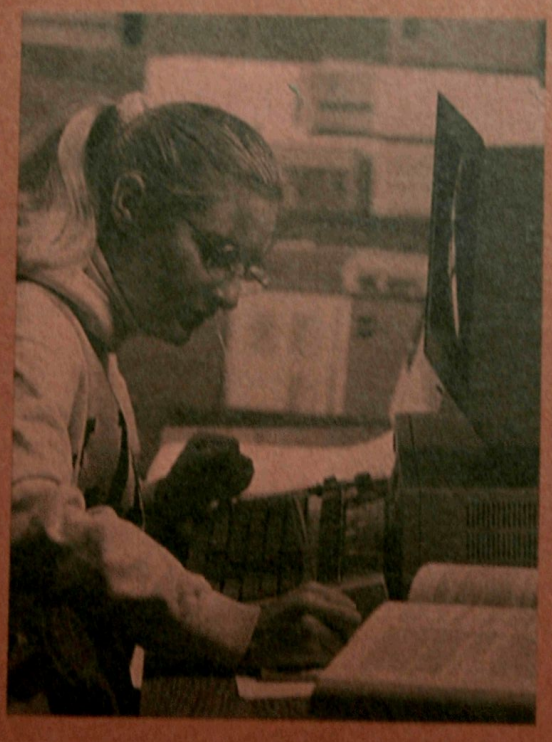
SYMPOSIUM HONORING THE DEDICATION
OF THE GRAINGER ENGINEERING
LIBRARY INFORMATION CENTER



"From the University to the Consumer: Putting Knowledge to Work for Business, Government and the Public"

THE LIBRARY OF THE UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

SYMPOSIUM HONORING THE DEDICATION OF THE

GRAINGER ENGINEERING LIBRARY INFORMATION CENTER

"FROM THE UNIVERSITY TO THE CONSUMER: PUTTING KNOWLEGE TO WORK FOR BUSINESS, GOVERNMENT AND THE PUBLIC."

OCTOBER 13,1994

INTRODUCTION

The Library of the University of Illinois at Urbana-Champaign presented the following symposium on October 13, 1994, in honor of the dedication of the Grainger Engineering Library Information Center. The speakers were Robert Allen, chairman and chief executive officer of AT&T; Jeanne Hurley Simon, chair of the National Commission on Libraries and Information Science; and Robert Wedgeworth, university librarian of the University of Illinois at Urbana-Champaign.

The program opened with welcoming remarks from William R. Schowalter, dean of the College of Engineering.

Welcoming Remarks

WILLIAM R. SCHOWALTER,

DEAN OF THE COLLEGE OF ENGINEERING

A mentor of mine was fond of saying that the role of a university is "to keep the books and to write the books." What he meant, of course, was that research universities have an obligation to teach what is known (to keep the books) and to extend the limits of what is known (to write the books).

You will learn from others details regarding the way the Grainger Engineering Library Information Center continues and extends the well-known excellence of the University of Illinois Library, and how we now have a unique combination of electronic and printed access to the information of this information age. What I wish to emphasize in my brief remarks are the human scale and human impact this marvelous new edifice will have on generations of Illinois students and faculty. Thus, I will address features of our new building, which I hope you will notice during the tours scheduled immediately after the symposium.

First, the lightness and informality of what is actually a massive structure are architectural accomplishments of the first order. It is no accident that the color scheme and even the furnishings blend in with the building to provide a continuity of style and mood made possible by an architect who did not restrict his attention to the placement of bricks and mortar, but extended his eye to the microscale of design, even to the level of some of the chairs that students use. This regard for warmth and intimacy provides compensation for the seemingly impersonal activities of electronic searches of databases thousands of miles away or the shipping of results to the terminal of a coauthor halfway around the globe.

It is already difficult to appreciate how much the Grainger Library has altered the face of this campus. Just a few months ago, the bright green landscape to the south of the library was a

jumble of cracked concrete paths between old buildings that inspired our former chancellor to describe the area as "a decrepit factory town left behind in the wake of the Industrial Revolution." In its place we have an arrangement of buildings pleasing to the eye and true to a master plan for the University, a plan produced through decades of careful thought by talented visionaries.

Finally, the location of the Grainger Library on the north campus is an important statement for our research university. Heretofore, this portion of the campus has been considered (somewhat erroneously) terra incognita for those not engaged in advanced research. Placement of the library a block north of Green Street moves the population center of our college one block north. The library now defines the center of the engineering campus. It becomes ground common to the Nobel prizewinner and the naive freshman. Chances are that they enter its doors equally confused over some technical problem—albeit at a somewhat different level of intellectual depth.

Put differently, this is where research and teaching meet and enrich each other. If this library works as it should, no government auditor will ever be able to tell what fraction of our magnificent structure is devoted to teaching and what fraction to research. They will coexist in splendid surroundings that can only spur us on to an even better "keeping of the books" and "writing of the books."

ROBERT WEDGEWORTH

UNIVERSITY LIBRARIAN OF THE LIBRARY OF
THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

A campus-wide committee report on the future of academic information and the library has been distributed for review and discussion. It sets forth a challenge to the campus and the University as to what must be done for the U. of I. to maintain a leadership position as we move into the next century.

Implicit in this report is the recognition of the university as an incubator of talent and ideas consumed by business and government and ultimately expressed in services and products to the public.

Our preoccupation is knowledge: its creation, its analysis and interpretation, its organization and its dissemination. Our major sponsors as well as our major client for these activities are government and business. Our relationship to these entities is sometimes fragile, occasionally unfulfilling, and frequently misunderstood.

Our program today celebrates the relationship with all of its problems and explores ways that we can strengthen it. We have two stellar guests to share their insight and some of their experience with us.

