Information Technology and Libraries

Volume 14 Number 4 ISSN 0730-9295

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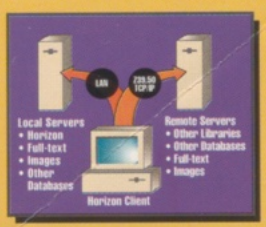

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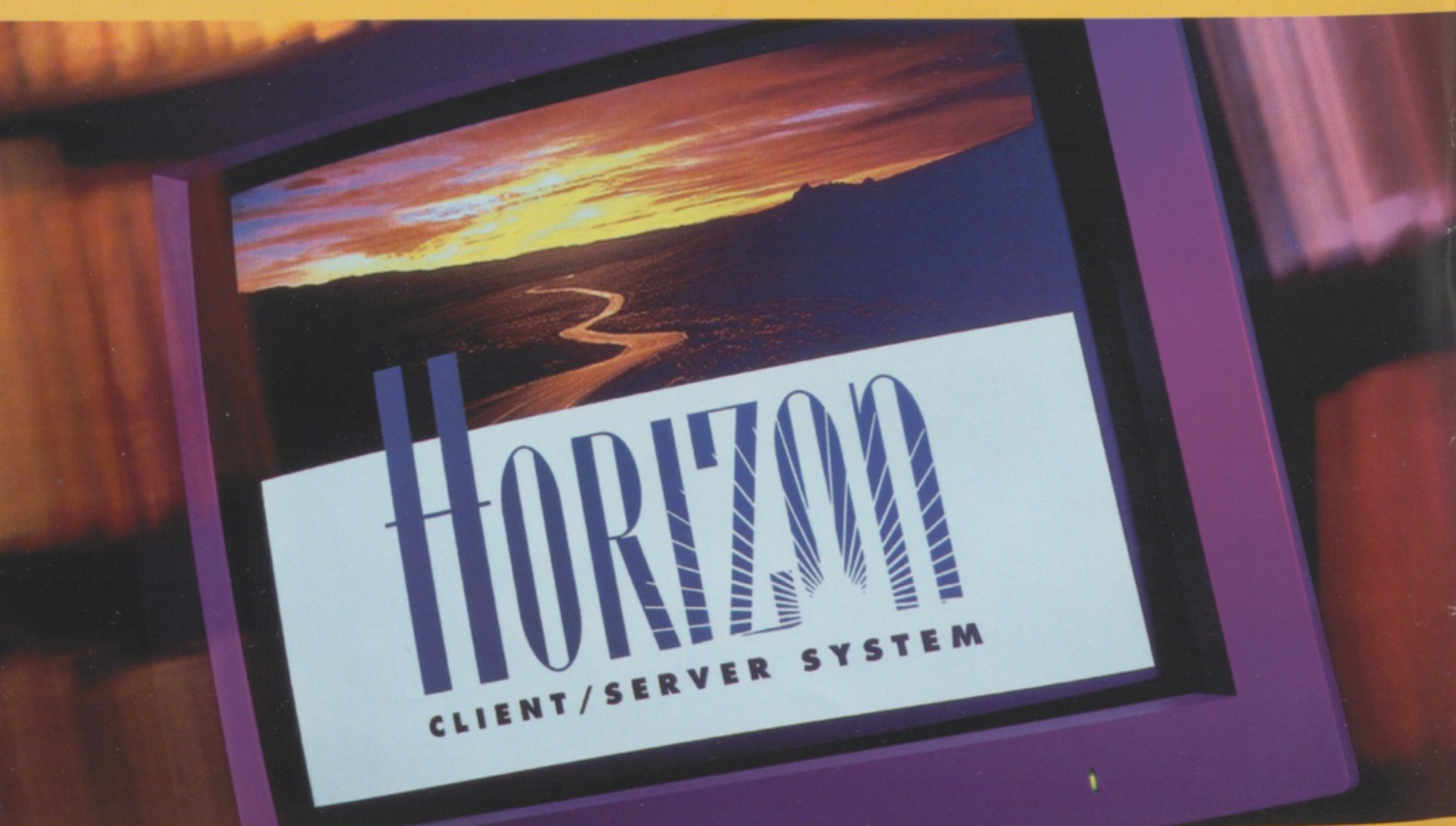

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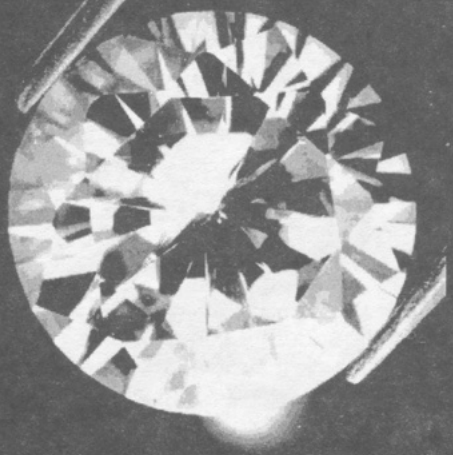

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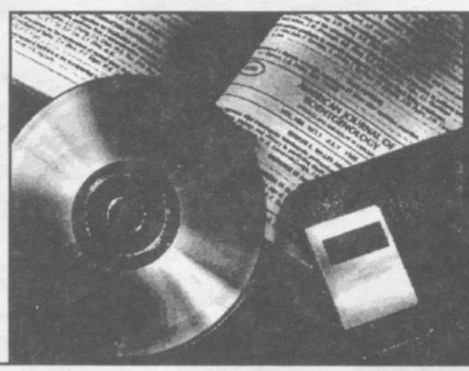

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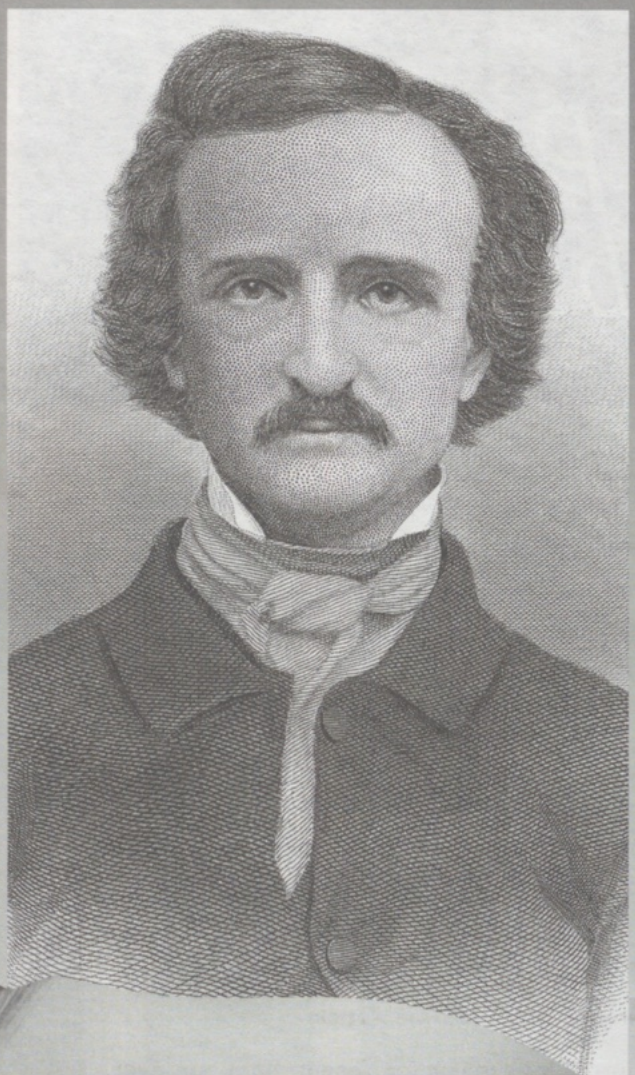

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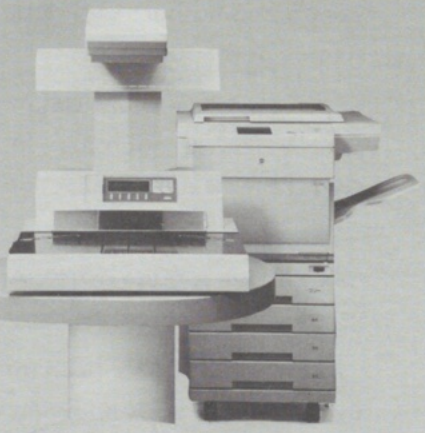

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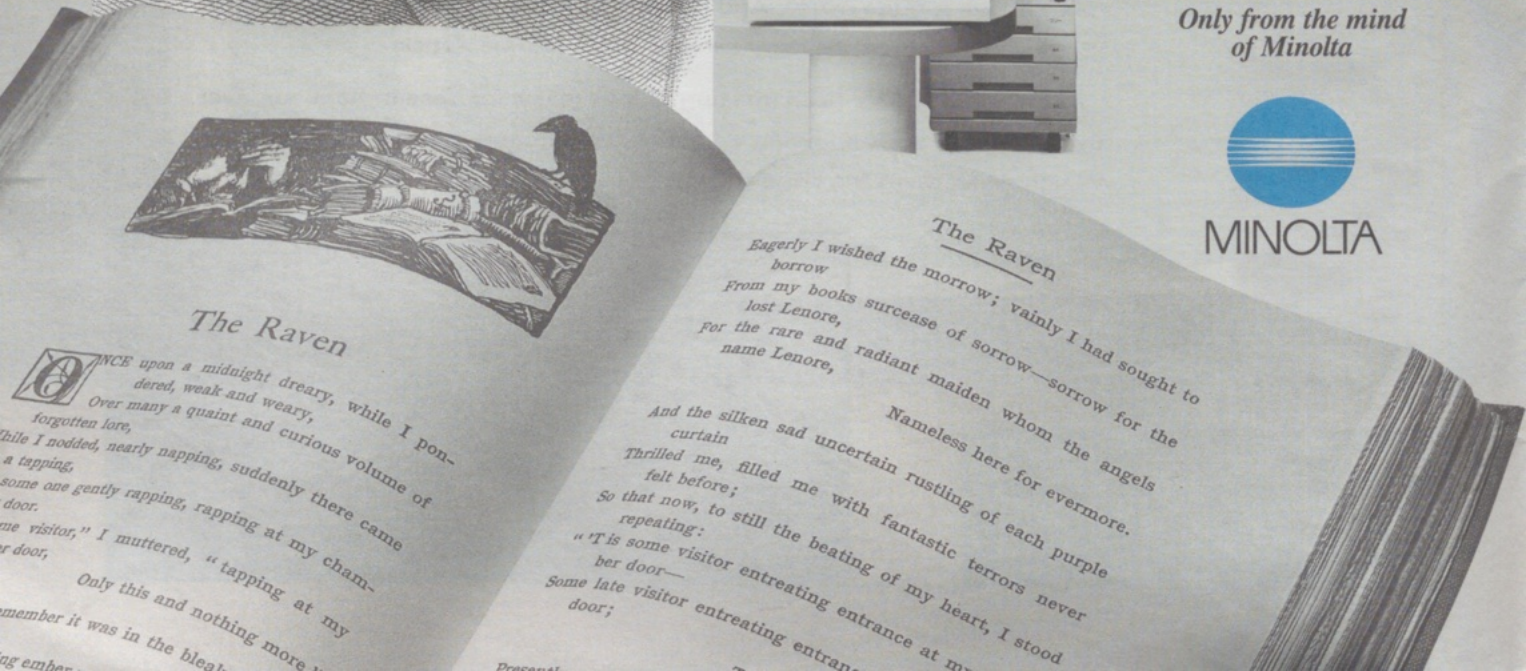

The Raven

ONCE upon a midnight dreary, while I pondered, weak and weary,
Over many a quaint and curious volume of forgotten lore,
While I nodded, nearly napping, suddenly there came a tapping,
some one gently rapping, rapping at my chamber door.
me visitor," I muttered, "tapping at my door,
Only this and nothing more
member it was in the bleak
ng ember

The Raven

Eagerly I wished the morrow; vainly I had sought to borrow
From my books surcease of sorrow—sorrow for the lost Lenore,
For the rare and radiant maiden whom the angels name Lenore,
Nameless here for evermore.

And the silken sad uncertain rustling of each purple curtain
Thrilled me, filled me with fantastic terrors never felt before;
So that now, to still the beating of my heart, I stood repeating:
"'T is some visitor entreating entrance at my
ber door—
Some late visitor entreating entran
door;

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Cover Design by Jim Lange. Interior Design by Dianne M. Rooney

Editorial

Thomas W. Leonhardt, Editor, R.I.P.

This is my final issue as editor of *Information Technology and Libraries.* James Kopp, long-time LITA member, is your new editor, and his first issue will appear in March 1996. I wish Jim well and predict good things for the journal under his leadership.

While we were searching for a new editor, I tried to explain to the LITA Publications Committee just what an editor does. Somewhat to my surprise, I discovered that as editor of *ITAL,* I worked with people as much as with words, and that was why I have enjoyed this job so much.

