The Ultimate Internet Cafe.

Reflections of a Practicing Digital Humanist about Designing a Future for the Research Library in the Digital Age.

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DRAFT NINE (07-27-02)

Introduction: A Vision of the Year 2012

Let me start this thought piece with a vision. The year is 2012. Chris Borgman's predictions about the Global Information Infrastructure (GII) have been realized, and there is a vast amount of easily searchable and accessible information available online (Borgman 2000). But our great, historic research libraries, far from disappearing or, at least, shrinking, are as alive and vital as ever. How can this be? Instead of fighting a hopeless rearguard action against digital technologies, in the early years of the 21st century research librarians decided to embrace them. For example, most research libraries have recently been outfitted with a realtime, immersive theater seating at least 50 people; some even have several theaters. Each theater features three highly luminous projectors with edge-blending. Its powerful supercomputer pumps out 60 frames per second of imagery onto the screen while also generating appropriate 3D sounds and even permitting users to move virtual objects around in 3D space as required. Users of the theater have the impression of being right in the middle of the subject of their study—be it ancient Rome, the three stable members of the C2H4O group of isomers, the interacting galaxy NGC 4038/9 in Corvus, or the geological stratigraphy of Mars. At will, users can fly over the earth and, moving a time bar, can set themselves down at any one of several hundred sites of great importance to humanity's cultural history. The information contained in computer models projected in the theater, though in part speculative, is by no means fanciful. Published by university presses, laboratories, and professional organizations, the models are readily available, reasonably priced, and reflect the same high standards of academic peer review long since

applied to print publications. As visualization tools, the models are a powerful resource in instruction, but—since they represent the state of our knowledge and ignorance--they are no less effective as midwives of new ideas and discoveries in pure research. Since the theater is the only place users can go to work with this information in groups and in a totally immersive environment, it makes the research library more than ever the center of learning and research on the campus. The theater is booked all day long by classes, research groups, and individual scholars. In the evening, community groups use it to catch up on the latest medical, astronomical, or archaeological discoveries. The theater is but one of many ways that the research library has adapted itself to new digital technologies, which, far from undercutting its raison d'être, have been greeted as tools helping the library to achieve its goal of supporting research and teaching.

Now, let's cut back to 2002. UCLA is the only American university with such a theater—and it is buried in the bowels of the central computing facility, not prominently displayed in our research library. At UCLA, my little team at the Cultural Virtual Reality Laboratory has made a handful of models of cultural heritage sites, and a few other hardy souls at other universities have made a couple of models of the other things I mentioned—brains, molecules, planets, etc. But there is no easy way to license a model, or even to find out that it exists, if you need one. There are no technical standards that ensure that my model of one building in ancient Rome will interoperate with another scholar's model of the neighboring building or with another building on the same site at a different period of time. Nor is there any standard about the documentation, or metadata, that should be published along with the raw model so that users can quickly understand who made the model, on

the basis of what hard data, and using what process of reasoning to fill in gaps in the record.

How do we get from 2002 to 2012? The central feature of the vision is a new activity--collaborative, interactive demonstrations of virtual reality models in the context of teaching and research--housed in a new space, the immersive theater. In this essay, I will argue that putting the activity and the space into the research library is both appropriate, in view of the research library's mission, and desirable, if we wish to see the research library flourish well into the new century. I will also argue that this is just one way that the research library might embrace the new opportunities presented by the digital age, which always entail incorporating new user activities and services while developing suitable architectural designs to give them tangible form and support. My message is thus an optimistic one: the research library will survive because of the introduction of ever more and newer digital technologies, not in spite of it. If managed well and if understood strategically in terms of the evolution of our educational system and culture, the transformation of the library from the old analogue technologies to the new digital technologies can occur with a minimum of pain and a maximum of gain.

The Future of the Book and the Future of the Research Library

Before writing about the future of anything these days, it is well to begin with a caveat: things are changing so fast that we can at best speak of the short-term (the next 5-10 years) and the medium term (the next 10-20 years). Beyond that, we quickly get into a realm better left to futurologists of the stature of a Ray Kurzweil (cf. Kurzweil 1999). So

by "the future of the book and of the research library," I just mean what I think will happen in the next five to twenty years.

