point of contact for scholars to ask for help in pursuing their research among library collections. Typically, reference services operated in proximity to a collection of reference books, which represented compilations of useful facts of almost every imaginable type. But reference librarians worked from and assisted with collections and information sources well beyond the reference collection. In carrying out their roles, reference librarians both responded to questions that were brought to them and proactively created educational guides and other helpful tools to inform scholars before questions arose. As the volume of published knowledge grew and scholarship became more complex, therefore, reference librarians performed a crucial task for decades.

Like bibliographic services, however, library reference services scaled poorly. By their very nature, reference services constituted an interpersonal, largely one-on-one activity that typically reached only a limited portion of the academic community. This, along with serious questions about their effectiveness, brought traditional reference services under intense scrutiny and pressure to change in the last two decades. The pressure to change was accelerated by a massive migration of reference information to digital format and a significant reduction in the demand for reference services since 1991.

As a result, reference services have changed significantly. Academic libraries now widely report that reference transactions have expanded from the reference desk to online chat, individual consultation, e-mail, and telephone. In short, reference services have become more virtual. Much of the form and style of reference activities, however, is still based on the old model. So whereas reference librarians have creatively adapted to the digital world, the librarian-assisted, face-to-face reference services—in all of their manifestations, including those that are technology-empowered—are realistically too limited in scope and speed to be the academy’s answer to providing assistance in the Web-based knowledge environment. In an environment increasingly characterized by information on demand and instant information gratification, the academic public has decreasing patience with reference services based on personal response, even if they are Web-delivered and asynchronous.

At the same time, the question-and-answer process, which is the heart of traditional reference, is suffering encroachment from increasingly sophisticated natural-language search engines. The big
commercial search engines clearly have an agenda to continue the development of Web-based help and to market it directly to scholars. Even though such engines have a long way to go, they are getting better, and scholars increasingly prefer them over reference services offered by the library. Another intriguing concept is that because it is an evolving, multifaceted information source powered by mass collaboration, the Web itself will be the true successor to library reference services. Functioning like one gigantic neural network, this future Web would accept and accurately answer queries of the most complicated sort.

Precisely where library reference services as a response to individual questions fit into the emerging knowledge environment is undetermined. And whether such a service will provide a viable reason to maintain libraries and librarians for even the mid-range future is unknown.

*Teaching Information Literacy*

Information literacy is a subcategory of the reference function, but it is sufficiently important to deserve separate consideration. For decades, the librarian stood between academicians and the chaos they would otherwise encounter in the world of knowledge. Librarians applied discretion not only in building, organizing, and managing collections but also in explaining them to students and scholars. Since reference services did not scale, librarians adopted the principal methodology of the academy and taught classes. In earlier days, the classes were called *bibliographic instruction*. With the addition of digital resources to print and multimedia, the knowledge environment became considerably more complicated and the need more urgent for expanding this kind of instructional service.

Thus, in the digital age this service has come to be referred to as *information literacy*, and it has had a challenging agenda. Not only have academic library users had to negotiate a multiformat environment, but even after the introduction of the Web, the digital environment has continued to be rife with Web-based proprietary systems (especially for copyrighted information) and plagued by failure across the publishing community to adopt common standards. So complex have things become that the subject of information literacy has gained the attention of major regional accrediting agencies as they wrestle with the question of the place of libraries in gauging the effectiveness of colleges and universities in the twenty-first century.

Not surprisingly, academic librarians have focused much attention on this issue. The National Forum on Information Literacy (http://www.infolit.org) was established in 1989, and a number of organizations, including the Association of College and Research Libraries, have developed information literacy competency standards. These efforts notwithstanding, it is still unclear whether the continued migration of information to the Web will result in a less-complicated environment with a reduced need for information literacy or whether placing everything together in one environment will make the need greater. Will marketing directly to readers become sufficiently refined as to eliminate the need for providing information literacy? Will the maturation of the Web as a source of knowledge and as a knowledge-retrieval mechanism decrease the need for teaching information literacy? And if the need for information literacy persists, will that need be large enough to provide a reason for keeping a library?

*Choosing Resources and Managing Resource Licenses*

Choosing resources lay at the heart of the library’s primary purpose. Librarians chose many thousands of books, journal titles, and other forms of published information to add to an institution’s knowledge assets. Decades ago, this was accomplished title by title. Many librarians participated in collection development, and some, known as *bibliographers*, specialized in the effort. By the mid-twentieth century, with the rapid rise particularly in scientific publishing, the amount of academic publishing began to overwhelm the title-by-title selection process.