An editor must take responsibility for the style and feel of a journal, sharing the good with the bad. A negligent editor can spell disaster for a journal. It follows, then, that an editor should get credit when a journal is successful, except that an editor alone cannot produce a successful journal, especially an official organ of an organization like LITA. With this, my final issue, it is important that I thank, by name, those who have been important and special to me during my six-year tenure. It is also important to note the other essential ingredients for success that will not change when Jim Kopp becomes editor.

The first people I want to thank are the authors I have worked with, those whose work was published in *ITAL* and those, too, whose work was rejected for one reason or another. Writing is hard, lonely, thankless work, especially for a refereed scholarly journal where payment is a free issue, some offprints, and one's name in an index. There is tenure, of course, but *ITAL* could not survive if its only writers were academics seeking tenure. Thank you, one and all, for making the commitment to write for publication. I appreciate your efforts.

Another group too large to name individually is the editorial board. The board membership has changed, as one would expect in six years, but the one constant has been the ability and willingness of these LITA members to review manuscripts, offer constructive criticism and encouragement to authors, and show up at board meetings during busy ALA conferences to offer counsel on matters like the redesign of the journal. These volunteers solicited manuscripts, guest-edited special issues, and generally helped keep us on track. Their reward for this service has been to see their names on the journal masthead and the best reward, a job well done.

The new journal design, beginning with volume 13, number 1 (March 1994) was discussed broadly within the division, but the real work did not begin until the decision was made to change the format. Linda Knutson, executive director of LITA, gave her moral support and time and coordinated the efforts of many people. The larger format and the new cover, designed by Jim Lange, signify change at one level, but it was Dianne Rooney of ALA Publishing Services who brought a true new look to *ITAL.* In addition to working with Jim Lange, Dianne selected the typefaces, redesigned the pages, and created a tasteful layout that improved the journal aesthetically and functionally (the pages are easier to read). This fresh look pleases without drawing attention to itself, the hallmark of all good book and page designers.

Bruce Frausto, the copy and production editor at ALA Publishing Services throughout my tenure, has worked miracles over the years to make sure that essential deadlines were met and that the journal got out on time even when I was late or unimaginable things actually happened. Bruce regularly contributed those hundreds of little things that add up to quality and success, and I will ever be grateful for his help.

I also want to acknowledge the help of Tel Aviv Barbee at the LITA office, David Epstein and Eileen Mahoney at ALA Publishing, and Linda Roman of the dean's office at the University of Oklahoma for their support, too. They probably thought I didn't notice or care, but I did.

My wife and children know what my hobby has been for six years. They have been most understanding and tolerant. Now I have no reason not to mow the lawn.

Susan Harrison, our book review editor, somehow gets the publishers to send her review copies of books, and she then finds competent, willing reviewers who meet her deadlines. Thank you, Susan. Only another editor can fully appreciate the job she has done for six years.

George Machovec has been our software review editor, and while the volume of material to work with has not been large, finding reviewers who are competent, willing, and conscientious about deadlines and who have the right equipment has been a challenge. Thanks, George.

Last, but certainly not least, is Marjorie Bloss, the managing editor of *ITAL* and its proofreader, author contact (Did he mean this? Is she really trying to say that? etc.), and liaison with ALA Publishing on production and production issues. To say that Marjorie is reliable, conscientious, knowledgeable, dedicated, loyal . . . . She's a good scout, and I could not have (and would not have) done it without her.

You, dear reader, were far too silent during the past six years. I did get a few letters for publication and a series of encouraging notes not for publication. There were words of encouragement and praise for the new look. Thank you, but that was not what I was hoping for.

It is important to let the new editor and his authors know that you read the journal and to comment on articles and reviews, critically, if necessary, but civilly and thoughtfully. The few letters I published were just such contributions, but they were far too few.

It is your journal. I have enjoyed serving you and look forward to rejoining your ranks as a journal reader. To Jim Kopp and the incoming managing editor, Ann Leslie Jones, congratulations and Godspeed!

SPECIAL ISSUE
The Information Future: Data, Data, Everywhere!

Milton T. Wolf and R. Bruce Miller

They're baaack! The LITA Imagineers who brought you Thinking Robots, An Aware Internet, and Cyberpunk Librarians *(Chicago: Library and Information Technology Association, 1992) don't know when to quit.*

> The Diamond Library Palace has red walls and houses the Gyalpo Rinpoche, the 41st Incarnation of the Bodhisattva Bob Miller, the Great Librarian Himself . . . Dr. Kay O'Neill, his Minister of Science, holds a rosary made of 108 antique microprocessors pierced and strung on a length of fiberoptic cable . . . "All human worlds are under the peace of the Library," said O'Neill. "This was accomplished partly by force, partly by conversion."[1]

In this special issue of *ITAL* we have attempted to open ourselves to new vistas: imaginative visions of the communication technologies that impact, sometimes disturb, our lives daily. A powerful information service industry is emerging from our scientific ability to meld television, telephony, publishing, and incredible computing skills into a digital magic carpet that literally flies us through a virtual world of immense data bases. With data, data, everywhere, is there a lot to think?

In the following articles we hope to challenge many of the prevailing assumptions and stir the data sufficiently to open new doors of perception in you, potential players in a worldwide information sweepstakes that will not make everyone winners. Make no mistake about this, the library is being redefined. Clifford Stoll's best selling polemic against the internet bemoans the impending demise of the library.[2] Whether or not one agrees with his facts or his logic, his perceptions as a library user have a reality that is defining our future right now. Walt Crawford and Michael Gorman use more reasonable logic to articulate today's issues, and they also take the next step to provide vision and direction:

> We believe in libraries. We believe in the enduring mission of libraries. We believe that libraries and librarianship have a future and that future is there to be seized by those with insight, realism, and, yes, daring.[3]

There are many people who believe in libraries. Science fiction authors in particular seem to value libraries. Asimov and Heinlein often built librarians into their tales. Try to find a novel by David Brin that does not include a library or a librarian! We've turned to our science fiction and futurist friends to develop this special issue. They have contributed their valuable writing time to create new works to inspire and guide us. We are indebted to them and hope that you, our readers, can repay them with inspired leadership.

A Note about the Artist

Susan Jurist, when she is not distracted by being the art librarian at the University of California, San Diego, is a digital artist. She is convinced that the world is flat and measures 640 x 480. You can write to her at sjurist@ucsd.edu or drop by http://gort.ucsd.edu/sj/ital to see the original digital paintings of the illustrations that you will see throughout this special issue. Those paintings are wonderful in digital color, and Susan provides details about the content and some related images. So what do all of those ones and zeros spell out in the illustration for "Institutional Circuitry," and whose cat-baby is that on the side of the road?

Milton T. Wolf is director of collection development for the library at the University of Nevada at Reno. If you want a connection to science fiction publishing, Milton is a great place to start. Send him e-mail at sfwolf@unr.edu (guess what the "sf" in that address stands for!).

R. Bruce Miller is responsible for user support services (those are all the hard working technical services and systems folks that the public never sees) in the library at the University of California, San Diego. Bruce loves to receive fan mail at rbmiller@ucsd.edu.

Gene Wolfe sets the stage with **"Libraries on the Superhighway—Rest Stop or Roadkill?"** Will librarians suffer the same fate as the dodo? History is full of documentation about various classes of "information elites," like the scribe-priests, who withered away when a new technology wiped out their supposedly impregnable social niche. Prior to World War I, many large corporations had Vice Presidents for Electrification. What technology giveth, technology can also take away!

And as many of you know, utilizing such technological innovations as Mosaic and Netscape to cruise the Web changes the way we experience knowledge. It permits participation with others in adding incrementally to what is known. Many documents are now much more a collection of perspectives than something that is patentable to one individual. Serendipity reigns supreme on the Web as your browsing constantly brings you in contact with information that you didn't know that you wanted! **Phil Agre** understands the new world that has opened for scholars and concludes that librarians should abandon the ideology of information in favor of **"Institutional Circuitry."**

Beyond The Third Wave

While technology is neither good nor evil, it changes our very nature and must be monitored closely for its residual effects. Most of us learn and remember better if the information we take in is wrapped in a narrative context which involves us personally. **Sonia Orin Lyris** has contributed original fiction, **"Multiply and Conquer,"** that suggests the promises and the pitfalls of such intimate access to interactive information.

The U.S. government is now enacting and proposing sweeping legislative changes in order to position itself and business for the emerging communications technologies, especially the interactive digital devices that will drive the information future. Formerly distinct functions and companies are being yoked together and traditional regulatory firewalls dismantled as digital replaces analog. Once again scientific advances are making former legislation not only obsolete but irrelevant. **Lisa Mason** alerts us to new dilemmas for free speech in **"The Elephant and the Net Cruiser: Regulating Communication on the Matrix."** Law and order have always followed any frontier environment, and abundance, sooner or later, has been organized for the "social good" (i.e., the good of the few). The technology can handle this data overload, but can we? **David Brin** suggests that self-regulation is in our best interest in his discussion of **"The Internet as Commons."**

Murray Martin goes beyond the governmental realm to consider the broad societal ramifications of **"Problems in Information Transfer in the Age of the Computer."**

Unfictionable Science

It is not coincidental that the issues being fictionalized by contemporary science fiction authors center on information technology. Technological extrapolation and literacy have been at the heart of science fiction; now they are at the heart of world culture. Forget seizing the means of production, it's the means of information that will give you an audience, an attitude, an amplification of self that will make you bigger than life. **John Barnes** drives that point home with **"Information and Unfictionable Science."**

Postmodern Cyberspace Geography

Postmodernism and science fiction are kissing cousins revealing the technological underbelly of modern society, the race for the neural plug that will mainline info right into your skull: all the bytes you'll ever need to be a productive citizen—where Republican and Democrat equate to all the choices you'll ever get, where wars are roboticized (no killing done by humans), and where good little burghers vote for jobs so they can pay their credit card debts and surf a thousand channels of mostly irrelevant data. **Paul Starrs and Lynn Huntsinger** provide a guided tour through cyberpunk literature while defining a new field of study, the "geography" of cyberspace, in **"The Matrix, Cyberpunk Literature, and the Apocalyptic Landscapes of Information Technology."**

Digits Are Forever

Computers are really non-mobile robots and are more than willing to serve. Robotic psychiatrist **Joanne Pransky** reveals the non-fiction world of **"Robots: Our Future Information Intermediaries."** Perhaps we may

choose to become the technicians of our auxiliary brains, mastering not the information but the retrieval and referencing functions. Like the vice-presidents for electrification, non-thinking priests of technology have a very limited social niche. The future of computers is not in the advancement of technology, but in the promotion of human resources.

Forget Virtual Reality

If humans are sacrificed to technology, then we have put the systems cart in front of the horse. "User-friendly" is supposed to refer to the ease for humans to interface with technology—not the other way around! If technology is to provide extensions and amplifications of the brain and body, then real life should be better than virtual life. **Alexander Chislenko** envisions **"Intelligent Information Filters and Enhanced Reality."** If, as Timothy Leary has suggested, we are going to download ourselves as digital information into the future, who's in charge of the authority file? The techno-nerds? No wonder cyberpunk was born.

Many Futures, Many Choices

Frederik Pohl once remarked, "There is no such thing as the future; what there is instead is an almost infinite range of possible futures." Which information future do we want? **Steven Barnes** tells us how to find the possible in **"The Impossible Dream."** Fortunately, the future comes one day at a time. Let's create an information future as though our lives depended upon it.

References

1. Walter Jon Williams, "Prayers on the Wind," *The Year's Best Science Fiction*, 9th ed. (New York: St. Martin's, 1992), 98. I have been searching for a place to use this quote since the first time I read this wonderfully zany story. My dad's name is Bob Miller, and the librarian reincarnation angle is simply too perfect. I'm not sure the quote is relevant, but it sure sets the tone for what it is like to do business with Milton! — RBM
2. Clifford Stoll, *Silicon Snake Oil: Second Thoughts on the Information Highway* (New York: Doubleday, 1995).
3. Walt Crawford and Michael Gorman, *Future Libraries: Dreams, Madness, and Reality* (Chicago: American Library Assn., 1995), 1.

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Libraries on the Superhighway: Rest Stop or Roadkill?

Gene Wolfe

You see before you a man suckered by his publisher. I thought my wife and I were going to get an expense-account trip to Miami in return for eating dinner and signing a few books. If I had known I was going to have to give this talk, I would never have agreed. I know nothing about the information superhighway said to be lurking around the next bend—and neither does anybody else, don't let them kid you—and what little I know about libraries I have learned from you. If I were a carny, I'd call this a "cold reading." It's what we science-fiction persons do.

Putting my fingers to my temples (without dropping the speech, I hope) and rolling up my eyes in a frightening manner I peer into the future.

Library, Dewey Decimal, Stacks and stacks and stacks and stacks, Cataloging, Pettifogging . . . Preservation!!!

Looks bad. Most of the trends are against you, so let's do roadkill first.