When we think of research libraries, we think, first of all, of books, lots of them. The fate of the research library, then, is an epiphenomenon of the fate of the book itself. And the good news is that the traditional printed book is doing better than ever. The same digital technology that might seem to threaten the book's very existence is also giving us "print on demand," making it easier and cheaper to produce books, reissue them, and publish new editions, all in relatively small print runs.[1] The real problem librarians may soon face is not the death of the printed book but the profusion of new titles, reissues of old titles, and new editions of scholarly books by living authors—all made more economical and practical by print-on-demand.[2]

Moreover, even power-users of digital devices such as PDAs overwhelmingly say that they prefer printed books to books online.[3] Not surprisingly, a recent survey of professional humanists found much the same result (Brockman et al. 2001, 3-4). This is just as well, since for several reasons, we are not likely to have digital versions of every last obscure text and document for a long time, if ever. Digital conversion projects, like their microfilm and microfiche predecessors, bump up against the realities of economic constraints that force choices and prioritization of what is converted (cf. Smith 2001) and of the ever-dreaded roadblock of copyright protection.[4] So the transition from the printed book to the book online is going to occur slowly, if it happens at all.

But even if we imagine that, with time, more and more readers will be habituated to the online book--perhaps in part because they become accustomed to the technology and in part because the technology platform of the online book is more ergonomically designed--then we can still safely predict that research libraries will continue to be needed because they are our repositories of precious documents: manuscripts, rare books, etc. Humanists are known to prefer original documents to facsimiles (Brockman, et al. 2001, 2, 4), and there is no reason to think that this will change, or should change, in the 21st century. Even if these materials are put online (and, however inevitable this may be, it is happening slowly and haphazardly at present and, in any case, is a massive task requiring many, many years; see Smith 2001; Brockman et al. 2001, 3), in the end scholars will still find that nothing can replace autopsy of the original document. To be sure, as a practitioner of statistical stylometry for the analysis, attribution and dating of literary works (cf., e.g., Frischer et al. 1996; Frischer et al. 1999), I will gladly stipulate that digital technologies can offer as much new support to the autopsy of texts and manuscripts as they offer to, e.g., the medical autopsies of pathologists.

Three Consequences of Digital Technology for the Research Library

But if research libraries will continue exist as the repositories of manuscripts, rare books, and of printed books not yet available in digital format, then they will also have new opportunities and responsibilities to face in the digital age. I see three consequences for librarians, creators of digital products, and library designers.

?First, in the digital age, the research library will be special not so much because of the quantity of information it can offer the user but because of the quality of the experience in which that information is presented.

?Secondly, producers of digital content need research libraries every bit as much as print authors needed them in the age of Gutenberg.

?And finally, in the age of cyberspace, real space and compelling architecture matter more than ever.

First Consequence: The Quality of Experience

The research library has always been what could be called the “high-end” place where information has been stored, catalogued, and delivered. In some research libraries with suitable working facilities, it was also the place where information was produced. Production, however, was always considered a secondary part of the library's mission. For example, the UCLA Young Research Library has generally received a very high ranking from the Association of Research Libraries; yet, because of its lack of reading rooms, carrels, meeting rooms, etc., it has not, generally, been the place where UCLA students and scholars actually get their work done.

In the pre-digital age, “high-end” referred mainly to the quantity of information. We measured the importance of a library primarily by the number of books on its shelves and

the quantity of journals to which it subscribed. In the digital age, information online will soon far outweigh information stored on a particular site (if it doesn't already). Hence it is not surprising to read the Association of Research Libraries report of a drop in total circulation from 1991 to 2000.[5] What is astonishing is that the drop was only 6%: surely this trend will pick up strength in the next decade.

But this will not necessarily consign the research library to the rubbish heap of history since the research library can be a place where users find it convenient and even preferable to access a great deal of the online library they use. In the digital age, what makes a library "high-end" will pertain more to the quality of information management and presentation than to the mere quantity of information stored locally.

Users of digital content may not know it, but they need research libraries more than ever. It is true that we can access such content in our offices and homes. But as Nietzsche (who started out as a professor of Classics) once observed, a good philologist needs to consult two hundred books a day. This may be an exaggeration, but humanists do need to read or browse through many books in a day, and often many are open on their desks at the same time, as they compare one passage to another.