ROBERT E. ALLEN

CHAIRMAN AND CEO OF AT&T

Bob Wedgeworth and I are old friends. We went to college together at Wabash College in Indiana — more years ago than I care to admit. He was a much better basketball player, but we were about even in our one-on-ones in the library.

Back then, our library card file was literally that — a card file. This was before the days that students would tap into a computer to find sources for their research.

Over the years I've watched with interest and respect as Bob's career in the library world has advanced. (You're very fortunate to have his talents working for you.) At the same time, I've observed how library science itself is advancing.

The Grainger Center is a very visible testament to these dramatic changes. Books and journals and printed materials are still the crux of the library.

But the computer and the computer network have become the new tools of the trade. Librarians use them. So do the thousands of students, faculty members, and engineers who access the library's resources.

I'm pleased that AT&T has helped equip the Grainger Center with the latest in computers, software, and networking services.

We're proud to have helped the University of Illinois create the country's largest, and perhaps best, engineering library with the most up-to-date technology.

"Robert E. Allen, chairman and CEO of AT&T, is a native of Indiana whose name has become familiar from the impact of one achievement after another. According to Business Week, *"He's no technology whiz . . . but in his quiet, determined way he has . . . succeeded where dozens of other CEOs have failed. He has taken one of the world's most entrenched corporate cultures and turned it around. . . . infusing a sprawling empire with a simple, overarching vision of the future."*

— Robert Wedgeworth

The theme of this symposium — if you'll allow my library pun — speaks volumes. "From the University to the Consumer: Putting Knowledge to Work for Business, Government, and the Public." That's a tall order and a lofty but worthwhile goal.

I like to think of the university and the library helping commerce, government, and its citizens put knowledge to work.

And I suggest that the industry of which I am a part — the information industry — has a similar role: putting technology to work for business, government, and the public.

This industry has become a mosaic of mergers, alliances, and partnerships between players in the computer, telephone, cable, entertainment, and publishing industries. The resulting changes are profound.

Just as the library card file has been replaced by screens and cursors, the digital revolution has changed how people communicate, how we send and receive information, and how we are entertained.

I'd like to share with you some of the ways people are putting technology to work at home and at the office. John Mayo, president of AT&T Bell Laboratories, refers to "killer" technologies. They are so powerful that they displace, or kill, existing ways of doing things.

The transistor, for example, "killed" the vacuum tube. Today's killer technologies are silicon chips, photonics, and software.

They are advancing at a dizzying pace. Computing and lightwave transmission capabilities double every year. For silicon chips they double every eighteen months.

Even software, once considered a bottleneck technology, is rapidly advancing — especially in the area of communications.

We experience these technologies daily. Tiny silicon chips instruct our appliances, make our cars talk to us, and power our computers.

Beams of light, generated by lasers and carried by tiny strands of glass, transmit everything from phone conversations to global financial transactions. And software adds intelligence:

These technologies are teaming up to create new capabilities and to change the ways we work, learn, and play. Some say the changes we face in the information age are more profound than anything society has faced since the industrial revolution.

And in many respects, we have glass to thank. Tiny strands of pure glass carry digital information under land and under sea. In the last couple of decades, high-speed, fiber-optic lines have replaced the copper cables that had been the workhorses of telephony.

Today fiber-optic systems convey vast amounts of digitized information traveling at the speed of light.

Cables of these fibers can carry hundreds of thousands of phone calls at a time. But they're capable of handling much more. Video signals or other interactive multimedia services contain magnitudes more information, which requires broadband transmission.

Fiber is up to the task. Until recently, the ability to switch and manipulate broadband signals didn't match the ability to transmit them. In the last several years, however, new broadband switching systems have closed the gap.

Fiber-optic systems are the key element of what is popularly called "the information superhighway." Some people like this term. Others say it's passé, or that it's an inaccurate analogy. But it has caught the public's fancy, and it does act as a headline for a blockbuster story of technology and policy that is being written even as I speak.

The capability summed up by the information superhighway is a mouthful: broadband interactive multimedia networking. You can see why a nickname evolved.

There is a roadblock on the highway, however. As extensive as the network of fiber is, it does not reach every home, business, hospital, or school in America. And it doesn't even reach every country on the planet.

How do we get interactive multimedia capabilities to everyone who wants them?

The obvious solution would be for phone or cable companies to install a fiber-optic line to every address. The enormous cost makes this impractical, at least any time soon.

In a more realistic approach, AT&T is working with telephone companies in the United States and abroad to install neighborhood nodes. Then other, more economical, forms of broadband connections serve individual customers.

Another approach compresses broadband signals so they can be carried over standard phone or cable TV lines. Compression technology also is used in videophones and other videoconferencing products and services. The quality doesn't match that of a full broadband signal, but it's good and getting better.

Yet another solution of great potential is wireless technology. One day, radio waves will carry broadband signals and people will connect with interactive multimedia services through direct broadcast satellite or through expanded personal communications technologies. This will empower people with two capabilities that are vitally important to the human spirit: mobility and interaction.

I'm reminded of the striking visual images captured by TV cameras when a U.S. astronaut first made an untethered walk in space. The year was 1984 — ten years ago. We saw a man in a space suit, looking a bit like the Pillsbury dough boy, silhouetted against the black of the universe.

He was totally free of any connection to earth. No ropes to the spacecraft. No planet beneath his feet. For the first time, a human being was completely on his own, an individual satellite drifting in space. He was, quite literally, set free by technology.

That is AT&T's vision for wireless services. We want to set people free with technology, to give them the personal freedom to move about at will and still stay in touch, if they choose; to deliver a wide range of wireless services that allow the exchange of voice, visual, and data messages; to fulfill the promise of anytime, anywhere communications.