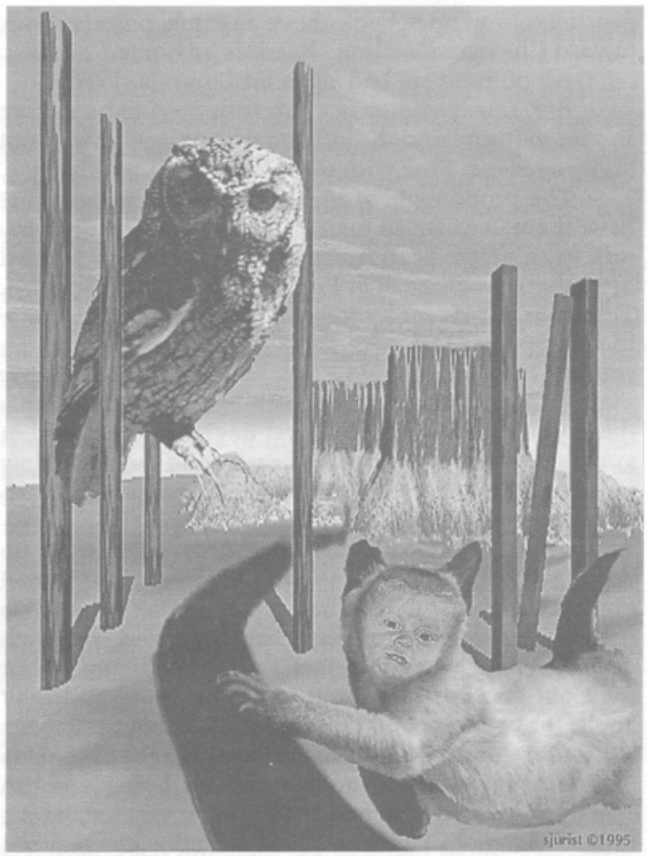
To begin with, free public libraries are a 19th Century phenomenon. Andrew Carnegie died in 1919—If you don't know who Andrew Carnegie was, ask old Mrs. Hwiggins at the Research desk. The 19th Century notion was that it was your duty to educate yourself, and it was nice for the public to help you. Since the poor could not afford to pay tuition, free schools were provided. Since they could not afford to buy books, free public libraries were provided, too.

To underline my point, I'd like to quote here from Cobbett's *Grammar of the English Language*, published in 1819, exactly one hundred years before Carnegie died. This is how it begins—the first paragraph of the dedication to Queen Caroline:

> May it please your Majesty, a work having for its objects, to lay the solid foundation of literary knowledge amongst the Labouring Classes of the community, to give practical effect to the natural genius found in the Soldier, the Sailor, the Apprentice, and the Plough-boy, and to make that genius a perennial source of wealth, strength, and safety to the kingdom; such a work naturally seeks the approbation of your Majesty, who, amongst all the Royal Personages of the present age, is the only one that appears to have justly estimated the value of the People.

There you have it. Remember, please, that Carnegie was born in Scotland and began his career as a bobbin-boy in a textile mill. Free public libraries are, or were, the weary bobbin-boy's dream.

All this is, of course, utterly alien to the mental habits of the 20th Century, and seems sure to be antithetical to those of the 21st. The new idea, the current idea, and the future idea—exemplified by drafting me to speak to this group—is that it is society's duty to adapt itself to the ignorance of its members, and it's a good idea for them to force society to do it. Faucets that used to read HOT and COLD are now red or blue—and I do not mean that those words are written on them.



We are in the process of reinventing hieroglyphics. The hood release of my car has a picture of an automobile with its hood up, and the cigarette lighter has a picture of a smoking cigarette. A week or so ago I was confronted by a large and intimidating sign that showed a hand dropping a handkerchief, overlaid with that circle-and-slash thing that look like the top of a slot-head screw. Its meaning seemed plain: I had wandered into the realm of Gilbert & Sullivan's *Mikado*, and the sign meant "Do Not Flirt!"

Other signs I have encountered recently include a tiger, meaning "Bring more babies to the zoo"; a knife, a fork, and a plate, meaning "Get gas here"; and a person

Gene Wolfe is a well-known and prolific author whose books include the recent series, *The Book of the Long Sun*. He is also a captivating speaker whose humor is well demonstrated in this text of his speech to the standing-room-only gathering of the LITA Imagineering Interest Group at the ALA Annual Conference in Miami in 1994.

peering into an open book above an arrow pointing back toward Chicago, meaning "Readers go home."

All of these are bad signs for libraries.

But, I hear you object, I'm supposed to be talking about the future and the information superhighway, not highway signs. Bear with me.

The proponents of hieroglyphics tell us we must have them because so many people—immigrants, visitors, even native-born Americans—have been educated in a language other than English, particularly Spanish. Think about that for a moment. Suppose that you were to visit Spain, Mexico, or some other Spanish-speaking country. How long would it take you to learn that *caliente* means hot and *frio* cold? Honestly now. Isn't that something you'd pick up on the first day? And be proud of yourself for having learned so easily and quickly? How much difficulty would that esoteric Spanish word *restaurante* give you?

I bought the rationale myself for years, right up until I read a little book called *Fish Whistle*. In it Daniel Pinkwater tells us that he had grown up listening to his father's broken English and being told—and believing—that Polish was his father's native language. At last the Cold War broke up, and he (a successful author of books for young people) was able to take his father back to the Old Country, where he watched as native speakers of Polish struggled to understand his father's Polish exactly as people here had struggled to understand his father's English. Horrified, Daniel Pinkwater realized that his father was fluent in no language whatsoever.

That gave me the clue to what is going on with the knife, the fork, and the empty plate. And with the dead man in the bed, the handkerchief dropper, and the rest. They aren't there, really, for people who read and understand Spanish, or Chinese, or any other language. They are there for Daniel Pinkwater's dad.

There are more and more of him, and there will be still more in the coming century, because (as I said) we have chosen to adapt to ignorance. Education was a privilege once. Today it's a chore, and tomorrow it will be a pointless chore. Most students' attitude is "Prove to my satisfaction that I will need to know this subject—otherwise I won't learn it." And as our society adapts further and further to the needs of its illiterates, the proofs demanded will become harder and harder to provide. What the hieroglyphics are *really* saying is "there is no need for you to read."

That brings me to the first thing I want to say about the information superhighway. It is that superhighways are great only if you own a car, a motorcycle, or a truck. No tractors, no skateboards, no horse-drawn vehicles, no bicycles, and no pedestrians. You've all seen the signs.

The information superhighway is going to leave a lot of people behind, in other words. I think that they'll resent it. They'll take out their resentment on any institution concerned with literacy—including what is called computer literacy—that is open to political control. If you haven't realized who that is yet, ask old Mrs. Hwiggins at the Research Desk. She knows.

Now it's time to ask what's really meant by an information superhighway. It is, pretty obviously, a "buzzword"—a term that I prefer to "slogan" because I can't rid my mind of the knowledge that a slogan was originally a Scottish battle cry.

In so far as "information superhighway" means anything, it means that everyone with a computer can be linked to everyone else similarly equipped, and thus that all of the digitized information that is generally available will be available to them. The image, in other words, is that of a coast-to-coast tollway—you didn't really think this was going to come free, did you?—connecting hundreds of stretches of local roads, streets, and by-paths.

It goes without saying that not ALL digitized information will be available. Governments and corporations will continue to hide nearly everything, and many individuals will at least try to conceal various matters.

What doesn't go without saying, I'm afraid, is that a lot of the data available on the superhighway will be false. It's currently estimated that one quarter to one half the research reported in scientific journals has been faked. This is a relatively new phenomenon and a dangerous one, and the amount of faking is increasing.

Furthermore, this faked data has been filtered for us, like cigarette smoke. It has had to pass the staff and the editorial board of the journal that published it, and these staffs and boards are very much alert to the problem, turning away masses of ill-conceived, poorly-executed, or suspicious-looking research. The information superhighway will bypass the filters. Anyone looking into a hypothetical connection between hamburgers and child molesting will get research sponsored by what used to be called the beef trust and research promulgated by Hindus and vegetarians. [Ed.: Take a look at *The Beef Handbook* in Phil Agre's article, "Institutional Circuitry."]

Wait, it gets worse.

Most faked research today comes from Ph.D. hopefuls and bush-league scientists angling for grants. Think what it will be like when the hackers and pranksters get to work. Wait till the bush-league scientists start writing papers under new names confirming their fictitious "discoveries." Public libraries have little to worry about in this regard, perhaps; but I'm afraid that those of you who work in university libraries are going to find your-

selves hip deep in it. Did a Dr. Smith at your school in fact confirm that it was not the onions, the beef, or the bun, but the special sauce that best correlates with an uncontrollable urge to fling infants to tigers?

Do you in fact have a Dr. Smith? Yes, you do. Do you have a record of this paper? Yes to that, too—although not ON paper, it's a computer listing. Did Dr. Smith in fact write it? No, he did not, and good luck in finding him to ask.

Most of you have labeled me as a hopeless technophobe by now, scratching out bewildered accounts of dystopias in which monstrous self-propelled juggernauts with wide chrome smiles kill more babies than tigers and scarlet fever combined.

Naaah.

It's just that—well, let me tell you about my freshman math teacher. His name, as well as I can recall it now, was Prof. Schleswigholsteinuntgottdamnerrung; and he was young and plump, and spoke English with an almost impenetrable accent. He rode a bicycle and was in those benighted times the only faculty member to do so, and he wore a knit cap in which the knitter had made some major mistakes and a knit scarf that was plainly a product of the same hand.

We were young too, and easily frightened in those days, a mixture of country boys who were thoroughly cowed at finding themselves amongst environs so very learned and sophisticated as a cow college, and city boys like me who were terrified to find themselves marooned for four years in a huddle of run-down buildings on a barren and trackless prairie.

We were afraid of upperclassmen, campus cops, cafeteria food, each other, and even (though I blush now to admit it) the English Department. Of the Chemistry Department, the Physics Department, the Dean's Office, and—above all the rest—the Department of Mathematics we stood in abject and mind-numbed terror.

Nevertheless, after the first class or two, we voted to keep Prof. Schleswigholsteinuntgottdamnerrung as a pet. The rowdy crowd might steal his knit cap and throw it on the roof or let the air out of his bicycle tires. We would have none of it, though we perpetrated various minor hoaxes, wheezes, and swindles involving thefts from the old, scuffed briefcase in which he transported his lecture notes, and conspiracies to misinform him about American holidays.

He had numerous peculiarities and eccentricities, but one of the things I recall most vividly now is that he wore both an old brass pocket watch that appeared to have been inherited from the same unsuccessful German attorney who had supplied his briefcase, and a new and very cheap wristwatch. When he wanted to know the time, he consulted both, added their readings, and divided the result by two—usually getting the answer wrong.

His most endearing quirk, however, was his habit of using his slide rule for every possible computation, reading it to five mostly inaccurate figures. If he had to double seventeen, for example, he used his slide rule and arrived at thirty-three point nine, nine, seven. It is good enough for engineering purposes.

Fifteen years later, the company that employed me, having established that I was worthless at everything else, made me a computer programmer. This, you understand, was way back in the pioneer days, when the memory of walk-in vacuum-tube computers was yet bright and home computers were still undreamed-of. I spent the last years of my engineering career as a programmer, and left the job in 1972. I was supposed to be telling the computer to tell a numerically-controlled milling machine how to make things, and mostly telling it how to make blow-molds for plastic bottles.

Our computer, as I soon discovered, had no interest in bottles. It was out to fake its way through the whole project, something I had done occasionally myself. I would tell it, very clearly and distinctly, to outline a bottle rather like a dress-maker's dummy, and it would proceed to rough out a Kline bottle.

Or something.

Before long, I recognized that computer for what it was. Cybernetic science, for which science fiction had given me such immense respect, had labored mightily for whole decades with silicon and germanium, rubber, copper wire, tin siding, plastic and God knows what else, and had at last triumphantly produced a Frankenstein Prof. Schleswigholsteinuntgottdamerrung.

That computer knew far more mathematics than I would ever know, and that computer knew nothing else at all. It could be misled by a child. It could be misled by me even when I was doing my utmost not to mislead it.

Furthermore, we had a keypunch operator—in our gross ignorance and primitivity we then used people called keypunch operators, and when I've got more time I'll tell you about IBM cards—named Bobbi Beavers. I'm not making this up; that was her name. She was small and cute, and could do an imitation of Shirley Temple, skipping rope while singing *On the Good Ship Lollipop*, that I have never seen equaled. And when Ms. Beavers and I combined our formidable creativities, we could tie that computer in knots well before the middle of the program.

I left programming in 1972, as I said, and took an honest job. It was a strain at first, and there have been times—though mercifully few—when I have felt a pang of nostalgia for Prof. Schleswigholsteinuntgottdamnerrung. I mean that darn computer. But I find that if I shut

my eyes really tight and think hard about plastic bottles, the feeling goes away.