Even in the age of the digital library this is the case. While we can open many windows on one PC, wouldn't it be nice if we could go somewhere on campus where we could find special digital work environments with multiple screens and multiple log-ins so that you could look at the equivalent of ten books open before you at the same time? And shouldn't such a space be designed with printed matter in mind, too? Most of us live in a

hybrid world in which the information we need comes both from traditional and from new media. Wouldn't it be appropriate for the research library to be one place on campus offering such a workspace? Of course, this will require new space, or a reconfiguration of existing space. But the fact that more and more books are being converted to digital format, however much it might seem to be a dark cloud hanging over the traditional research library, does at the very least offer the silver lining of permitting the print versions of those books to be consigned in good conscience by librarians to long-term storage, thereby freeing up space in the library for other uses. One high-priority use could well be the provision of the new, hi-tech workplaces for which I am arguing here.

If so, the library, not the home, could become the preferred place for scholars to work.[6] This would especially be the case if, as the number of books on the shelves declines in tandem with the rise in the number of online texts, libraries change their status from circulating to noncirculating. This would mean that scholars could count on finding the books they need on the shelves (I don't propose making our libraries closed-stack), and, if books are fitted with inexpensive RFID tags (RFID = Radio Frequency IDentification) devices, they could even locate books that are not in the right place on the shelf because they have been misshelved or are in use someone else in the building.

And couldn't the Internet itself even be the friend of the research library if, for example, the electronic catalogues of our libraries that are now increasingly available on the net were broadcast inside the library so that users could use wireless PDAs wherever they are in the building to discover where a book is shelved and whether it has been checked out? If readers were required to swipe each book they take off the shelf for use at their

workplace so that the central catalogue could keep track of the current position of each item in the collection, then systems of collaborative filtering could be used so that readers with similar interests who are in the building at the same time could be so informed by e-mail messages (cf. Sarwar et al. 2001). If they then chose to meet to discuss their work, their scholarship would be enriched, and the library would have taken on a new role, consistent with its original mission, in furthering collaborative research.

Second Consequence: Why Creators of Digital Content Need Research Libraries

Once again, the need for the research library can be argued simply on the basis of its traditional role. Digital products need to be preserved just as much as do books and may be more fragile than printed publications not only because of the vagaries of the storage medium but also because of the ephemeral nature of the hardware and software platform that supports them. Someone needs to preserve high-quality digital products. Why not the research library? This responsibility has indeed begun to be recognized by several forward-thinking librarians and information scientists (cf. Chodorow 2001, 12f.; Waters 2001; Marcum 2001a; Nichols and Smith 2001, 41-54). [7]

But once again, there is a new role for the research library to play. If providing state-of-the-art hybrid workstations will be a boon to a library's users, it will also help digital producers who deliver their content over the Internet, encouraging them to produce versions of their sites that require the highest bandwidth possible. But not all digital products are best delivered over the Internet, and some digital products were never

intended for the Internet in the first place. They are best seen in theater-like spaces and in social settings I described in my vision of the year 2012. As I mentioned, in 2002, the only such theater in an American university is the Visualization Portal located in UCLA's Academic Technology Services (see http://www.ats.ucla.edu/portal/default.htm). Since the lab I direct is a major content producer for the Portal (see www.cvrlab.org), let me digress a bit to describe its projects and mission.

The Cultural Virtual Reality Laboratory(CVRLab): Producing New Tools for Teaching and Research in the Digital Age