In the months ahead, you'll see some very exciting wireless communications developments.

Consumers see the promise of the information superhighway one way. They dream of movies on demand, video phone calls, and interactive home shopping services. Businesses want better ways to share information and software, and to collaborate across the miles.

That's happening. AT&T has joined with Lotus and Novell to make their popular Lotus Notes and NetWare software available over our network. By combining the intelligence of our network with their software programs, computer users anywhere can access, track, organize, and share information.

In another high-tech alliance, AT&T has joined with Xerox to combine their document management capabilities with our computer and communications know-how. As a result, customers can create book-length documents, transmit them over the AT&T network, and produce and deliver finished products anywhere in the world.

AT&T also offers products and services that allow people at multiple locations to share data and image files while participating in a call that includes both voice and video. Visual collaboration like this can greatly enhance business effectiveness and efficiency.

I've talked about the technology and the capabilities of the information superhighway. The challenge my industry faces is to make sure the technology doesn't overshoot people's ability to harness it.

This challenge is reflected in our stated mission at AT&T, which is to "give people easy access to each other and to the information and services they want and need — anytime, anywhere."

In many respects, the technology that is supposed to make our lives easier has actually added more complexity. Many of us still don't know how to program our VCRs. We use only a fraction of the capability of our personal computer. We have different phone numbers for home, office, and car.

We drown in information and drift in oceans of data. Technology, intelligently directed, can put people back in control of their lives.

What if you were able to employ an "agent" to navigate networks, find information, and perform helpful functions? Well, to borrow a phrase from AT&T's forward-looking advertising campaign, you will.

Maybe you saw a front-page story in the *Wall Street Journal* late last month about a new breed of software that acts like electronic agents. The *Journal* called them "cyber servants" and referred to a new AT&T service as "a kind of turbo-charged, on-line service, a nationwide network . . . that will provide a relatively simple way for ordinary people to launch their own electronic servants into the ether."

This may seem the stuff of science fiction. But the first commercial availability of this service is here now. Special software from AT&T, called "PersonaLink," can wander in and out of various networks to search for information or to conduct a transaction, all while the user is doing something else.

These electronic agents can execute such commands as "Page me if I receive e-mail from the boss," or "Book me on the next flight to Los Angeles," or "Find the Ford dealer nearest my home."

Initially these agents work only through devices called portable digital assistants. Sony has just brought out the first product that deploys agents on AT&T's PersonaLink service. It retails for around $1,000. Within a year, however, PersonaLink service will be available through any personal computer. And the power and potential of networks will be harnessed like never before.

I've talked about how consumers and businesses will ride the information superhighway. The potential is just as exciting for government services and education.

Interactive technology can bring greater efficiency to the delivery of government services and greater convenience to citizens. For example, long lines at the department of motor vehicles could become a thing of the past.

AT&T is involved in some trials where citizens can register their car through an interactive connection to the DMV data base, which can then bill the license fee to a credit card number.

Education, too, is putting information technology to work to transcend the classroom walls. Students on a Crow indian reservation in Montana meet via computer with students in Germany and discuss the fall of the Berlin Wall.

Networks link high school students to lectures by university professors and allow them to browse the world's libraries. Technology extends the reach of teachers and resources, increasing productivity and adding to the quality of the educational experience.

I'd be remiss if I didn't look beyond our U.S. borders in this discussion of putting technology to work. While Americans contemplate interactive multimedia and electronic agents, two-thirds of the world's households don't even have a phone. And half of the world's population, about three billion people, have yet to make a phone call.

This is rapidly changing. Recognizing that telecommunications is critical to economic development, the nations of the world are investing a billion dollars a week in communications networks.

In many cases, since countries don't have an existing infrastructure in place, they can leapfrog directly into the latest wireless and fiber systems.

The most dramatic example is China, home to 1.2 billion people, the most populous country on Earth. China is adding 12 million new telephone lines to its network each year.

The pace is quickening, and by the year 2000, they expect to add 20 million lines a year. To put this in perspective, that's the equivalent of creating one Ameritech-size company every year.

The dream of a global village is indeed becoming a reality—one in which the free exchange of ideas and information from people to people, country to country, can be a force for economic progress and a better quality of life.

I hope I've given you a taste of the amazing information capabilities here today or on the horizon. The challenge of the

information industry is to put our technology to work for the benefit of people. To make it accessible and easy to use.

The true promise of the information age will go unfulfilled as long as the volume or format of information renders it useless. And as long as the information we need is too hard to find.

It's within our capabilities — those of us in the university, the library, and the information industry — to turn information into useful knowledge. To make it easy to access. And to put it to work for people at home, at work, and in their governments.

JEANNE HURLEY SIMON

CHAIRPERSON, U.S. NATIONAL COMMISSION ON LIBRARIES AND INFORMATION SCIENCE

Opening the new Grainger Center is a major event for this university, for the state of Illinois, and for our nation. The new engineering library reflects a partnership between the university, government, and industry to serve the public interest. The Grainger will, I predict, become a flagship for the 21st century — a century that will be defined by knowledge-intensive industry and collaboration.