When the rage for writing on computers began, Algis Budrys and a dozen other friends told me I simply had to get one. I asked them to name one useful capability a computer would give me, and they named scores of neat ones. Unfortunately, they were *only* neat. Useful is something else.

That computers are wonderful machines, I do not in the least deny. If you want to hunt submarines using statistical methods—which is what electronic computers were in fact built to do, originally—they are truly marvelous. They are unequaled at calculating orbits for NASA. But give them a simple job . . .

Well, the library I frequent has done away with the old card catalogue and installed computers, and they are wonderful. Say that you are interested in snipe hunting. These computers—and I use the plural advisedly, for there are frequently as many as two in service at one time—will produce a list of every single book on snipe hunting held by every single library in the northwestern Chicago burbs. They will even tell you which of these books are in the library in which you happen to be sitting.

But there is one thing that they will not do under any circumstances. You can cuss and sweat, and pound the table until the library closes; but they will never, ever, tell you where that book is. For that you need a librarian.

And eventually it dawns upon you that you can bypass the computers completely, just going up casual-like to a librarian and saying, "Where are the snipe-hunting books?"

In a way, this is rest stop—librarians are not about to go the way of the key-punch operator. In another, it is just more roadkill because librarians have to deal all day long with people maddened by their failure to access (as computer folks say) the simple information they need.

I've done some reading in order to write this little talk—reading is often needed, I find, when you know nothing about your subject—and as a way of sliding from roadkill into rest stop, I'd like to read you some sentences and paragraphs I've come across, and of course argue with them and find fault, and carry on as I always do when I read just about anything.

Here's a fine science-fiction writer, David Brin. "On the other hand, no author before 1979 came even close to predicting something as fundamental to our modern world as the home computer."

The reason—and Brin should have had no difficulty in deducting it—is that authors are not in the business of predicting irrelevancies. The people I know who own home computers are reading and sending e-mail, the great majority of it cocktail-party chatter. They enjoy it, and that's good. But it isn't anything a writer can make a story from. They are playing neat-o games; that's fun, but . . . They are keeping financial records and playing the stock market; neither, alas, is new. My writer friends who write on computers all tell me that they are writing more and better. I read them, and they are indeed writing more.

But not better.

In fact, not as good—possibly a story could be made out of that fact, but it would interest few people who are not writers themselves.

I have racked my brain to find something really relevant that some owners are using their home computers for, and the only thing I've come up with is that home computers are letting some people who used to drive to an office work at home. I'm all for that, but it's basically a revival of cottage industry.

Here's another quote. This is by Stephen P. Brown, the editor of *Science Fiction Eye*, and is one of those interesting statements in which the idea itself is correct, although almost all the details are wrong.

> Right now everyone is infatuated with the technology itself with little thought as to the results. It's as if early auto theorists spent all their time on engine and road design without a clue regarding the massive changes made in society by putting total mobility into the hands of everyone.

That of course is exactly what the early auto theorists did. And they did NOT put "total mobility" into the hands of "everyone"—try to drive from here to France. Try to drive if you're blind, or too poor to afford a car and gasoline.

And of course not "everyone" is infatuated with this sort of technology. I for one am not. Rather, I am fascinated by the hold it has upon its devotees, and how little real, usable capability it has given them to date.

For my final quote, here's one of the best cyberpunks, Bruce Sterling. "[Computer] bulletin boards excel at minor aspects of social housekeeping, such as swapping addresses, spreading headlines, breeding rumors, and, especially, exchanging insults."

I think that makes very plain what the worst of the "roadkill" aspects of the superhighway will be for libraries. In place of that bewildered-looking man who wanders up to you and asks where you keep the snipe-hunting books, you're going to have hundreds (I'm lying here, because I'm afraid that you wouldn't believe me if I said thousands) of inquiries, inputs, and complaints, nearly all of which will have to be dealt with in some way by somebody. In the 25th Century, my old pal Buck Rogers assures me, that somebody will be a computer. In the 21st, I fear, old Mrs. Hwiggins will have retired; but you will still be there.

Did I say that bit from Bruce Sterling was my last quote? I lied about that, too. Let's return to David Brin

for a minute. Brin asks, "What will be the consequences when, as some predict, the personal computer is so cheap that the average citizen of the Third World owns one and has greater access to *data* than to clean water?"

My late friend Jim Friend taught English at a college in Chicago. And a few years before he died, Jim visited China. He dropped in on a university in Beijing to compare notes with his Chinese counterparts, and they grabbed him and demanded that he speak to their students. The students, they said, would never forgive them if they let a western professor leave without giving a lecture. They would provide a translator, a hall, a mike, and in short whatever Jim wanted but he *had* to speak. What about tomorrow night?

That gave poor Jim something like ten minutes in which to rack his brain and come up with a topic of interest to Chinese college students—one that he knew enough about to speak on without references. The topic he came up with was the capabilities of Chicago-area colleges and universities: which ones were strong in English, which ones offered what foreign language, which had well-regarded journalism departments, and so on. There are roughly sixty institutions of higher learning in the Greater Chicago Area, and Jim was familiar with most of them. He told his Chinese colleagues, and they put up little notices around the campus. "Prof. James Friend of Chicago State University will speak tomorrow night on the capabilities of Chicago-area colleges."

Jim said he figured nobody would come because the notices were in Chinese.

Seriously, he expected forty or fifty students at best, those who had some reasonable expectation of becoming exchange students and thought that they might like to come to Chicago.

He got fifteen—hundred. That is not an exaggeration. The room in which he spoke was intended to hold four or five hundred.

And the students knew it. They had begun arriving about four for his six forty-five talk. Every seat was filled, and they were seven deep in the aisles. They filled the windows, sitting and standing on the windowsills.

Brin speculated that the *average* citizen of the Third World will eventually have his own home computer in which to cruise the superhighway. I don't believe it, but I do believe this: Suppose that every *college student* in the Third World gets access to a computer and the superhighway. Forget about the millions upon millions of toiling peasants. Let's just suppose every college student.

Well, it's not as bad as you might expect. There are only 600,000 of them in all China. That's only ten times as many as attend the University of Illinois, or twenty times as many as attend the University of Florida. It could be a lot worse.

Teachers are another kind of people in China who may well get onto the net before long, though I doubt that they'll be quite as active there as the college students. Anyway, there are only about 700,000 of them.

Now that we've begun looking at the bright side, let's switch to the good stuff, the rest stops. Sure, there are going to be problems. And we can be certain that the rosiest predictions of the technophiles are pipe dreams, as they always are—I remember when they said that electricity generated by nuclear power would be so cheap you wouldn't need a meter.

But there are going to be some real benefits for all of us, including libraries. Say that someone needs very badly to have a look at *The War In Florida*, by a Late Staff Officer. It was published in Baltimore in 1836, and it's not likely that your library has a copy. Your computer will be able to tell you within a few seconds that there's a copy at Bethune-Cookman in Daytona.

Furthermore, you'll be able to print up a facsimile of it on the spot, including all the drawings and maps. Pretty cool, huh?

It won't be cheap, though. I suspect that you'll either charge your patron a fairly stiff fee and let him keep the book, or (if he prefers) a lesser fee and loan him the book. When he returns it, you can catalogue and shelve it for the next researcher.

Nor is that all. About thirty years ago, I had the very enlightening experience of watching two librarians trying to help a patron who wanted to read ghost stories. Their library had no such category—it distinguished only between juvenile and adult fiction, as I remember—and they did a great deal of fumbling around.

That's already a thing of the past, as you know. Today you can perform a key-word search that should yield all the titles that include the word *ghost*. Tomorrow you will be able to compile your own anthology, if you choose. Or your patron can. "Let's see. 'The Ghost' by Richard Hughes. I have to have that. And here's 'The Woman's Ghost Story,' by Algernon Blackwood. I've heard of him, so I'll put it in, too. What about 'The Ghost Ship,' by Richard Middleton? Why, that could be about a German raider in the First World War or something. Let's just pull it up onto the screen and have a look. Dear, dear! I wish the library didn't make everything so difficult."

All the participating libraries in the world will become, in effect, parts of one vast library. If you work for, let us say, the Savannah Public Library, you will be able to think of the Library of Congress as a branch of yours.

Far more important, you are ideally positioned to make the benefits of the information superhighway available to those to whom they would otherwise be denied. I said a while ago that a highway is of benefit

only to those who can own and drive a car, a truck, or a motorcycle. You can be the Greyhound and the Trailways of the information superhighway.

No, you *are*, because if you aren't nobody else is going to do it. You can make "home" computers available to the people who cannot have them in their own homes. Using them, people whom the educational system and the economic system have failed will be able to explore the bewildering array of programs that are available to them on the city, county, state, and Federal levels, and can be coached by software through the completion of the necessary applications, which they can then submit over the net.

That will not just give them a reason to learn to read, it will actually teach them computer skills that may permit them to land jobs.

And in the process they will have *learned* to read. Think of it; at the same time that they see the need, they will be acquiring the skill.

Furthermore, they will have acquired it *in the library. Your* library. It will no longer be an alien place, a place frequented by the educated elites whom they believe are their oppressors, but a known and friendly place.

The world has turned away from Carnegie's dream, and it's quite possible that it believes it's done away with Carnegie's dream once and for all.

I don't agree. Dreams are weak things, as every writer quickly learns. They are nebulous—we who hawk them on the streets know that only too well. But dreams, I notice, always play the second half.

And the second half has just begun.

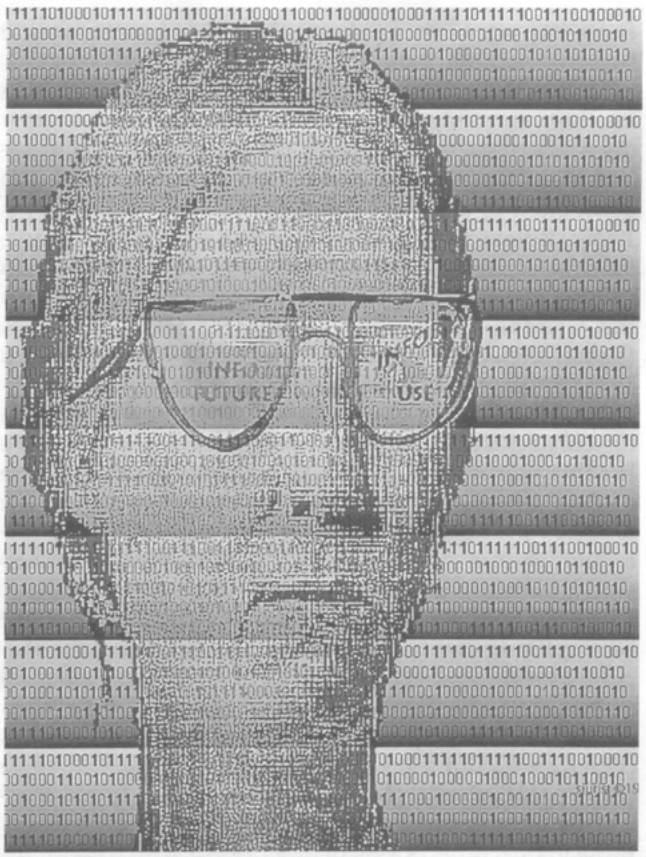
Institutional Circuitry: Thinking About the Forms and Uses of Information

Philip E. Agre

We have been asked to speculate upon the future of information, and I would like to begin by unpacking some of the assumptions bound up in this phrase, "the future of information." The word "information" is grammatically a mass noun, like "milk," "flour," and "money." Information is thus a figurative substance (cf. Buckland 1991), and consequently we can tell certain stories about it: possession, accumulation, surfeit ("overload"), distributional inequality ("haves and have-nots"), measurement (Shannon and Weaver 1949), commoditization (Schiller 1993), and so on. In order to tell these stories about information, we must imagine it to have a location. Yet we have also come to understand information as a "content" divorced from any specific physical realization (speech, paper, computer chips, fiber optic cables). We imagine information to be referential—information is always information about something—and we imagine it to be truth-functional—we assume that information is true but we know it can be false. At the same time, the term "information" rarely evokes the troubling questions of epistemology that are usually associated with terms like "knowledge" and "belief." The concept of information, then, carries a certain connotation of neutrality—it is homogenous and noncontroversial. The reality, of course, is more complicated.

To speak of the *future* of information, furthermore, supposes that information has a definite character that can change. Indeed, it supposes that information is a unified phenomenon with a single fate. To the extent that its future is already determined (if perhaps undisclosed), we are in the position of passively predicting it rather than actively making it ourselves. The idea is that, by predicting the future of information, we can prescribe a future for librarianship.