The CVRLab was created in 1997 in order to create scientifically authenticated 3D computer models of the world's cultural heritage sites. The hard part comes in defining and implementing what is meant by "scientific authentication," and this is where the Cultural Virtual Reality Organization (CVRO) comes in. CVRO is a new professional organization started by lab staff and kindred spirits from around the world (see Frischer et al. 2002; http://www.cvro.org). Our idea is that, if you are going to try to use computer technology to rebuild a temple, public building or some other structure that no longer exists at all or in its original form, then you ought to do so in a way that is "scientific" not in the sense that the model is 100% correct but in the sense that it is 100% transparent. The members of CVRO are interested not just in producing a computer model of a site but also in supplying the footnotes, or metadata, that tell a user everything she might like to know about the reconstruction from who made it to why one kind of marble or plant material was used and not another. By publishing the metadata along with the model itself, the CVRLab and the members of CVRO want to enable users of models to distinguish the definitely known from the hypothetically reconstructed; to be aware of scholarly

controversies; and even to empower users to tear apart a model and put it back together in a way that seems more cogent to them when they disagree with the reconstruction decisions we have made. In developing new metadata standards, CVRO is benefiting from analogous work already undertaken by research librarians for the Dublin Core Metadata Initiative (see http://dublincore.org/). On its own metadata committees, it is seeking the active participation of librarians and information scientists.

Equally important for authentication is the use of a scientific method for producing a model. This starts with something very simple—but something often missing in a commercial model of a cultural heritage site: a scientific model must have an author. The CVRLab has developed the notion of a collaborative authorship involving the cultural authority responsible for the site, a scholar who has written a technical monograph about how the site was constructed, and a cultural historian who can put the site into some larger context. We include experts like this on the team so that we can base the model on large-scale measured drawings and on high-resolution photographs of the actual surfaces of the building. We also obviously want our models to reflect up-to-date thinking and theories and to be created with all necessary permissions and blessings from the cultural authorities in charge of preserving the places we recreate. As an example of one of our authorship teams, I would cite the group which directed our modeling of the early Christian basilica of S. Maria Maggiore in Rome. The building was built in the first decades of the fifth century A.D. and has undergone many changes and transformations since then. Our goal was to strip away the accretions of the ages and to restore the church to its original appearance, which was dominated by its fine cycle of polychrome mosaics illustrating the life of Abraham, Isaac, Moses, and Jesus. The team of authors consisted of

a professor at the Dutch School in Rome who just before we started our project had published a highly-regarded monograph reconstructing the original phase of the building; and two curators at the Vatican Museums—one in charge of the excavations under the church revealing the pre-Christian phase, the other responsible for the maintenance of the present building. It was thanks to our Vatican scholars that we were able to use the state drawings of the basilica for our model as well as excellent photographs of the mosaics.[8]

The CVRLab is currently doing similar projects for the Roman Forum, House of Augustus, and Colosseum in Rome; the Villa of the Mysteries in Pompeii; the cathedral of Santiago de Campostela in Spain; the Second Temple in Jerusalem: and two Inca sites at Farfan and on the Island of the Sun. We hope to continue this work into the indefinite future, creating models of significant cultural heritage sites around the world, and showing the main phases in the development (including, when pertinent, the destruction) of each site. In other words, working in cooperation with CVRO members around the world, we hope to create a virtual time machine that will permit students and scholars to visit the very places they are studying. But there is no guarantee that we will be able to achieve this goal: we get no funding from the university, and our very survival depends upon seemingly random opportunities to find funding for a specific project. Meanwhile, for an important reason I will discuss below, we have not been able to discover a way to market what we create in any consistent way so that we cannot, at present, be self-funding.

It is one thing to create a real-time, interactive model and quite another to deliver it to our users. We do this in a variety of ways, including print, video, and the Internet. In the end, the way a given model is delivered is determined by our users' pocketbook and specific

needs. The computer model is a flexible digital asset that can be used in a variety of ways. At the low end, in terms of interactivity, immersivity, and price is a 2D image that can be used to illustrate a publication or a sign in a museum. A bit higher up the scale is the video documentary. We can output fly-throughs of our models to DigiBeta, edit the segments, add music, voiceover, and other visuals. The result is a documentary presenting an archaeological site to the public. We have produced such videos for a number of exhibitions, including the London Science Museum, the Jubilee Year show on Christian art in Rome, and the new museum of the Basilica of S. Maria Maggiore in Rome.

Then there is, of course, the Internet. We can post 2D pictures on the Internet, and we can stream our video documentaries. But we can also put actual interactive models online. But I hasten to add that these versions of our models have less detail, and they are not experienced by Internet users with anything like the degree of immersivity that is possible on other delivery platforms.