I like the following quote from the dedication brochure:

> *"In the building plan of the greater University of Illinois, we hope that there will be included a design of an Engineering Library . . . The need . . . has been noticed by many . . . A library of this kind should not only have ample space for bookracks but also for filing cabinets for blueprints and for photographs of minor as well as of great engineering accomplishments. The atmosphere of such a library would be more conducive to hard work . . . especially in the evening. The need for our library is apparent . . . ."*

The need was apparent in 1918, when this passage first appeared in the *Technograph*. Back then, the editor, C.H. Clarahan, did not anticipate that the design of the new engineering library would

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Jeanne Hurley Simon is a native of Illinois, a graduate of Northwestern Law School, and a former member of the Illinois General Assembly who has spent most of her life helping individuals and institutions. In 1993 President Clinton appointed her to chair the U.S. National Commission on Libraries and Information Science, an independent commission charged with advising the President and the Congress on matters related to libraries and information services. In every administration intelligent, well-meaning persons are appointed to head commissions, giving advice in areas in which they have little or no knowledge or experience. This appointment was refreshing, even inspired, for identifying someone with a long record of advocacy for libraries and the public's interest in them.

require new architectural concepts for storing, organizing, accessing, and using scientific and technical information. The Grainger is designed to accommodate more than bookracks and cabinets, and the Grainger's services are not limited to the collections housed in the new building.

This new library is linked electronically to networks, databases, and retrieval systems around the campus, throughout the state, and, indeed, via the global Internet. The Grainger is interconnected with knowledge resources worldwide. Further, Grainger's services are not only accessible in the evening; they are accessible around-the-clock to a global community network.

Services available from the Grainger Center demonstrate the potential for advanced information technology to facilitate the communication and creation of knowledge. This new library continues a distinguished tradition of service to the academic community; but, at the same time, its opening marks a "gateway to a new era." The Grainger is a benchmark for a new generation of libraries that will provide the citizens of the 21st century access to the resources and tools required to develop new knowledge in the fields of engineering, the physical sciences, electronic communications, and library technology.

It is an honor to participate in this symposium. And it is great to be here with Bob Allen and Bob Wedgeworth to offer some brief reflections about what the Grainger Center symbolizes for the future of libraries and the future of access to knowledge.

Now, I don't want to detract from my fellow speakers, but I think that I have the best job of the three of us. The chairperson of the U.S. National Commission on Libraries and Information Science (NCLIS) does not make decisions affecting the multi-billion-dollar global telecommunications market, nor does my work involve planning beautiful new libraries like the Grainger. But as commission chairperson, I work closely with librarians and committed citizens who care deeply about libraries. We provide advice to policy makers on what is required to meet the information needs for our complex society.

The commission's statute, P.L. 91-345, calls on NCLIS to advise the president and the Congress about policies related to libraries and information services for the American people. Along with my fourteen colleagues on the commission, I take our mission very seriously.

Since President Clinton appointed me NCLIS chairperson last November, I have met with representatives from the library community, from government, and with average citizens. These meetings reveal concern about the future of libraries given the rapid proliferation of advanced interactive information and communication services.

This concern is echoed in a recent *Time* magazine story about "Battles on the Frontiers of Cyberspace." Regardless of where you turn, people are fascinated with the information superhighway. Many news accounts herald the advent of interactive multimedia network services to the home that promise an endless series of videos-on-demand and shopping services.

But, with all this talk about the convergence of different industries and technologies, claims about the greatest technological marvel of the modern era, and the ultimate triumph of Marshall McLuhan's global village, I still believe in books and, yes, I still believe in libraries.

If you haven't guessed by now, I am not exactly a cheerleader for new technology. If you live, as I do, with someone who uses a manual Royal typewriter to write his books, you don't take easily to computers and you aren't yet comfortable "surfing" the Internet. But, despite my limited experience navigating cyberspace, I have learned enough about new technology developments to be excited about the profound impact these new developments can have on our libraries in America.

At present, the commission is exploring what is required for libraries to take advantage of new advanced network communication technologies that are such an integral part of the new Grainger Center. We have found that only 20 percent of the nation's 9,000 public libraries have access to the Internet and that very

few are providing public access to the network. The commission's study shows that we need to develop connections for our nation's libraries to offer electronic services to isolated rural areas, to economically deprived urban centers, and to schools. Libraries can provide an on-ramp for public access to the information superhighway.

Some pundits are predicting that advances in information technology will make libraries obsolete. They argue that network access to global information services will replace the need for libraries to provide students, researchers, business people, and consumers with access to information. Why build libraries when we have network access to information services? Broadband interactive communication networks will provide links to global knowledge delivery services, along with entertainment and interactive communication services.

Well, fortunately, there are those, like David Grainger, president of the Grainger Foundation, that recognize the importance of building a new generation of libraries that integrate traditional knowledge structures with newer technological infrastructures. These are the true visionaries, as far as I am concerned.

John Brademas, president of New York University and author of P.L. 91-345, which established the commission, writes in his 1989 book *In Praise of Libraries*:

> *"Libraries and librarians today, whether in the U.S., Britain, France, or Spain, are operating on the frontiers of automation and technology. Yet complex as the new library world has become, libraries remain fundamentally about readers, writers, and books."*

To unlock the full potential of new interactive media, libraries must integrate traditional services with digital communication networks. The Grainger Center moves toward this goal. The new engineering library provides access to a network infrastructure that is changing the way scientists, engineers, and scholars work.

This new information infrastructure is also changing the way industries do business and the way government relates to citizens.

Those using the Grainger Center will be performing work that advances the integration of old and new information technologies. According to a recent announcement, the University of Illinois will receive a $4 million grant from the National Science Foundation's Digital Libraries Research initiative to develop a digital library of journal articles in the sciences and engineering. This initiative is intended to ensure that future generations of students, citizens, and leaders are connected to those technical knowledge resources that form our intellectual heritage.

Research projects such as this will contribute to the development of knowledge institutions that foster learning and creativity. If libraries are not provided opportunities for new technology integration, they will be lost to history; but, similarly, new information infrastructures that bypass libraries will generate chaos. Without navigational tools and contextual structure of library technology, we are cast adrift in the cyberspace, where the stupefaction of mass culture will forever obscure knowledge.