I want to suggest, though, that things actually work the other way round. Information is not a natural category whose history we can extrapolate. Instead, information is an object of certain professional ideologies, most particularly librarianship and computing, and cannot be understood except through the practices within which it is constructed by the members of those professions in their work. The future of librarianship is not contingent on the future development of something called information; to the contrary, the category of "information" is contingent on the future development of the various institutions that now constitute it. The category of information may disappear entirely, or it may be reconfigured as structural relationships change between the "information professions" and the other institutions of society. To understand this process, much less intervene in it, we must comprehend the system of dynamic tensions through which "information" is constituted in the present day. This is a difficult task since ideologies



invariably present their constituent categories as natural and pregiven, and not as the contingent products of human activity. But it is a necessary task if information professionals wish to maintain their relevance to the deeper social values that give their work meaning.

Librarians understand themselves as experts on the use of information. This definition of librarianship is strategic. It is preferable, for example, to defining the profession and its expertise in terms of particular media: books, bound journals, long-playing records, and so on. The rate of migration of these materials to digital media is no doubt often exaggerated, but everyone understands that these media are technologies like any others, that specific technologies come and go, and that some-

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thing important about the skill of librarianship would survive their demise.

But the concept of "information" is strategic in another, more significant way. Libraries serve a great diversity of patrons; indeed, the encouragement of social pluralism through public access to information is often cited as a central value of the profession (Dervin 1994). Research characterizing these patrons' diverse information needs and uses has evolved from a focus on catalog systems (Dervin and Nilan 1986) to a focus on the standpoint and experience of particular patrons (Bates 1986, Frohmann 1992, Hewins 1990, Kuhlthau 1991). In particular, library patrons from various backgrounds may bring ideologies with them that differ from the constitutive ideology of librarianship (Dervin 1989). In other words, library patrons may or may not conceive of themselves as looking for "information." Academic research professions, for example, orient not to "information" but to "literatures." Most literatures are associated with keywords such as "organizations," "activity," "networks," or "planning," though these words might be employed in wholly different ways by unrelated disciplinary communities. Of course, librarians are well aware of the significance of these words to their users and of the consequences of their choices of indexes (Fidel 1994). But a literature is more than that. It has a history (founders, milestones, rise and fall) and a structure (founding texts, survey articles, textbooks). Each of these in turn reflects a set of practices (research methods, standards of evidence, forms of argument) and a system of institutional relationships (dominant and dissident lines of thought, powerful and marginal research groups, politics of publication and funding). A research community's insiders read its literature with such things in mind; indeed, these larger forces help shape the specific genres of writing and the protocols of reading in which the community's members are skilled (Bazerman 1988). Threading one's way through the archives to reconstruct a literature is a rite of passage for research people entering a new field, and standard reference works offer only limited assistance with the process. A bibliography might map certain regions of a literature, but most often with a degree of "flatness" that does not nearly map the complex and differentiated terrain which the researcher experiences.

Library cataloging schemes do not represent literatures. An ordering of topics, as in the Library of Congress classification system, may embody a cataloger's understanding of their social history, but it will provide little explicit representation of that history. And the ordering can approximate the interconnections of a literature, so that someone exploring a literature can profit by browsing the shelves. Yet the gap between the ideologies of information and literatures remains. Few researchers realize that libraries could greatly facilitate their efforts by making the structures of literatures explicit, so in practice they tend to treat the work of exploring literatures as a series of discrete problems to be reformulated in the language of information, either on their own or with the assistance of a reference librarian.

If librarians attempted to organize research works in the ways their patrons orient to them, of course, certain difficulties would follow. It would be necessary to make explicit some frequently contested matters, such as who founded the literature, which research groups are dominant, which survey articles are definitive, which systems of ideas prefigured which others, and so forth. It would also be necessary to sort documents into genres and to articulate those relationships among texts that are not explicitly provided for in their lists of citations. Librarians would find themselves effectively positioned as participants in the disciplines' conflicts but without the disciplinary standing needed to make their views stick.

The ideology of information, then, serves to position librarianship as a neutral profession, in two senses: (1) librarians minimize their participation in the internal disputes of other communities; and (2) librarianship does not define itself in relation to the ideology of any particular community of patrons. Of course, librarians do make decisions (about what books to buy, for example) that are inescapably political. Nonetheless, through the ideology of information, the library presents itself largely as a blank screen upon which particular communities can project their own practices and projects. To be sure, libraries occupy a special place in the world of academic researchers; Latour and Woolgar (1986) suggested viewing an academic laboratory as a factory for turning research materials into publications. Likewise, my own university's *Policy and Procedure Manual* states that the "Published Work" contributing to a case for academic promotion "consists of work published in the open literature, i.e., work which one may reasonably expect to find in libraries other than UCSD's." But other communities will have their own ideologies for "information," and these ideologies will always be rooted in the categories of their own institutions.

Yates and Orlikowski (1992) suggest interpreting these categories in terms of genres that arise and evolve through the interplay of forms and functions in institutional communication. For example, they trace the rise of the business memo in the early 20th century. Business people first modeled their intrafirm communications on the familiar business letter. But as organizations grew, the special demands of internal communication led this form to evolve into another, the memo. The memo, then, was not invented once and for all on any single occasion. Members of each organization used existing rules as

guides to action, but they did not apply these rules mechanically. Instead, they adapted them to the demands of each particular case, yielding modifications to the existing forms that provided precedents to which others could orient in turn. The genres of business letter and memorandum, then, are neither natural categories, arbitrary rules, or spontaneous responses to particular situations. Instead, the genres coevolved with the larger network of practices in which they participated, shaping organization members' activities and being shaped by the logic of those activities in turn.

But beyond this, genres of communication also embody ideas. The memo, for example, typically embodies ideas about accountability (in the identification of its author and the authors' orientation to scenarios in which the memo might come back to haunt them later on), collective identity (in the specific styles of writing that are cultivated at specific firms), procedure (in status codes such as "draft"), rationality (in its appeals to objectivity), and so on. These ideas are inseparable from broader understandings of business in general, as well as each firm's particular calling. Likewise, specific academic disciplines cultivate genres that reflect their own ideas about method, evidence, language, credit, dialogue, objectivity (or the rejection thereof), and so on. The "literature," in this sense, is an ideology of both the documents and the institutions of research. Both the genres and the ideologies can change, and these changes are part and parcel of larger institutional changes.

From this point of view, the problem with "information" is that it levels the distinctions among disparate categories of communicative actions and artifacts. Libraries contain artifacts generated within a wide variety of practices, and for that reason libraries are also points of intersection for a wide variety of differently structured processes of circulation in society. Library materials circulate, of course, in the sense of that term recognized by librarians. But the institutionally specific constituents of those materials—the statistics, arguments, metaphors, ideas, coinages, and so on—circulate as well, propelled by and propelling the whole range of energies that traverse a society's disparate sites of practice (Greenblatt 1988). These things circulate within a definite institutional circuitry: the forms and pathways that specific social formations maintain for the movement of their own categories of communicative practice. The institutional circuitry of academia, for example, includes the production and distribution of scholarly books and journals, but it also includes the circulation of draft papers, the ritualized explanation of one's research to others at conferences, the accelerating chatter of electronic mail, and the promotion of keywords. These practices are not machine-like or slavish in their orientation to existing rules of form, but they are most definitely guided by the precedents and expectations of precisely those communicative genres that one attempts to master in graduate school.

Case Study

Let us make these ideas concrete by examining a particular artifact whose highly evolved genre is not regularly found in libraries. The *Beef Handbook: Facts, Figures and Information on the Beef and Cattle Industry* is a simply printed, 116-page paperbound document with 9"x11" covers and 8.5"x11" pages, divided into sections of varying length by five two-inch thumb tabs labeled "Nutrition And Health," "Beef Safety," "Environment," "Animal Care," and "Economics And Statistics." Its pages are not numbered. According to its title page, it was "produced for the Beef Promotion and Research Board by the National Cattlemen's Association" of Englewood, Colorado. It is dated "Third Printing, September, 1990." I obtained it in 1992 by writing the National Cattlemen's Association to request materials that might assist me in presenting the industry point of view in a university course I was then preparing on the material organization of environmental controversies.

The *Beef Handbook* includes much evidence of its place in the institutional circuitry of business political mobilization. Its introductory page describes it as a "resource" that has been "designed to provide accurate and up-to-date information on issues related to the cattle and beef industry." Although it follows no consistent terminology in describing itself, it nonetheless conforms to a definite morphology: a hierarchical ordering of topics and subtopics, with "facts," "statements," questions and answers, and references for each.

The *Handbook* includes much evidence of being intended as a resource for industry members who engage in public debate. This is made particularly explicit in the introduction's explanation of "industry facts," which concludes:

> Note that third-party statements are included. **Consumer research confirms that third-party endorsements and statements are the most effective and accepted means of presenting the industry position on an issue.**

Here is a typical third-party statement, from the "Fat" topic of the "Nutrition and Health" subsection of the "Nutrition and Health" section:

> "The movement of the beef industry to make lower-fat beef available is a very important contribution to the consumer's ability to choose a lower-fat, lower saturated-fat diet," notes Nancy Ernst, Nutrition Coordinator, National Heart, Lung and Blood Institute.

Likewise, "questions and answers" are explained as follows:

> Following each issue outline is a list of commonly-asked questions on each subject as well as recommended answers.

Here is a typical question-answer pair, from the "Pesticides" subsection of the "Beef Safety" section:

> Q) Of all the pesticides used on the farm, how many does the government test for in food samplings?
>
> A) The government tests for essentially all compounds. Pesticides are members of specific chemical families, such as chlorinated hydrocarbons. The government tests for the presence of all major chemical families associated with pesticides. If a residue is found, more specific testing is done to determine exactly which pesticide is responsible.

The introductory page treats the category "General industry statements" as self-explanatory. These statements outline a thesis that the following specific statements, facts, and quotes will flesh out; they rarely make specific factual assertions of their own, relying instead on relatively vague phrases such as "safe and wholesome," "properly prepared," and "protecting the environment." Here is a typical "overview statement," found in both the "Beef Safety" and "Antibiotics" subsections of the "Beef Safety" section:

> American cattle producers are committed to producing a safe and wholesome product for consumers. Experts often describe the American food supply as "the safest in the world." One reason for that evaluation is the outstanding safety record of beef. American beef is one of the safest foods available to consumers today.

The *Handbook* covers a range of topics roughly coextensive with the objections to industry practice that activist groups had raised publicly over the preceding few years (Schell 1984). (However, it predates Jeremy Rifkin's book *Beyond Beef* (1992).)

My goal is not to assess the truth value of specific assertions but rather to specify how the *Handbook* is adapted to its role in the creation of a collective industry voice. The *Handbook* presents itself as a reference work, hierarchical rather than linear in its organization. As such, it addresses itself to members and allies of the industry, not to opponents, authorities, or neutral parties in the various institutional sites in which actual debate takes place. It presents only facts and quotes that tend to support stated industry positions. It does not appear to anticipate that its reader might dissent from its positions or its individual assertions. It does not present critics' views at any length, nor does it identify these critics or discuss their credentials or motives. Its posture is thus basically defensive, neither promoting an industry agenda for change or attempting to make a public issue of the activists or their activities. Its appeal to consumer research on the role of "third-party endorsements" indicates a rational, strategic, instrumental approach to intervention in the sites of public debate. This idea is a commonplace of public relations, and indeed the conceptual system of facts, statements, and quotations from third parties corresponds to the conceptual framework of the public relations profession. The "overview statements" in the various *Handbook* subsections, for example, are typically called "messages" in the language of public relations, and the distinction between statements/messages, facts, and quotes is maintained throughout, even though the bulleted points under each topic often include examples of all three.

Above all, the *Handbook* is geared to providing its user with these small, standardized units of rhetorical material, which might be reassembled into a wide variety of documents and performances. This user may wish to browse the *Handbook* , memorize its contents, or even read it linearly, but its physical organization provides extensive support for the user who needs rhetorical materials in a specific concrete situation. This situation is defined in terms of a particular public issue, and specifically the key words associated with that issue ("environment," "safety," "deforestation"), and then either in terms of specific topics ("fat," "water use," "reasons for proper care of animals") or questions that activist critiques have given currency in the institutional sites where the industry's practices are debated. It is also defined in terms of the types of arguments that are envisioned as instrumentally effective in these sites: appeals to scientific reason, expert authorities, statistical evidence, and pecuniary interests in doing the right thing.

The *Handbook* is also adapted to the cognitive situation of its user. This is most evident in the consistent set of cues for searching provided by its layout, including its conventions for starting subsections and questions-and-answers at the top of odd-numbered pages, heading these pages with standardized bold type subsection labels such as "Industry Facts: Environment" and "Questions And Answers: Environment," along with square logos indicating the current section. More fundamentally, the *Handbook* reflects a recognition that the average industry member cannot individually command the rhetorical and factual resources required to answer effectively the full range of current objections to industry practices, much less project a standardized industry voice in a range of interactional settings. This voice is very much a collective construction, and the *Handbook* reflects a highly developed technics for the production of such a collective voice.