At the very top end of the scale is the Reality Theater or CAVE, two special kinds of spaces where users can come together in groups of typically 10-50 to enjoy a fully immersive, real-time experience. In a Reality Theater, there is one screen that is curved 166^{0}-180^{0} around the room (see http://www.magicsys.ro/sgi/3000/1212.pdf). In the CAVE, there are screens on at least the three front walls of the space, and, ideally, also on the floor, ceiling, and back wall (see Cruz-Neira, et al. 1999; http://www.technologyreview.com/articles/wo_basu090501.asp). Since CAVEs and Reality Theaters are expensive and available only in a handful of American universities, it

is no surprise that the top end of our scale is also the least frequent way of using our models. This is a shame, and it is where research libraries might be able to help.

Desirability of Displaying 3D Computer Models in the Research Library

The Reality Theater and the CAVE are two examples of spaces suitable for the display of digital products never intended for dissemination on the Internet. Today, they tend to be found, not in a university's libraries, but in its central computing facility or department of computer science. This is not surprising because both the technologies and content are still in the phase of research and development and are, admittedly, not yet ready for widespread commercialization. But this is quickly changing--and some would even argue that viable commercial solutions already exist. Be that as it may, all would agree that we are on the threshold of a period in which the 3D computer model of a mathematical equation, complex molecule, distant galaxy, or ancient city will be as commonly used in university research and teaching as 2D slides were throughout the twentieth century.

But before the 3D technology catches on, it must first overcome the famous paradox of the chicken and the egg. Until CAVEs and Reality Theaters are common on our college campuses, no audience for models will exist. If there is no audience, there is little funding and little incentive to carry forward this kind of work. Yet, you don’t have to be a constructivist to intuit that, all things being equal, students will learn more about the Roman Forum by going there than by reading about it; and that scholars are more likely to have new insights about the data they study by immersing themselves in detailed photorealistic representations of it than by making doodles of it on their whiteboards or on the backs of envelopes.

Research libraries could fill the void in our universities, at least in the first stage of the growth of computer modeling. As there are more and more 3D models and more users, other venues will naturally develop, as the price drops and demand grows. But at first, the research library may be best equipped in terms of its mission and skills to host visualization theaters. It could then become the physical equivalent of the virtual communities that have been springing up with increasing frequency since the advent of the Internet and the concomitant growth of collaborative research in the humanities (cf. Brockman et al. 2001, 13). In economic terms, our research libraries could do for the digital publication of scientific 3D models what they have long been doing for the print publication of scholarly books and journals: through standing orders, give publishers the courage and incentive to take the risks inherent in developing and marketing any new product.

I like to think that by embracing this particular digital technology, the research library will also, in effect, return to its roots, for the first research library--the great library of Alexandria--not only had a great collection of books, but it also had botanical and zoological gardens, an astronomical observatory, and an anatomical theater (cf. Schaer 1996, 12). In the modern period, such features have been spun off the library, which has come to offer only the representation of our objects of study, but not the objects themselves. Given the infinite increase in the number of objects tracked by the modern university, it would be unrealistic to attempt to build an updated version of the Alexandrian library. But by admitting the new form of 3D representation into the sacred precinct of the modern research library, we can eventually recreate something of the richness of the first great museum-library with the help of virtual reality technology.

Third Consequence: The New Importance of Architecture and Design

In attracting people to our new library of the digital age, digital theaters, high-end equipment, new digital services such as the wireless transmission of the catalogue throughout the library will all be very helpful magnets, but let's not forget the important role that must be played by architectural design in creating spaces that are functional and, even more importantly, inspirational. In a sense, this, too, represents a return to (modern) origins: in the first treatise on library organization, written by Gabriel Naudé in the mid-seventeenth century, the siting, orientation, design, and decoration of the library were all topics given great emphasis. In the age of cyberspace, too, real space made of bricks and mortar still matters, and it matters, I would argue, even more than it did in the last century when the measurement of a library's excellence was mainly quantitative. Those elaborate work spaces with many screens and multiple log-ins that I hope to find someday soon in my local research library—not to mention the virtual theaters I called for--will all take talented architects to design.