What then can be said about the role of government in addressing our symposium topic, "From the University to the Consumer: Putting Knowledge to Work?" What government policies are needed to promote the development of a new electronic gateway to knowledge that involves libraries as consumer access points to advanced electronic information and communications technologies?

Some would argue that the federal government can best contribute to the communications revolution by staying as far away as possible from making any decisions or having any involvement with the national information infrastructure. They call on the government to eliminate all legal and regulatory impediments to competition in the communications field. Legislation to this effect is expected to be reintroduced in the new Congress early next year.

Since 1934, U.S. telecommunication services have been regulated by government mandates promoting universal service. Now,

the emphasis has shifted to fostering competition in phone and data services to expand choices for customers. The twin goals are to promote a healthy growth rate of the information economy, and, at the same time, to ensure open access to new technologies and new network services.

What is required to usher in a new age of universal service where the public will enjoy the advantages of access to a modern, interactive information infrastructure? Won't AT&T, along with commercial partners in the information movement and management industry, provide access to vast knowledge resources that are now available only to the users of the very largest libraries?

Well, yes and no. YES, the public needs to receive the benefit of the information age; but NO, our nation will not advance with information infrastructure policies that are at odds with democratic values. Government policy needs to ensure that basic rights and freedoms are safeguarded and secured on the information superhighway. This includes rights of privacy and the protection of intellectual property. The rules of the road on this new interglobal 'info-bahn' must safeguard democracy from becoming roadkill.

The solution to balancing economic and social concerns for the information superhighway involves the formation of partnerships between industry, government, and the university. The Grainger Center offers a model for collaborative partnerships. Ultimately, the success of the National Information Infrastructure program will be measured by whether it empowers citizens, protects individual rights, and strengthens our democratic institutions. Cross-sector partnerships need to become the rule in developing access to knowledge for the next century.

Vice President Gore speaks often about the vision of a national information infrastructure that is transforming our world through a digital revolution. But the vice president also talks about the transforming power of electronic communications for entertaining, informing, educating, and for promoting democracy. Knowledge institutions must serve the research needs of the community. But the citizen's need for access must also be ensured if we are to

realize the tremendous opportunities resulting from the university's collaborative relationship with industry and government.

Historically, the introduction of new technologies challenges existing social, cultural, and institutional structures. This was true with automobiles, telephones, and television. It is also true with computers, faxes, cable television, and the Internet. There is an inherent danger, however, that the overload and excess that characterize much of television's electronic "entertainment" will dominate the emerging cyberspace of the information superhighway.

It is no longer a choice whether computer networks will reshape the fabric of human society and consciousness; rather, the choice involves the kind of future we want to design with these new tools. They can create a virtual reality where fear, confusion, violence, and anguish dominate, where we are seduced by glittering images of a virtual cyberspace inhabited by a disembodied world of electronic pixels. Or, they can be used to create a virtual democracy where emancipation, creative inquiry, and knowledge dominate.

Finally, then, libraries have over the centuries provided society with tools for human transformation. They enable us to explore possibilities and to engage responsibilities. They supply our context for civilization, and they offer us a sense of meaning, purpose, and connectedness. Libraries like the Grainger connect us with our past and with our future. They provide more than a conduit to knowledge. They are the engines of good science, good knowledge, and good society.

Thank you for your attention, and . . . **POWER TO THE LIBRARY!**

Robert Wedgeworth

UNIVERSITY LIBRARIAN OF THE LIBRARY OF
THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

A few weeks ago the *New York Times* published a front-page story about an AT&T camera crew that went into the streets of Manhattan filming interviews at random with persons who were asked, "Can you tell me how to find the information superhighway?" One answer was, "You go down this street and take a right!"

If the question had been, "Can you tell me how to find the bookstore or library," in small towns and big cities across the nation you may not have received the right answer, but most people would understand the question. That is part of our dilemma today.

Over the centuries universities have developed an understanding of what constitutes formal knowledge. We have accumulated it in books and journals, we have organized it in courses and in libraries, and we have transmitted it to students and to the public. Most of what we recognize as formal knowledge is in printed form.

By the middle of this century, with the growth rate of knowledge at exponential levels, we began to employ a number of information technologies to manage the records of knowledge, to index it and produce abstracts. The introduction of photocopying allowed us to share texts more widely. The advent of satellite communications added the capability of transmitting texts and images worldwide. Taken together, these developments have only changed our understanding of knowledge and knowledge institutions marginally.

Robert Wedgeworth is the university librarian of the Library of the University of Illinois at Urbana-Champaign, the third-largest academic library in the country, and president of the International Federation of Library Associations. He formerly was dean of the School of Library Service at Columbia University and executive director for more than a decade of the American Library Association.

The advent of the Grainger Library Information Center, which we celebrate this week, is both an advance of these marginal changes and a promise of more dramatic changes in our understanding of what constitutes knowledge, how we organize it, and how we communicate it.

It is within our tradition to ask a student to describe the main characteristics of the Italian Renaissance. But what would be the response if a faculty member asked a student to recreate the atmosphere of the Renaissance? Probably much the same as the reaction to the question from the AT&T camera crew. Yet this is precisely the type of challenge that our universities are beginning to face. The ability to routinely combine full-motion video with sound and text will radically change our concept of what constitutes formal knowledge. And we are not prepared to handle most of its implications.

The Grainger collections and services will have as their primary mission the support of the teaching and research programs of the College of Engineering. But the Grainger laboratories will serve to prepare the University Library for the future. It is here that we will test techniques for storing and retrieving images and sound. It is here that we will experiment with new ways to index and analyze literatures. It is here that we will study the behavior of users to improve methods for manipulating data online from local and remote sources.