Clearly, then, the *Handbook* can be read for its place in the institutional circuitry of business political mobilization. It refers explicitly to certain elements of this circuitry, including the industry association employees who are available by telephone, the research reports and government documents that are available for further reference, and the government agencies that are listed as industry resources. In this sense, the *Handbook* is an industrial artifact that represents certain aspects of its own position in a much larger system of distribution. The industry in question distributes cattle and their products, of course, but more to the point it also distributes the messages, facts, and quotes that serve as modular components for interventions in public debates. The primary customers for this industrial distribution system are, naturally, the industry association's paying members, and the economic value of this system's products presumably lies in their effectiveness as tools for both the defense of purely individual interests and the coordination of solidarity across the organized interest group. The strategies of interest group mobilization are more complex than a reading of this single document can reconstruct (Heath 1988, Measell 1992, Vogel 1989). But the more complex strategies are assembled from the basic formal and ideological elements already described.

The Future

The "stuff" that flows through a given institutional circuitry, then, is not information. "Information" is at best a superficial generic term for a broad range of categories whose forms can be described in terms of genres but whose nature can ultimately only be understood within a larger system of structural relationships and ideologies. The artifacts and media that convey this stuff through the circuitry will change as the institutions change or as technological innovations supply new options for strategic communication. Yates and Orlikowski's (1992) theory suggests that any new technologies will be taken up through a back-and-forth motion, with existing genres being imposed on new media and new genres then emerging as the practical demands of the situation lead to incremental innovations in the genres themselves. In the case of business political mobilization, the emergence of "information-intensive" politics and real-time "grassroots" lobbying techniques (Greider 1992) has provided a purpose for telemarketing equipment, fax machines, and computer networks in tactical mobilization over current legislative and regulatory issues. At the same time, the emerging genres of communication through these media share the message/facts/quotes ideology and formal structure of the cattle industry *Handbook*.

Inasmuch as information technologists and librarians both define themselves as dealing in information, it is common to suppose that advances in the technology will undermine librarianship and heavily automate or even eliminate libraries, or else that librarians will migrate in a natural way from the management of physical information artifacts to digital information media. Yet analysis of this question requires an appreciation for the strategic neutrality of "information" as an ideological category in the definition of both professions. In each case, the strategy of providing generically defined services to diverse institutional customers has historically required that only a limited range of accommodations can be made to the specific structures and ideologies of each.

But this may change. As Friedman (1989) has explained, the development of information technology can be understood as the accretion of successive layers of settled art: first the basic methods to get anything to work right at all, then the conceptual framework to get the right thing to work based on some representation of customer requirements, and then the provision of "user interfaces" for nontechnical users. He describes the emerging period of technical history as "the phase of organizational environment constraints," which constraints pertain to "the interface between internal computing systems and specific agents in the environment of the organization. Agents include customers and clients, suppliers, competitors, cooperators, representatives and public bodies" (1989: 337). These issues are not straightforwardly "technical" at all. To the contrary, they concern the institutional relationships that information technology increasingly mediates: they are matters of institutional circuitry that only make sense within the practical logic of a particular institution. As a result, they may call not for computer people with some knowledge of (for example) political mobilization, but rather for experts in political mobilization with some knowledge of computers.

Librarianship may feel the same centrifugal force. As computer networks permit librarians to pool their efforts at cataloging, research assistance, and other duties formerly requiring a great deal of local duplication of expertise, intensive specialization will become increasingly feasible. Digital media, likewise, do not impose the constraints of an expensive, centralized, voluminous collection of physical artifacts. Therefore, as digital media increase in number and practical importance, multiple specialized cataloging schemes can arise to serve particular institutional audiences. In each case, it may become possible—and perhaps even unavoidable—for librarians to abandon the ideology of information and

replace it with the specialized ideology that governs the circuitry of a particular institution. Research libraries will be cataloged in terms of literatures, libraries of materials for professionalized political mobilization will be organized through the categories of public relations, and so forth. The libraries themselves will become increasingly integrated into the rest of the institutional circuitry. The only question is whether a coherent profession of librarianship, and the pluralistic values of public access it supports, will survive this transition at all.

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Bibliography

Marcia J. Bates. "Subject Access in Online Catalogs: A Design Model." *Journal of the American Society for Information Science* 37, no. 6 (1986): 357–76.

Charles Bazerman. *Shaping Written Knowledge: The Genre and Activity of the Experimental Article in Science*. Madison: University of Wisconsin Press, 1988.

Michael K. Buckland. "Information as Thing." *Journal of the American Society for Information Science* 42, no. 5 (1991): 351–60.

Brenda Derive and Michael Nilan. "Information Needs and Uses." *Annual Review of Information Science and Technology* 21 (1986): 3–33.

Brenda Derive. "Users as Research Inventions: How Research Categories Perpetuate Inequities." *Journal of Communication* 39, no. 3 (1989): 216–32.

———. "Information ↔ Democracy: An Examination of Underlying Assumptions," *Journal of the American Society for Information Science* 45, no.6 (1994): 369–85.

Raya Fidel. "User-Centered Indexing." *Journal of the American Society for Information Science* 45, no. 8 (1994): 572–76.

Andrew L. Friedman. *Computer Systems Development: History, Organization and Implementation*. Chichester, UK: Wiley, 1989.

Bernd Frohmann. "The Power of Images: A Discourse Analysis of the Cognitive Viewpoint." *Journal of Documentation* 48, no. 4 (1992): 365–86.

Stephen Greenblatt. *Shakespearean Negotiations: The Circulation of Social Energy in Renaissance England*. Berkeley: University of California Press, 1988.

William Greider. *Who Will Tell the People?: The Betrayal of American Democracy*. New York: Simon and Schuster, 1992.

Robert L. Heath. "Working Through Trade Associations and Public Information Organizations" in Robert L. Heath, ed., *Strategic Issues Management: How Organizations Influence and Respond to Public Interests and Policies*. San Francisco: Jossey-Bass, 1988.

Elizabeth T. Hewins. "Information Need and Use Studies." *Annual Review of Information Science and Technology* 25 (1990): 145–72.

Carol C. Kuhlthau. "Inside the Search Process: Information Seeking from the User's Perspective." *Journal of the American Society for Information Science* 42, no. 5 (1991): 361–71.

Bruno Latour and Steve Woolgar. *Laboratory Life: The Construction of Scientific Facts*. Princeton: Princeton University Press, 1986.

James S. Measell. "Trade Associations: Whose Voice? Whose Vice?" in Elizabeth L. Toth and Robert L. Heath, eds., *Rhetorical and Critical Approaches to Public Relations*. Hillsdale, N.J.: Erlbaum, 1992.

Jeremy Rifkin, *Beyond Beef: The Rise and Fall of the Cattle Culture*. New York: Dutton, 1992.

Dan Schiller. "From Culture to Information and Back Again: Commoditization as a Route to Knowledge." *Critical Studies in Mass Communication* 11, no. 1 (1994): 93–115.

Orville Schell. *Modern Meat*. New York: Random House, 1984.

Claude E. Shannon and Warren Weaver. *The Mathematical Theory of Communication*. Urbana: University of Illinois Press, 1949.

Gaye Tuchman. "Objectivity as Strategic Ritual: An Examination of Newsmen's Notions of Objectivity." *American Journal of Sociology* 77, no. 4 (1972): 660–79.

David Vogel. *Fluctuating Fortunes: The Political Power of Business in America*. New York: Basic Books, 1989.

Joanne Yates and Wanda J. Orlikowski. "Genres of Organizational Communication: A Structurational Approach to Studying Communication and Media." *Academy of Management Review* 17, no. 2 (1992): 299–326.

Multiply and Conquer

Sonia Orin Lyris

Justin Campbell liked to walk as he thought, especially when weather this warm and sunny came through in the middle of November. And he liked working at Stanford's student health, talking with students about their problems, giving them relaxation techniques and other ways to cope with the strain of being at a high-pressure university like this one.

But feeling powerless, that he didn't like.

The mind was a complicated place, he'd be the first to admit it. And an advanced degree in psychology didn't make you any kind of expert on why people felt what they did. But by and large, if you had a good enough collection of tools, some clinical experience, and some common sense, you could usually help people make their world a better place.

Most of the time. This hadn't been a good week. In the last two days he had seen ten students, all deeply disturbed because they felt they'd lost something they thought irreplaceable. In a computer.

He sighed. Cyberspace was supposed to empower the human psyche, not damage it. Despite long conversations with the students, he was still mystified.

He'd done plenty of his own graduate research on cyberspace personas, on how people present themselves in artificial realities. He still remembered the middle aged woman who always preferred to be invisible in any cyberspace virtual reality. After months of working with her, they together discovered when she'd lost her self esteem by trying to make herself into what her father wanted her to be, even to the point of making herself a sexual servant for him. Justin had helped her express sorrow and fury and finally her c-space persona had begun to change, first into a glowing light, finally into a woman.

Angst over the loss of a particular persona was understandable, but he didn't quite understand what had happened in the Scape last week or why it had affected so many so strongly. If there were ten students actually willing to seek him out for help, then there were twenty more who were keeping it to themselves, and that *did* disturb him.

A problem is an opportunity in disguise, he told himself. The fact that he didn't understand only meant that he had a chance to find out. Adventure, he thought wryly.

He watched his striped pink and white running shoes pad over the grey cement path—a clean, neat world against the hard grey of the real world, where things got dirty. Was that what it was to project yourself into a cyberspace and then come back?

He sighed. He had ten students in real pain, mourning the deaths of their constructed selves in this new cyberspace called the Scape, which ran a program named "ALICE." He knew one of the researchers on the project, had done some undergraduate work with her years ago. Maybe he should pay her a visit.

The vendors outside the student union were all dressed gaudily for the holiday, little sparkling turkeys everywhere. Strange how the vegetarianism fad of the late '90s—the so-called "cultural reevaluation"—had given way in the next decade to this new, no-apologies-made, proud to be at the top of the food chain, sort of carnivore lust.

We are alive the turkey signs seemed to say. *And we prove it by eating other animals.*

Was that why people put so much of themselves

Sonia Lyris says: "This story is a side view of an event that occurs in a novel I'm working on. The novel is an extension of my novelette *A Hand in the Mirror*, published in *Asimov's Science Fiction Magazine* (August 1993) and *Cyberdreams*, edited by G. Dozois and S. Williams. I write science fiction and fantasy, and am a software consultant and instructor. I'm active in today's cyberspaces (http://www.teleport.com/cos/~sol.html) and hopeful about tomorrow's. I believe that cyberspace will not only enable and empower us, but will recreate us."

into this Scape cyberspace, at the risk of losing so much? Was it just another way of proving that they were alive?

Yes, it was time for a visit. He wandered east, past the chapel with its vivid stained-glass windows, through the red-brick courtyard, and to the computer science department. Perhaps, he thought as he looked up her name on the list of instructors, he should have called or sent email rather than just showing up on her doorstep. Instead he knocked.

Deborah Moreno was a slender woman, short dark hair, with simple features that now turned into a not-so simple smile as she opened the door.

"Justin, hello. What a surprise. Come on in."

"Am I interrupting?"

"Yes and I'm glad. I'm writing grant proposals."

"Scape proposals?"

She nodded. "It's mind numbing work."

"Isn't that why they pay by the pound?"

She chuckled, motioned to the spare chair. "Have a seat. What's up?" She sat down across from him, hands folded on the wood of the desk, neatly framed by piles of papers on both sides.

"You tell me. I've had some of your research subjects in my office this last week. Some of them are kind of a mess."

"Oh?"

"Feelings of violation. Loss of self-esteem. Something happen in the Scape last week?"

"Ah." She nodded thoughtfully. "I didn't think Scapers would be so upset. I'm glad they had the sense to go see you."

"I'm sure they're not all coming to see me and that's part of what worries me. So what happened?"

"They're calling it the Doppelganger Incident."

"Yes, I've heard a bit about it. Persona destruction?"

"More or less."

"I can understand disappointment, but this? I've seen students with depression, paranoia, flat affect, and general disorientation. It's a cyberspace, yes? A game, yes?"

She gave him a wry smile. "Not exactly, Justin."

"Whatever it is, this isn't the first time it's done something like this. What about when you had that Jesus Christ construct? I had people at Student Health questioning the faith they'd depended on their entire lives. There was even a fight among demonstrators out in front of the computer science building, wasn't there?"

"Yes."

"I don't mean to be rude, Deborah, but can't you do something about this?"

"Me?" She smiled. "A number of things have been suggested, you know, and not all of them polite. But we try to take a hands-off approach. We feel it's best for the research."

"The research," he repeated. "What about the students?"

She gave him a curious look. "Is it our job to protect students from the experiences that they themselves choose to seek out? No one is forced to enter the Scape. People—students, faculty, and outsiders—all do it because they want to. They line up to get into the labs, Justin. Sometimes they wait an hour for an open lab. 'Pursuit of happiness?' Remember that?"

Justin snorted, reached into his pocket and pulled out two silver balls which he put into his right hand and began to rotate. The balls helped him focus, kept his hands busy, and reflected the world in an interesting, curved sort of way. "Then perhaps we should have places where people can dismember kittens, too. For the pursuit of happiness, of course."