But beyond the needs occasioned by these new features of my ideal library in the year 2012, librarians need to think more about architectural design because in the digital age, users of physical libraries will want to experience something in a library that cannot be had in the office or home, and that something is the drama of community. The library buildings that communicate and foster a sense of that awe will be a centripetal force on our increasingly silo-ridden campuses, drawing people in, facilitating new contact between faculty and students and between colleagues in different fields.

Research suggests that, if you build it (or, at least remodel it), they will come. Just as power-users of PDAs still surprisingly prefer printed to online books, so, too, typical owners of a PC unexpectedly often choose to work, not in splendid isolation of their homes or offices, but in a bustling 24/7 Internet cafe.[9] Or, perhaps that isn't surprising. After all, in Berlin or Vienna, the mere fact that you own a coffee pot doesn't keep you from becoming an habitué of your local Konditerei.

Those Association of Research Library statistics mentioned earlier offer some support for this in terms of the research library: whereas total circulation fell from 1991 to 2000, the number of group presentations held in research libraries soared by 41% in the same period.[10]

Configured in the right way for work in the digital age, and offering facilities such as reality theaters that can never exist in the home, the research library can become the ultimate Internet cafe where we find it convenient and congenial to connect to remote places. With this in mind, I think that the kind of research libraries that will encounter difficulty in making the transition to the digital age are those modernist structures with no inspiring communal working spaces that are more book warehouses than libraries. As a classic example, I must, alas, cite my own Young Research Library, which, for all the excellence of its collections and staff, has no grand entrance to lift the user out of the humdrum routine of everyday life, nor even a main reading room. Instead, it isolates readers in individual desks lined up along the perimeter of each floor. This is exactly what will no longer work when people can get from the Internet their fill of disintermediated rationality and Sherry Turkle's pluralistic self, or, as Internet critic Hubert Dreyfus would

more pessimistically characterize it, plain old-fashioned alienation (cf. Turkle 1995; Dreyfus 2001).

I like to imagine the ideal new research library as following the lead of Pei, Cobb's new San Francisco Library (cf. http://www.pcfandp.com/a/p/8908/s.html), whose uplifting foyer was used to represent heaven in the recent film, "City of Angels." More down to earth is the new Middlebury College library, which is scheduled to be completed in 2004. Architect Bob Siegel explicitly describes the project as driven by a concern for making the library a "social gathering center" on campus. It will have meeting rooms, classrooms, faculty offices, but also provide enough book storage for an anticipated fifty years of service while at the same time accommodating other media, including digital media. It will be interesting to see the final result and especially to see whether Siegel also tackles the difficult issues involved in creating hybrid and high-end digital workspaces.[11]

And what will happen to architecturally outdated buildings like the Young Research Library? Assuming there is no money available simply to tear them down and start over, there are other, less expensive solutions. Those important missing pieces--a suitable entrance and reading rooms with state-of-the-art digital workstations--could always be added. If, as I suspect, the aversion to reading books online diminishes over time as the e-book becomes more familiar, the graphline trajectories of new books printed and old books digitized may cross at some point ten to twenty years from now. At that point collections can actually start to shrink each year, as the newly digitized books are removed to long-term storage facilities. This will free up space within existing buildings for retrofitting along the lines suggested here.

Conclusion

The UCLA research library was one of the first in the world to complete a retrospective digital catalogue of its collection, to make the digital catalogue available online, and to remove the card catalogue from the library. The space occupied by the card catalogue is now devoted to current periodicals and to computers giving access to the online catalogue and other finding aides. The next logical step might seem to be the removal of all the journals and books from the library, their replacement by an online digital library, and the simultaneous closure of the library itself. Such an evolution has been predicted by some observers (cf. Basili 2001, 35-46).