Shortly afterward, emerging digital technology provided options to accomplish the selection process more easily. Specifically, commercial book-distributing agencies began to purchase large numbers of academic publications for major discounts and provide them to libraries often for less than it cost the libraries to acquire the publications directly from the publishers. The practice was attractive because it allowed libraries to create automated collection profiles that could accomplish much of the selecting without the involvement of librarians. When such profiles let unwanted materials through, libraries could return them, but most libraries found that the error rates were sufficiently small that keeping the unwanted books cost less than reviewing and returning them. This practice was characterized by the use of “approval plans”: materials were sent to libraries subject to approval after the fact. This and similar practices continued as late as the mid-1990s as a means for acquiring monographs on paper.

More recently, however, librarians have been dealing with an additional and different paradigm for providing access to resources. Resources in digital form, initially represented by journals and multimedia, are increasingly unavailable on a title-by-title basis. Rather, they are usually made available grouped as collections, and these collections are offered as sets. In addition, such sets—previously available for purchase by subscription—are shifting to an arrangement in which they are licensed rather than purchased. Thus, librarians have been required to become adept at understanding and negotiating licenses.

Since traditional academic monographic publishers were slow to adopt digital technology, they have been under pressure to change as the economic model for paper publishing and distribution has begun to falter. This has been especially true for university presses. New agencies such as World eBook Library (http://www.netlibrary.net/) and Questia (http://www.questia.com/) have increased this pressure by aggregating and marketing monographs among their digital offerings, packaging the monographs in license arrangements and setting the stage for the landmark announcement by Google and the more recent announcement by Yahoo. In addition to economics and competition, customer demand for digital resources has also risen, resulting in persuasive arguments that electronic
monographic publishing will prevail.22 Within the next decade, published academic knowledge of all types will likely be issued digitally and made accessible on the Web, with paper publishing limited to mass-market titles, textbooks, and other areas that make economic sense. This circumstance will gradually eliminate much of what remains of the collection-development process and will shift the librarian’s role much more toward managing licenses. What must be determined is how large and how important this role will be.

Collecting and Digitizing Archival Materials
As a part of their founding purpose, academic libraries have played key roles in providing access to archival materials of all types. Typically, this effort has been a comparatively small part of academic library programs, but many of the resulting archival collections have proven essential for documenting major aspects of the represented cultures. In carrying out this role, academic librarian/archivists have sought out such materials and evolved principles for organizing, storing, and facilitating their use. This effort not only has helped to preserve the cultural heritage but also has provided a rich repository for research across a vast range of disciplines. In addition, these one-of-a-kind archival materials have brought unique research strengths and often distinction to the institutions holding them.

Such archival materials have suffered from two significant limitations, however. They have been available in only one location, and they have been difficult to find and use. The coming of digital technology offered a solution for both of these limitations: if archives could be digitized and tagged with the proper metadata, they would no longer be location-bound and they would be much simpler to find and use. Academic libraries and other agencies therefore began efforts to develop digital archives and make them available on the Web.23 This has caused an increase in the use of archives by scholars and, in turn, has given new value and impetus to both the collecting and the digitizing of archival materials.

Significant numbers of valuable, library-held archives have not yet been digitized. In addition, vast archives held by businesses and individuals could be useful if they were preserved and made accessible. Such archives represent almost every type of medium of communication—some are physical representations, some are originally digital—and most hold value for research and scholarship. For these reasons, collecting and digitizing archival materials may offer a significant opportunity for libraries and librarian/archivists in the future.

Maintaining Digital Repositories
The idea of maintaining digital repositories can easily be misunderstood. It refers to maintaining collections of data actually stored and managed by a library and does not include data stored and managed by other agencies for which a library serves as a gateway or portal. In some ways, maintaining digital repositories is therefore analogous to maintaining physical library materials and is often a necessary aspect of building local digital libraries.

As digital collections developed, two interrelated types of library digital repositories emerged. First was the more limited type of repository that included materials converted from some other format to digital, data bought and mounted locally, and original digital publications. Such early repositories were typically separate datasets and were not integrated with other repositories of similar or different formats. Many of these, even when Web-enabled, are not visible to the major search engines and are often referred to as being on the “Invisible Web” or the “Deep Web.”24

In the late 1990s, a second type of digital library repository emerged, one that was to some degree a byproduct of the crisis precipitated among colleges and universities by the combination of copyright restrictions and the high costs of journals in the sciences, technology, and medicine.25 Called an “institutional repository” (IR), this idea is based on the premise that an institution or a collection of institutions might reasonably publish the work of their own faculties by placing the work in Web-accessible databases. Championed by MIT with DSpace (http://www.dspace.org/), this approach formally got
Caught between Money and Icons

Although these emerging, digital-age library services may be important, even critical, in the present era, there is no consensus on their significance to the future academic library—or even on whether they should remain as library functions carried out by librarians. In addition, at this point, the discussion of the future of the academic library has been limited to librarians and has not widened, as it should, to involve the larger academic community. Consequently, neither academic librarians nor others in the academy have a crisp notion of where exactly academic libraries fit in the emerging twenty-first-century information panoply.