"That's an old argument. Slasher dramas and snuff films. But it's not society's dramas that are dangerous, it's the mind that takes a fantasy to an unacceptable extreme with real people. Whatever the entertainment media, we can only generalize when we examine how people respond to what they see. And the Scape is even a purer reflection of people's fantasies and dreams than the media that gave us slasher dramas. Is the human mind itself to be proscribed?"

Justin shook his head. "If you encourage people toward violence, you shouldn't be surprised when they enact violence on each other."

She smiled. "I struggle with these issues, too. We get dozens of complaints every week. I've come up with a standardized complaint form. Outside my office is a stack of them and there's one in my web page." She opened a drawer, pulled out a thick folder of papers. "Here's the dead tree pile. Care to take a look?"

"I'd be interested in a summary."

"They fall roughly into three categories: religious objections, obscenity, and 'other.' Satan showing up in the Scape, for example. Someone complained that he was doing something 'disgusting and immoral.' Imagine that. But Satan's a very popular construct, and that popularity keeps him vital. As for obscenity, there's this walking orifice creature who does disgusting things, with anyone, anything, and itself. All at once, if possible.

"Then there are what I call personal complaints. Mostly of the form 'he hit me, so I flattened his city, and now he and his friends are holding my queen hostage, and it isn't fair.'"

"These are all adults?" Justin asked.

"All adults. At least chronologically," she added with a grin. "I refer them to the waver. If they give me more grief, I tell them that since the Scape is a perfect

democracy, they should take their case to the people. That usually works."

"What do you mean, a perfect democracy?"

"In the Scape, attention is the only real currency. As you look at things, you change or reinforce them, or both, while the things that are ignored get less and less of ALICE's resources. Everyone votes, whether they intend to or not, just by being in the Scape. As long as we keep minors out of the Scape and keep the grant investors happy, the Scapers pretty much define the place as they like."

"So this 'Doppelganger Incident' . . . ?"

"Sometime before last week, someone in the Scape made copies of what I'll call the 'major players.' Those who have houses and followers and so on. The popular ones, who get the most attention.

"Major players. I follow."

"This Scaper, whoever it is, and we still don't know, made a duplicate of these major players in the Scape. Mostly visual duplication—mannerisms and voice and all the other subtle cues are going to be way off, since that's the sort of information ALICE picks up from the participants themselves, rather directly, through the SQUID helmets."

"SQUID helmets?"

"Superconducting QUantum Interference Device. The helmets provide data from the brain's magnetic field, which ALICE uses to build her knowledge base. There's a lot of information that goes into building the subtleties of how a persona moves and acts, tone, posture, and so on. It's hard to mimic that. So the constructs could move around a bit, if directed to, but artificially. Like animated mannequins."

"Like moving photos?"

"Pretty much. And then, at the Tea Party—the weekly blow-out gathering at the Rabbit Hole, all the doppelgangers show up, all at once. They start walking around, stiffly at first, but—since everyone is watching them and hence feeding ALICE their expectations about how the originals would and should move—before long the constructs are acting more and more like the originals. Essentially borrowing from the realism that each major player has spent so long building into their persona. Then each of the doppelgangers seeks out its original.

"So far what the Scaper has done is arguably rude, but it isn't worse than any other acts of attempted impersonation, or any of hundreds of other generally offensive images that are explored in the Scape every day. That's important to understand."

"The Scape is a free-for-all. I follow."

"You have to remember that ALICE keeps private information private, so anything that an entity does in private stays that way. But now, at the party, nothing is private, everyone is there, and all of the major players are faced with their own doppelgangers. It takes them by surprise. Some get angry. Others laugh.

"The doppelgangers mimic their sources. But it isn't simple mimicry—they also intersperse the mimicry with the original's most common poses—you might call them physical clichés—which our Scaper has apparently collected along with the basic forms. Had it been simple mimicry, I think it would have faded fast, because people are used to looking into mirrors. But mix mimicry with a few original actions, however few—mix it with the power of expression, of anger, or pain, or sorrow, or lust, and people start to react to their own images. And once they do that—"

"They reinforce their own doppelgangers."

"Exactly. The Scaper would have to have done some work with all the doppelgangers, giving them a few common phrases to adopt, teaching them to mimic. This wasn't something he or she did a few days before. It might have taken him weeks to set this all up."

"So what was he trying to do?"

"Hard to say. He might not even have thought past this point." Deborah shrugged. "An experiment. It would be hard to imagine that anyone could have guessed what would happen."

"Which was . . . ?"

"What do you think happens when you look at your own image, and no matter what you do it mocks you, looking like you but not acting like you, and worst of all, clearly not under your control. You, and not you, both at once?"

"Frustration? Uncertainty?"

"That and more. Remember that these are persona images, which are not as firmly ingrained in the minds of Scape participants as their own faces would be. But they're not far off. As it turns out, most Scapers have persona faces that reflect their real world faces, though the similarities are usually subtle enough not to be noticed. So it's a little like having your image in the mirror talk to you, which is not something people respond well to."

"So what happened?"

"Some Scapers fought their doppelgangers. Some refused to fight and quit the Scape, which left observers uncertain about whether it was the original or the copy who remained. In those cases, the watchers subconsciously gave ALICE enough information to help the doppelganger act more and more like the original. Close enough to confuse, but not close enough to reinforce, so when the originals came back, they were met with skepticism, and they had trouble getting people to believe in them again, effectively destroying their persona in the Scape."

Justin made a thoughtful sound. "Their persona's credibility was undermined."

Deborah nodded. "Those who stayed and fought tried to break down the plausibility of their copies, using the tricks of Scape warfare, which basically come down to, well, gathering the right kind of attention. One woman, Madri, began to dance. She has long hair that changes color and moves independently of her—impressive detailing. She's known and admired for her erotic dances, so she got lots of attention fast—currency, remember? Her doppelganger tried but couldn't follow the dance, and it was immediately clear which was the real one. That gave her enough of an edge to destroy her doppelganger.

"But most of the major players couldn't manage to convince the watchers that *they* were, beyond doubt, the real thing. Time was the enemy because the imitation gained truth value with every passing moment. All the doppelganger had to do to win was to keep surviving, letting its existence be reinforced by the familiarity of the well-known player. For the original to win, he or she had to *disprove* the construct. Much harder. Make it seem clunky, give it attributes it couldn't shake, make it seem less real. More cartoon-like. That didn't always work. One Scaper tried to put enormous ears on his doppelganger, only to find his own ears likewise enormous, because people just weren't sure which one was the original."

"I can see how this would all be pretty demoralizing."

"Yes. Some Scapers began to loose faith in their own ability, their competence, because they could no longer seem to control their presentation in the Scape. Once they lost that faith, they'd lost the battle, because ALICE uses belief to create the consensus reality.

"The worst cases, though, were the ones where the Scaper began to actually mimic the *doppelganger*. We're still not sure why that happened. Perhaps the feedback loop produced a trance-state of some

"I had one of those Scapers in my office. He says he's never going back."

"I'm sorry to hear that."

"I'm not. So how long did this battle stuff last?"

"About ten minutes for the original interaction."

"Ten minutes? Is that all?"

"A lot can happen in ten minutes. Most doppelgangers and their sources separated. Some originals quit, or went somewhere else in the Scape, which left the doppelganger with the freedom to become the original's replacement. The few who neither fled nor overcame their copies as Madri did, ended up settling into patterns of expression and change, locked into cycles with their copies. Finally the audience saw what was going on, stepped in and broke the pairs apart."

"It took them that long?"

"The Scape population is rapidly expanding, so many Scapers are newcomers. And how do you tell if something is a battle or a show? That's an ambiguity that is a reoccurring theme in the Scape because there just isn't that much difference between a good battle and a good show. You need attention to fuel both. The audience definitely fueled this one in a big way."

"And then what?"

"Well, the doppelganger constructs had been given such a high level of attention that they became persistent constructs. That is, they hung around afterwards because people believed in them. Their existence was reinforced by those who knew the major players as familiar images, even those Scapers who hadn't been at the Incident. You see the catch?"

"The more the duplicates were seen, the more like the originals they seemed."

"Yes. Some Scapers who were really desperate to keep control of their personas committed Scape-suicide, destroying their own personas in public ways. They reasoned that people would not believe in the doppelganger's existence if they believed the persona itself to be dead. It worked, more or less, but at a high cost—if you destroy your construct convincingly enough to make the doppelganger vanish, you've also made your own construct vanish. You can't just return from the dead. The image of your demise is so clear in watchers' minds that they destroy you without intending to every time they see you."

Justin sat back, exhaled. "Which explains a lot of the sense of loss I'm hearing about. Deborah, something here bothers me."

"What's that?"

"For young children, reality is very plastic. They don't distinguish well between dreams and reality, between themselves and others. They cry and then there's food—the world is one single system. Even older children imagine that other people's views of them affect them directly, so that, for example, if enough people don't like you, you'll turn into a monster. It seems to me that this is exactly what's happening in the Scape. It's a child's reality."

"That's one way to look at it."

"Your Scape convinces the user's unconscious mind that the fears and beliefs of childhood are real. You're snapping people back into childhood emotional responses, pushing them back to a developmental stage where they cannot perceive causal relationships between themselves and others."

"All sorts of responses are possible in the Scape, Justin. It's a research environment that deals with the very flexible human mind."

"But, Deborah, we've evolved to live in *this* physi-

cal world, where what we do affects objectively-measurable reality. One of the ways we separate adults from children is that adults distinguish the effects that others have on them from their fears of those effects. That they see the difference."

"'Sticks and stones may break my bones, but names . . .'"

"Exactly."

She considered for a moment. "We may have evolved for this physical reality, as you say, but there are many kinds of evolution. The evolution of the mind can, perhaps, go farther."

"It's already gone somewhere. As adults, we're prepared to deal, awake, with *this* world. The Scape puts us in a child's nightmare reality. That's a step backwards in developmental evolution."

"Maybe it could be a forward step, too."

"I think it's a dangerous step. I think it puts people in a profoundly vulnerable psychological state. Obviously it hurts people—it just did."

"Dangerous, you say?" Deborah laughed a short laugh. "When I was an undergrad, I began to believe that the best kind of research was the most dangerous kind. Scientists shouldn't be too comfortable or they stop making new discoveries. So much of university research is so sterile, so safe. ALICE, though—"

"Safety has a lot to recommend it. Especially when you're dealing with people."

"Of course. But evolution has never been safe. Should we stop evolving? Stop discovering? And what could be more dangerous than the evolution of the mind, of consciousness itself?"

"I'm not convinced that it is evolution and not devolution."

For a long moment Deborah looked at him. "So how are you going to decide?"

"What do you mean?"

"Or have you already decided? You seem very sure. You say the Scape is bad for people's minds and destroys their abilities to operate in the real world. That there are no benefits worth that risk. You know, you would have plenty of company with the fundamentalists who say the Scape is the work of the devil."

"That's a low blow."

She shifted forward. "Then maybe you should try it yourself. Make up your own mind."

Justin was already shaking his head. "I don't need—"

"Raw data? Rather have second-hand data?"

"Excuse me?"

"Here's the thing, Justin: the Scape allows interaction between people's personal—and subjective—views of reality. ALICE tries to make those views objective by forcing people to share what they create. But all you have now, sitting here with me, is second-hand knowledge of some very complicated, interacting systems. If you want to see firsthand what the Scape does to a mind, you're going to have to go in and try it yourself."

The silver balls in his hand were still. "You make a persuasive case."

She laughed. "I've had a lot of practice recently."

"Am I the only one reluctant to enter this crazy Scape world of yours? Everyone else seems so enthusiastic. All but one of my students is talking about going back, despite the obvious discomfort and pain it causes them."

"You're not the only one. Those who don't want to try the Scape are pretty quiet about it. I think people are embarrassed to admit that they aren't entirely at ease seeing what their minds can come up with."

"I'm not convinced it's so healthy to do that."

"Early last century they said the same thing about motorcars going faster than thirty miles an hour."

"And they were right."

She laughed. "But then how do you get anywhere? Even the commuter rail goes faster than thirty miles an hour. Every now and then, that is."

"On a clear day," he grinned back. "But I see your point."

"Which is?"

"You're calling me scared." He blew out a long breath between pursed lips. "And I'm not so sure you're wrong."

She was silent as he turned the silver balls in his hand. In the reflection of the curved balls his face was surrounded by her office and everything in it—desk, bookshelf, pictures on the wall. Everything curved around his face like a frame. There was, he told himself, a lot to be said for the reality that you knew best.

"And then there's adventure," he said softly, "Okay, I'll try it."

"Adventure," Deborah said, smiling. "Isn't that how we evolve?"

The Elephant and the Net Cruiser: Regulating Communication on the Net

Lisa Mason

The Way You Think . . .

"The way you think about things shapes the way your reality is." Ruby Maverick, a character in my novel, *Summer of Love*, says that when she challenges a far-future time traveler to examine the assumptions underlying his ontology of spacetime. The concept could very well be applied to recent attempts by the United States government to censor speech on the Net.