An ambitious program for research and development of the substantive aspects of the information superhighway will require new resources that are not likely to be available from the university, especially when we realize that most academic components of U.S. universities have received a declining percentage of the educational budget over the past decade.

The development of more than limited entertainment options for the coming information superhighway will require a massive and strategic investment in the research and development capabilities of our nation's universities that the Grainger symbolizes today. But that can only happen if we strengthen the partnership

with government and business to ensure the flow of talent and ideas that will enrich the lives of the public.

There are some who question the future of libraries and their role in managing access to knowledge. They question the capabilities of librarians to meet the challenges posed by these dramatic developments. They question the ability of libraries to respond to an information world that is predominantly online and not in the stacks. In the words of one questioner from the information industry at a symposium last summer, "What could libraries have to offer on the information superhighway?" My response was that at Illinois we are not entirely sure. But with an avarage of 1.5 million log-ins to our online catalog each week we must have something that people want!

In some respects our more cautious approach to the new world of online knowledge will be a stabilizing factor in the university environment. We know that requirements for the education of librarians will change. We know that the mix of materials that the university library will own or lease is already changing. However, we also know that the cumulative investment in the comprehensive collection we now have will continue to be of value. Even the Nobel Prize Committee recognizes the current value of discoveries made decades ago.

Ours is a simple vision for the university and the University Library. At the heart of our academic programs will be a comprehensive network of information services and technologies that support teaching, learning, and research using both local and external knowledge sources.

Earlier this month the University of Illinois was recognized as one of six institutions selected to do research and development on elements of the digital library of the future. The stimulation of this work by a federal agency and its requirements for business, industrial and other institutional partners is one viable model for moving us forward. We look forward to more success in attracting partners to research and development programs that exploit the capabilities of the University Library.

GRAINGER SYMPOSIUM

QUESTIONS & ANSWERS

OCTOBER 13, 1994

QUESTION: *If one looks at the classical role of bringing a book to life and getting it in the hands of a reader, it is really the publisher who acts as the conduit for that and decides first of all whether a book should be published and whether to take it in one way or another to a market so that the reader can find it and purchase it. Is that publishing function analogous in the context that we have been talking about today to the information industries—AT&T and other companies that act really as conduits for information? And if that analogy makes a little sense, is it realistic to think that those conduit organizations in the future might also be somewhat the gatekeepers in the sense that publishers have made reputations, made money, or lost money depending on what they chose to be the conduits for? So in a sense, does it seem at all reasonable that the companies that now transmit information could have a good bit of control over the selection of that information at the source?*

ANSWER: (Mr. Allen): That's been a concern of a number of people, and it has been a concern of mine, frankly. As these mergers take place, that's an issue that has frequently been discussed. We believe that we are very, very focused on and strongly believe in openness. That is to say that the people who provide the conduits or who facilitate communication should be ambivalent about who owns the content, they should not be owners of the content. In fact, I believe that if we are owners of the content, we're going to lose a lot of business in our core business, which is the facilitation and movement of that content. So, I don't think it is a good business decision for us.

We are strong advocates of openness on both ends so that consumers can have access, via any transmitter they want, to select any source of information, and vice versa, and the content providers ought to have the opportunity equally to reach their consumers or readers, in that case. We therefore need rules and regulations, and I don't like to seek regulations—we have enough of those. We need an agreement about standards and about openness that will enable that to happen so that we avoid the conditions of the information haves and have-nots and control. In fact, it's a very important principle that we can discuss in and of itself—control in the information age.

ANSWER: (Mrs. Simon): That's pretty technical. Let me talk about something else that I think publishers are interested in, and that's making money. When they make these digitized books, where is the copyright going? What's the fair use standard? How are we going to get any money for this product? This has not been settled yet, and it is under consideration now by many committees under the aegis of the national information infrastructure of the Department of Commerce. Ronald Brown has deputized six or seven different committees to look into all the organizations of the national information infrastructure and the copyright problem.

ANSWER: (Mr. Wedgeworth): This question in itself recognizes how tied we are to the concept of publishers as the conduits, but that wasn't always true in making texts available. It only became true after it was so expensive to own printing, so that you had to create these companies that became the gatekeepers. Now we are going back to an earlier period where the authors are more readily able to get their materials to the public in the same way that we used to have the broadsides that would make available the news, rather than a huge printing plant to print a daily newspaper.

So I think that that is going to be another answer—the openness of the network and the ability of individuals with very low

entry-level cost to be able to make their materials available. That will also facilitate the process.

QUESTION: *Is the Internet going to collapse under the increased users that's occurring nowadays?*

ANSWER: (Mr. Allen): Well, first of all I think no one knows quite for certain how many users there are of the Internet, and I've seen estimates that range from a few million to many, many million, and I don't know what's accurate. Under its current state, if it were not to be improved, it would collapse, and in fact, it does collapse many times during the course of the day, at least certain sub-networks or the capacity to use the Internet is limited. I'm sure you are a user and probably know more about that than I do. But the Internet has limitations. I don't think it will collapse. I think there are a number of interested parties who have a financial and other interest in keeping it going and building the kind of capacity that will be required for more people to use it and use it much more easily. Internet certainly is an example of the thing we both talked about in terms of lack of ease of use. 'Surfing' the Internet is not an easy thing for a very high percentage of American people, even if they know how to get access to it. So, the Internet leaves a lot to be desired. I don't think it would collapse.