In this essay, I have argued against this scenario for a variety of reasons--some empirical (e.g., readers' resistance to reading books online; the greater ease of publishing and reprinting physical books in the digital age; etc.) and some logical (e.g., the need for a place to store and access important digital and non-digital documents; new digital products that are not intended for delivery over the Internet). The essence of my argument comes down to the fact that, even in the digital age, there are some activities that can take place in the research library more appropriately than anywhere else on campus; and there is a positive interaction between those activities and the design of the spaces provided to house them. As the activities change to take greater advantage of digital technologies and products that help the library to realize its basic mission of promoting research and learning, so, too, must the physical design of the library. The experience with UCLA's retrospective digital catalogue project encapsulates some of the key features of this

interaction: as the activity of book finding evolved from shuffling through notecards in hundreds of drawers in scores of cabinets to searching online, the cabinets could be removed and the computers put in their place. But this was not a zero-sum game: much more searching activity could take place both inside the library and, via the Internet, outside; and not all the freed space was devoted to the searching activity. Some of it was reallocated to the display of current periodicals.

But this example does not capture my entire thesis because it omits three important subsidiary points. First, there should be new space in our libraries for products made possible by digital technologies that are immersive and interactive, and which are not primarily intended for dissemination over the Internet. Secondly, the library needs to be made the place for the production, and not simply for the distribution and consumption, of knowledge through the use of technology to facilitate information gathering and through the creation of new hybrid workstations where students and scholars can work and interact as individuals and as parts of larger collaborative work groups. Thirdly, the architectural space of the library itself must be reconceptualized to express and leverage its main advantage over the Internet: the centripetal, community-building power of real physical presence over the alienating, community-rending effects of mere virtual presence. And let's not forget the great cappuccino![12]

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[1] Cesana 2002, 179-189. Cesana mentions the Ingram Book Company, which is collaborating with IBM Printing System Company (which handles printing) and with Danka Service International (which manages distribution). The books are printed on IBM's InfoPrint 4000 High Resolution Printer (which prints up to 666 pages per minute in high resolution—up to 600 dpi). Michael Lovett is quoted (Cesana 2002, 186) as saying: "This is a win-win situation for everyone involved in the book industry. The publishers win insofar as they sell books that otherwise would go out of print; distributors win since they can sell more books to a larger number of customers; consumers win because they have a larger selection of titles; and authors win because they continue to keep the copyright on their work" (my translation). IBM is in a similar partnership in Europe with Chevrillon Philippe Industrie, one of the biggest French publishers; and there is a similar operation in Italy in Trento at the firm Editrice Bibliografica.

[2] For example, the Library & Information Statistics Tables reports an increase of 20% in the number of books published in the UK in 1995 (96,620) and 2000 (116,415). Source: http://www.lboro.ac.uk/departments/dils/lisu/list01/pub01.html (April 15, 2002)

[3] Cesana 2002, 179.

[4] For the state of the battle between publishers and librarians see Kirkpatrick 2002.

[5] Source: http://www.arl.org/stats/arlstat/graphs/2000t1.html (April 15, 2002). See Appendix One below.

[6] Cf. Brockman et al. 2001, 8, for evidence that currently, most scholars prefer to do their most intensive reading at home; and see ibid., 31 for a suggestion, complementary to the one I make above in the text, that the research library should facilitate scholars' use of computers and online resources.

[7] Cf. also the DSpace project at MIT, which has been funded by the Andrew W. Mellon Foundation, is actively creating an archive in the MIT library for digital document: see http://www.infotoday.com/it/nov00/news3.htm.

[8] For more information about the project, see http://www.cvrlab.org/humnet/index.html.

[9] An excellent example is the Easy Everything chain of very large Internet Cafes. See http://www.easyeverything.com/ (seen on April 15, 2002).

[10] Ibid.

[11] On the project, see the press release of the Middlebury College Office of Public Affairs at www.middlebury.edu/%7Epubaff/press2001/latc2.htm (seen April 23, 2002).

[12] This paper grew out of a talk I was invited to give at the 2002 Sponsors' Symposium of CLIR. I wish to thank Abby Smith for the invitation to speak and CLIR staff for their help in researching and writing this article. Special thanks to Amy Harbur for gathering statistics about book production in the United States; and to Kathlin Smith for invaluable editorial advice. A number of scholars read and commented on earlier drafts of this article. I fear that the traditional disclaimer about how they do not all agree with everything I have written is even more necessary than usual! For taking the time to provide thoughtful comments and to suggest improvements, I wish to thank: Jon Bonnett, Andrew Dyck, Tom Martin, Franco Niccolucci, Charles Rhyne, Nick Ryan, and Donald Sanders.