Librarians must widen the discussion and raise the questions concerning the future of academic libraries. In doing so, however, they have reason to be nervous. Such questions may precipitate draconian answers based mostly on financial concerns. Providing access to authoritative knowledge has been costly—though arguably its value has exceeded its cost. How costly? The mean annual budget for the libraries that constituted the Association of Research Libraries (ARL) in 2004 was $22,700,000. Over the presumed ten-year transition period, therefore, a single institution with a library at the mean would spend, in today’s dollars, one-quarter of a billion dollars. In 2004 alone, the 113 universities with ARL libraries spent roughly $2.5 billion. Although most colleges and universities spend appreciably less, their expenditures are still significant within their respective contexts.

Signs of financially triggered draconian reactions are already visible. In early 2005, Bangor University, part of the University of Wales, announced a decision to lay off eight of its twelve librarians. Bangor noted that technology had “deskilled” literature searching and had reduced the need for librarians. In the government realm, the city of Salinas, California, announced in September 2004 that it would close its public libraries, and the city of Philadelphia, Pennsylvania, indicated in February 2005 that it would lay off librarians and reduce library hours. On a larger scale, in the spring of 2005 the governor of Missouri proposed to discontinue the state’s multi-million-dollar subsidy for the Missouri Bibliographical Information User System, a statewide consortium serving sixty libraries. This action was subsequently approved by a Missouri House and Senate conference committee.

Even if all of these proposed actions are reconsidered and reversed, they are enough to sound a warning. The obvious risk in such knee-jerk reactions lies in acting on a largely unconsidered and totally untested assumption: that libraries and librarians are unnecessary and that alternatives will take care of themselves.

In addition, in raising questions about the future of academic libraries, librarians risk being vilified as cultural barbarians by the general academic community as well as by some of their library colleagues. Perhaps because they were the guardians of authoritative knowledge, libraries became cultural icons. As much as any other human institution, they developed a mystique that symbolized knowledge, wisdom, and learning. The buildings that housed libraries were awe-inspiring architectural creations that added to the mystique, and books—with their distinctive, ancient aroma—became objects of art and reverence. Consequently, simply asking questions about the future of libraries, let alone working to transform them for the digital age, almost inevitably evokes anguish, poignancy, and even hostile responses filled with nostalgia for a near-mythical institution.

Finally, there is the more personal element: asking these questions calls into question the viability of the librarian’s own future. The skills needed to work with metadata, IRs, and other similar sources are much more highly technical than those possessed by most of today’s academic librarians. In bringing such questions forward, therefore, librarians must understand the stakes involved. They must also understand that not raising such questions abrogates a crucial professional responsibility: helping the academy recognize the implications of the changes taking place.

Seeing the changes introduced by the technology revolution more than a decade ago, one member of the academic community observed: “What then becomes of professors and publishers and librarians? If we are very sure we know what our roles are and very determined to work hard to maintain them, we have every reason to look forward to extinction. Confident reliance on old models for such functions will not suffice.” Given the events of the past decade, academic librarians perhaps know better than anyone else that the institutions they manage—and their own roles—may face extinction over the next decade.

Though schools of library and information science appear to be aware of this and are changing their curricula, they have generally been at a disadvantage in preparing the kind of information scientists needed and in preparing large enough numbers to build the digital library future. They have small faculties, must cover a large range of subjects to maintain accreditation, and are unable to achieve a critical mass of specialists in an area. At the same time, engineering and computer science programs generally lack the professional service ethos deemed critical for library success. So whereas many senior librarians may simply not know how to function in the evolving environment, not enough recent library school graduates have the necessary technical expertise. With the baby boom retirement wave approaching,
the predicted shortage of academic librarians31 may be fortuitously timed to give the academy an opportunity to rethink its libraries without affecting the careers of too many librarians.

Conclusion
Because of the fundamental role that academic libraries have played in the past century, it is tremendously difficult to imagine a college or university without a library. Considering the extraodinary pace with which knowledge is moving to the Web, it is equally difficult to imagine what an academic library will be and do in another decade. But that is precisely what every college and university should undertake to determine. Given the implications of the outcome, this is not an agenda that librarians can, or should, accomplish alone. Over the next decade, colleges and universities will have to make critically important practical and policy decisions about the function of libraries, about the space devoted to libraries, and about the roles of librarians. If these decisions are made wisely, the academy may be able to maintain much of the ineffable, inspirational value associated with academic libraries while retaining their practical value through altogether transformed activities and functions built upon a new mission designed for a more digital world.

Notes
3. For the tip of the iceberg, see <http://www.google.com/Top/Reference/Libraries/Digital/>.