QUESTION: *What are library schools doing to enable the librarians of the future to understand the technology that's coming out every day, that's changing so rapidly.*

ANSWER: (Mr. Wedgeworth): Well, I'm not as close to it as I was a couple of years ago, but I try to maintain my relationship with one of the best programs of the nation here on our campus. Based on what we get, and the graduate assistants that we have work-

ing in the University Library, and what I get from my colleagues who are teaching and doing research in the programs, we are doing several things. One is, they are more rigorous about the basic methodologies that students learn so that their education is not so time-limited. So, they may not be able to keep up with all of the latest equipment, but with the programming skills and with the methodology skills they learn, they can adjust to those changes as they occur in the field. I think they are getting a stronger theoretical background in terms of looking at how information behaves. They are putting more emphasis on studying the precise behavior of users, all of which would be critical to how libraries will operate in this electronic environment. The curriculum that I studied at the end of the 1950s here at the University of Illinois bares absolutely no relationship to the curriculum that students have today.

QUESTION: *My question is about the slippery nature of information in online databases. With a book, the images don't jump up and move around. When a book is online, you can change it, and you will never have a consolidated one edition of something.*

ANSWER: (Mr. Wedgeworth): Well, just let me start off by saying that that question raises one of the most important issues that I believe librarians are concerned about today. That is, in an online context, how do you know that you have an authentic document, and how do you verify who originated this document, and how do you know when the document has been revised? Those are certainly some of the issues that publishers will be vitally concerned with in looking at the future of online information, and while we can lament the easy way in which the text can change, we also recognize that that's one of the attractive features for many of the users of those systems, that they can get easy access to those texts and make those changes.

QUESTION: *First, I have always wanted to ask somebody that might know—who does own the Internet? My second question is, do you really think that we are moving toward a place where information, like journals, will ever become the bulk of the use of the electronic medium, as opposed to now, where the bulk of the use is in paper form. I would hate to be the kind of person to have said ten years ago that CDs will never catch on. People keep saying, "Lets have electronic journals," but I see people that print out their e-mail so they can have a hard copy. People want to take it home and read it in their living room where they don't have a computer. I would be a skeptic and say that it will never happen, but I don't want to do that, and I am curious if you would say that.*

ANSWER: (Mr. Allen): I don't believe that will happen. I think it just demonstrates that there are supplemental ways to get information, and all of those forms of media will continue to increase in use. I do think as a generation change occurs, for example, my children, and even more so my grandchildren, are much more comfortable with electronic information, exceedingly so. What that means in terms of how the future of information is obtained and used, I'm not really sure. There is a clear trend toward ease of use, at least in their minds.

As I mentioned in my comments, it is up to those of us who try to employ technology to make it much more user friendly than it has been in the past so that many more people without a lot of training and rigor can use it. In fact, I am convinced that we will be able to do this with voice commands. You have a voice print, I have a voice print, just like we have different fingerprints. There is security involved in that. We will be able to convert your voice into a request for information that won't require all of the keyboard activity. When that happens, my keyboard is the first one to go. But it doesn't phase my children and even my grandchildren, who are very young. So, I don't know how to predict, but I don't think one will ever replace the other one.

ANSWER: (Mr. Wedgeworth): I think the real question is the rate of change. The trend is inevitable. Last week the international publishing community met in Frankfurt, and most of the stories coming out of Frankfurt talked about the impact of the electronic publishers joining the other publishers, but they were only at this point representing about 18 to 20% of the number of publishers present at the Frankfurt Book Fair. I think what you can see is that cost will enter into this heavily. It is extremely expensive to print and publish journals and ship them around the world. When you can reproduce this journal in electronic form, even if you print it locally for a short period of time where they don't have the capability of accessing it online, you are going to see these developments continue. You are going to see an increasing number of journals. Right now there is one vendor who can offer 7,000 journals in full text online, and the competition is catching up. So, there is going to be an increasing percentage of journals that will be available online, but they will start at say 1985 or 1988. So, for a long time to come you will have a strong mix of the use of printed back files of journals with active use of current journals. That trend is definite, and you can see that in the future, that mix will change very rapidly. But I don't think that is the most important change that's going to happen. The really important change is when we begin to affect some of those constituencies that don't deal heavily with text—the artists, the musicians, and others—that's where the real change will occur in what will be available online. The journal problem is fairly simple compared to some of the problems of incorporating different kinds of knowledge into what you have to learn. That's where you will see really dramatic change.

QUESTION: *I know that it is a myth that libraries are "free," but there is still free access to libraries. It is not at all clear that there would be the same kind of free access to the information that will be available on electronic networks. Here at the university we are*

privileged to be able to use them without seeing the bill. People who are relatively privileged can have computers and access to CompuServe and Prodigy for a fee, but what do you see as enabling people who are not as privileged to have access to that kind of information so that we do not create a society that has more "haves" than "have nots."

ANSWER: (Mrs. Simon): Well, we certainly hope that every public library, every school library, will have this free access to the Internet. It is true that not every home will have the computer access—even many libraries don't even have a telephone, of course, and many school libraries are poorly equipped. But if President Clinton and Vice President Gore mean what they say, by the year 2000 every clinic, every hospital, every school, and every library will be connected to the Internet. Then I think there will be access to some of the "have-nots," and we have to remember that this is a nation of "haves" and "have-nots," and this university is a "have" place. I think part of our job in the government is to make sure that the have-nots get that access, and that will be part of our mission.

QUESTION: *But that's assuming that even universities are not paying. If universities have to pay, too, for this access to databases right now, there is a relatively free flow of information, but if that information comes with a bigger and bigger price tag, even the haves are going to have trouble. So are there policies that are being developed that will ensure that this access is still going to be available?*

ANSWER: (Mrs. Simon): We are hoping to do that with the reauthorization of the Library Services and Construction Act, no matter what it's called—the name "Construction of Libraries" is probably a thing of the past, with Andrew Carnegie and so forth. What we are looking at now is the retrofitting of libraries to accommodate the new technology, and if the reauthorization goes through the Congress next year, hopefully with a decent budget attached

to it, that will be the beginning. It will be that federal dollar in there, which will leverage, certainly, the local money to make sure that the Internet access is available. That's our hope anyhow, but it's going to take a lot of money, and with the current deficit running in the federal government, there isn't that much money out there to dispense.

ANSWER: (Mr. Allen): I'd like to comment on a couple of perspectives. First of all, we can set a national policy that would create this opportunity for everybody to access, and we can even subsidize it if we wish. I think universal access is a very important principle, regardless of how you pay for what you get, once you get access. I think that's the fundamental question in our industry, and perhaps even related to the question that was just discussed.

The history here is such that in the time before the breakup of the Bell system, when AT&T was a monopoly—and virtually all the telephone companies were a monopoly—we had a universal stated policy, a national policy, that we called "universal service." The concept was that everybody would have access to the basic telephone network, and we would subsidize the price of that. It was a very low price so that everybody could have it, and we would put those subsidies on other forms of calling that were not necessary to basic service, i.e., long-distance calling. And so, that system worked very well. That is why we have a 94 percent development in this country for access to telephone service.

But, the world is upside down now. That is to say, that concept of cross-subsidization does not work in a competitive environment, and it simply cannot work, cannot be sustained. And if it is, if the attempt is made, we will violate the rules that make the marketplace effective. And so, there are mechanisms still today, even though long-distance services are competitive. You have plenty of choice. There are still mechanisms that flow through subsidy to the local exchange service.

Now, I believe we will all be better served when that last vestige of the monopoly, the local telephone service, is also up for choice.

So, if you have an opportunity not just to select Ameritech, if that happens to be your supplier, but if you have two or three choices, the system will work better. I am convinced of that. I've lived through ten years of the positive effects, not an easy transition, but the positive effects of a competitive environment. So that policy, in my judgment, will not work on a continuous basis. We will have to do something else. I don't know what that "something else" is, but universal access is a very important principle.

Now what we do beyond that, as we do now with other welfare programs or other national subsidies to education or to science or to research or whatever, is an issue for the senator [*Paul Simon, D-IL, in the audience*] and others to debate at that time. But the old system, in my judgement, would not work, but we must preserve that principal, not of universal use at the same cost to everybody, but universal access. Beyond that, we can decide how people pay for it or whether they get subsidized by other methods.

QUESTION: *I am interested in following up on something that was touched on earlier. Traditionally libraries have also played roles of creating historical collections and preserving and caring for them. Since online data is somewhat more elusive than printed material, are we going to get into an age where we will need to re-evaluate the value of long-term information on a long-term basis?*

ANSWER: (Mr. Wedgeworth): Well, I don't think there are any clear answers to that, but it also is another issue that is on the agenda for the role of librarians and archivists in the information age. That is, what role will they play in preserving some portion of all of these documents and messages that are being transmitted? I think it is quite clear that there is going to have to be some kind of program to capture and preserve some percentage of what's being passed back and forth on the Internet. But I don't think we have clear ideas as to what that percentage is, how we will go about doing it, and what will be the criteria for the selection.

QUESTION: *The Library of Congress is now making efforts to put everything in digital form. Will that include their vast selections of music and art and so on?*

ANSWER: (Mr. Wedgeworth): Yes, that's their stated intent, and I think that's very true. In fact, one of the early targets for some of the newer systems that will enable us to incorporate images and sound will be special collections in libraries that are now very difficult to access unless you are on the spot. What we would like to be able to do, for example, at the University of Illinois is to make it possible for a researcher in Australia to look at the letters in the H. G. Wells collection before they decide they have to make a trip to Champaign-Urbana—to actually see the documents online. That just simply isn't possible today, but there are other illustrated materials, other sound materials, video materials, that equally could be made accessible in some other format.

QUESTION: *Right now we have a really cumbersome, or fairly cumbersome, way of adding historic information electronically—disks and so forth. Are there technological advances being worked on now that will help us store information in a better way? I can picture a hundred years in the future assimilating all of this electronic information that we also want to save, much like the hundreds of years of printed information that exists now in the Library.*

ANSWER: (Mr. Allen): It's clear that industry is daily improving the techniques and capacity for storage, so I don't know what you reference when you say how difficult it is. I don't have to do it, so I'm sure I don't appreciate the difficulty, and we are not in that business. At least I am aware that that industry is constantly improving its capacity in the smaller and smaller units and facilitating, I believe, easier ways to do that converting. But I am not an expert on that.

QUESTION: *In two months we will be opening a children's science museum here, and in traveling around the country looking at other science museums, AT&T's name keeps coming up a lot. And I would like to just commend AT&T for its obvious commitment to informal science education and ask if you have any innovative new ways of connecting kids' museums with the Internet and the new kinds of things that we will be seeing in the next few years.*

ANSWER: I'll tell you. AT&T is a company of 310,000 people and I cannot, I am happy to say, keep up with all their ideas. I do know that our technologists and our foundation people work very closely together. In fact, the trustees of our foundation are people who work in our various units and come from the technical side, the marketing side, and so forth. They have been very creative in the past, and I appreciated your saying so. We are trying to use our philanthropy and our technology and our people's time to create something of value in the community that has lasting value. So, while I don't know the specific answer to your question, I have every confidence that they will keep coming forth with creative ideas. The best news is, they don't generate these ideas themselves. They go to the community leaders, to the children's museum leadership and try to centralize their ideas with our capacity. That's what makes that work. We don't have all the great ideas, but we do have some values there. Thank you for saying so.

CLOSING: (Mr. Wedgeworth): Jean Simon, Bob Allen, thank you for gracing our campus today and helping us celebrate this week.