I'm honored to submit this address to the Library and Information Technology Association. In 1992, I attended the American Library Association conference in San Francisco where I heard presentations by Hans Moravec, Bruce Sterling, and David Brin at the LITA President's Program. Among other things, the discussion then raised the issue of censorship of speech on the Net, but focused more on the censorship implicit in the commercialization of cyberspace, the increasing dependence of university libraries on funding from big business, and the domination of the public's attention span by a dwindling number of hugely powerful arbiters of taste.

When talking about big business, I've developed Neil Postman's wonderful term "technopoly" into my own buzzword, "the technopolistic plutocracy," and I think librarians and academics should never waver in their vigilance against encroachment by the technopolistic plutocracy upon the intellectual integrity and experimentation that have been the benchmark of scholarship in the United States. Now, three years later, censorship of speech on the Net is still an issue of vital concern. Today I want to shift the focus from the censorship implicit in technopolization to a nasty and quite explicit piece of proposed legislation in the U.S. Senate known as the Exon Bill.

The Exon Bill: What Is the Senator Thinking?

The Exon bill mandates that anyone using a modem who makes, transmits, or otherwise makes available any comment, request, suggestion, proposal, image, or any other communication that is obscene, lewd, lascivious, filthy, or indecent will be subject to up to two years in jail or $100,000 in fines. The Senate has just passed the telecommunications deregulation bill, of which the Exon bill is a part, and observers believe that the House is likely to pass some form of the bill, as well. Similar bills have been proposed in New Zealand and Singapore, so Senator Exon is not alone in the effort to mandate morality on the Net.

The way you think about things. . . Listen to enthusiasts of the Net and you would conclude the online experience is the most exciting intellectual development since, say, the Renaissance. Mike Godwin, online counsel for the Electronic Frontier Foundation writes, "For the first time in history we have a many-to-many medium in which you don't have to be rich to have access and in which you don't have to win the approval of an editor or publisher to speak your mind. UseNet and the Internet. . . hold the promise of guaranteeing for the first time in history that the First Amendment's protection of freedom of the press means as much to each individual as it does to. . . the *New York Times*."

The way you think about things. . . But what if extremist anti-government militias use e-mail to distribute hate speech, together with instructions on how to make a bomb? What if sexually explicit materials of questionable literary value are distributed over a network maintained by a distinguished university library? What if a university student broadcasts on a bulletin board a fictional account of a violent assault using a fellow student's name? What if publishers located in Finland distribute in Iowa computer-generated graphic images simulating child pornography? What if your ten-year-old daughter is cruising the Net looking for information about koala bears and she stumbles onto the *Penthouse* Web site? What if your eleven-year-old son is cruising the Net and he's looking for the *Penthouse* Web site?

Well, several of these scenarios have actually happened, and the others may be disturbing. I'm pretty confident no opponent of the Exon bill would argue that you shouldn't be concerned about exposing your child to materials you deem inappropriate for him or her. I'm fairly certain there are opponents of the Exon bill who have little interest in smut and who themselves never ever go to the *Penthouse* Web site. I'm quite sure most opponents of the Exon bill neither endorse hate speech nor approve of that university student's pathetic attempt at fiction. And I'm positive your child can go find your issues of *The New Yorker* in the magazine rack right next to *Scientific American* for some pretty sizzling short

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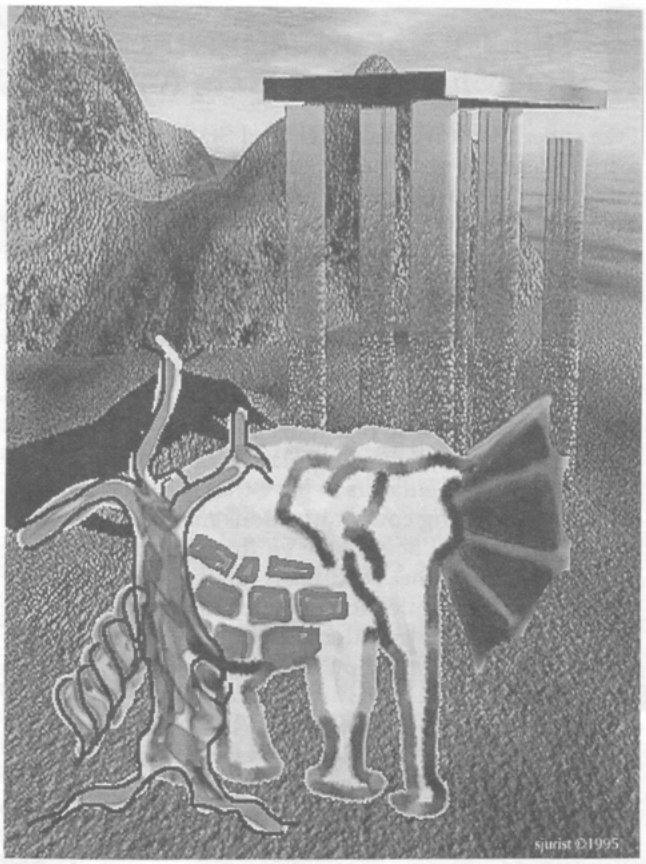

stories by Mary Gaitskill or Jamaica Kincaid far more easily than he or she can turn on your computer and access adult bulletin boards wallowing in obscenity.

Of course, you have to determine whether a communication in question is obscene, and we generally assume that stories in *The New Yorker* are literature. On the other hand, one reader's obscenity may be another reader's *Ulysses*, *Lolita*, "Howl," or "Love Book." Lest anyone think that the seizure of books is a relic of autocratic zeal half a century ago, remember it was the late sixties when Allen Cohen, the editor of the *San Francisco Oracle*, was arrested and jailed for distributing Lenore Kandel's poetry on San Francisco streets for ten cents a book.

It really does get down to the way you think about things, and I can think of at least five fundamentals that cybercops, cyberlibrarians, systems administrators, and especially senators should contemplate before they decide how they're going to shape the reality of the Net. The first two fundamentals speak to the ontology of the Net, the third and fourth address existing regulation of communication, and the fifth goes to us, we the people.

THE FIRST FUNDAMENTAL Globalism Defies Traditional Notions of Jurisdiction

The first fundamental turns on the sheer global nature of the Net, which defies traditional legal notions of jurisdiction. This nonlocality may be a delight to net cruisers but is clearly a bane to the like of Senator Exon. Perhaps tiny Singapore, whose government cares little for civil liberties and also controls the island's only Internet gateway, may be able to clamp down on "obscene" or other "subversive" materials there, but the United States government and other governments in the global village will be hard-pressed to enforce such control.

The sheer ontological problem of the Net is that traditional legal notions of jurisdiction don't easily fit. Traditional jurisdiction is defined as the authority by which the court may take cognizance of a case, the power a court possesses to compel parties to appear before it, or a court's power to render judgment over specific subject matter or a specific person. But the "store-and-forward" nature of data distribution on computer systems means that data may exist on a system at some point in time (or place) even though the data did not originate there and will not ultimately end up there.

Attorneys have already careened full speed into the problem of jurisdiction in the Thomas case, in which systems operators based in California were tried and convicted in Tennessee when a postal inspector in the latter state downloaded images from the sysops' bulletin board. The court found that the images were obscene under the community standards of Tennessee. The Thomases are appealing because the images would not have been considered obscene under the community standards of California.

"Where" were the images, exactly, before the postal inspector pulled them down, and which community standards should prevail? If you decide that the community standards of the physical location where electronic data is ultimately downloaded prevail, then everyone everywhere who uploads anything on the Net will have to conform to the standards of the most conservative and restrictive jurisdiction to which any data could possibly end up—or face potential criminal prosecution of the most serious kind.

If anyone is worried about our proper sister state of Tennessee, what about Singapore? What about Saudi Arabia? How about Beijing? Or Iraq?

Such a scheme is not only unconstitutional, it's an administrative nightmare. It just won't work.

THE SECOND FUNDAMENTAL
The Elephant and Your E-mail

Remember the parable of the elephant and the four vision-challenged people—also known as the four blind men? Each blind man touched the elephant on only one part of its anatomy. Since the elephant is a huge beast and each man is comparatively small, each blind man conceived of the elephant according to his sensory perception of that one part. The elephant was either a rope, a brick wall, a tree stump, or a big, leathery fan depending on whether the man touched the elephant's tail, its ribcage, its leg, or its ear.

The Net is a lot like that elephant. At times, the Net functions as a one-to-one medium, sometimes as a one-to-many medium, and often as a many-to-many medium. E-mail is sort of like the postal system and sort of like the telephone system. Bulletin boards and newsgroups are sort of like talk radio. Some commentators compare the World Wide Web, where companies and others display commercial information, to a magazine publisher or perhaps a newsagent. Software archives and electronic libraries are a lot like traditional publishers or traditional libraries.

Would you tolerate it if our government could and did open every piece of mail or wiretapped every telephone call to make sure you weren't sending or receiving something obscene under who knows what sort of community standard? Essentially that's the modus operandi of the Exon bill.

The American Civil Liberties Union has stated that it "would most like to see the method of constitutional analysis . . . closely track that applied to the phone system, where censorship is essentially nonexistent, anyone can talk to anyone else, and there is a requirement of universal service. This would be preferable to that applied to cable TV where censorship is more common, all information flows in one direction from the cable company to the consumer, . . . and service is less universal."

Hopefully, the Exon bill notwithstanding, the future of the Net will lie closer to the elephant and the blind men. The moral of the parable is that none of the blind men understood what an elephant really is because none of the parts described the whole beast. So, too, with regulation of the Net. Regulation of the whole cannot be governed by regulation suitable for just a part. And we must find the appropriate analogy for each of those parts.

THE THIRD FUNDAMENTAL
Free Speech Isn't Free, Anyway

Free speech isn't free in the United States. Myriad laws already regulate seditious speech, libel, and obscenity. A sale may be fraudulent regardless of whether some huckster makes it through the mail, in cyberspace, or at your front door. Threatening to kill the President is illegal whether you do so through the postal service or in cyberspace. Conspiring to make bombs or distribute information about making bombs will surely win the attention of the FBI whether you use the Net or not. A harassing phone caller can be legally enjoined. Every medium through which ideas are distributed or communicated is subject to some regulation of content.

Some commentators believe that the various existing laws regulating communications may be adapted to interactive media. Some believe that the nature of the Net undermines the very basis of some regulations, rendering their application over broad.

For example, traditional libel law is grounded in the nature of traditional publishing, a one-to-many medium of communication, and addresses the typical inequality between the libeler and the victim. But in a many-to-many medium like the Net, victims of libel may far more easily provide an effective rebuttal that will reach as wide an audience as the libeler. Considering the policy of libel law, then, there are less compelling reasons to hold a systems operator to the same standard of liability as a newspaper publisher. And considering again the nature of that fabled elephant, it seems absurd to hold an online service to a standard applicable to a publisher, who edits everything, when a service may more appropriately be characterized as a common carrier like a telephone company, that doesn't regulate content at all.

And obscenity law? As we saw in the Thomas case, the traditional constitutional test for determining whether a communication is obscene turns in part on an application of "local community standards." The policy behind the community standards test is that what is acceptable in New York City, San Francisco, or Chicago should not govern what is acceptable in Memphis. But the converse is true as well as well: what is acceptable in a small conservative community cannot constitutionally narrow the standard of what is acceptable in Chicago.

Clearly, we need to examine whether the traditional laws governing communication are constitutionally sound when applied to this new medium.

THE FOURTH FUNDAMENTAL
Free Speech Isn't Always Pretty

Free speech isn't free in another way, too, and the cost may be tallied in emotional distress. The principle of free speech permits not only minority political opinion, but also speech that may be provocative, outrageous, juvenile, mean, or downright ugly.

I don't just mean the phenomenon of flaming, but incidents such as the university student I mentioned above who uploaded a fictional account of a violent assault using the name of another student and the discovery of personal insults on a men-only online conference at a West coast junior college. The student has been arrested; the online conference has been subjected to a "code of conduct" imposed campuswide and has recently been shut down.

These incidents are part of a disturbing trend in the scholastic community to impose "speech codes." It's quite true that the online speech involved was odious. I can understand that the policy driving speech codes and the desire to censor bigoted and sexist speech on campus are decent and good-hearted. Speech codes are intended to prevent harassment and spare victims' feelings. I'm not unsympathetic to good intentions. Harassment, like libel and obscenity, is legally actionable. Personally, I wish all the jerks of the world would grow up. Maybe they could stand to have their mouths washed out with soap.

But constitutionally you cannot throw the jerks of the world in jail or turn off their bulletin board for having foul mouths. And emotional distress, however painful, cannot override the constitutional protection of speech, however nasty. In the end, speech codes amount to impermissible censorship and must be challenged.

Offensive free speech may not encourage tolerance, but it does educate us about pluralism. It does put you on notice of just what you may be up against. And who knows; a brilliant comeback to a small-minded bigot may actually teach the bigot something. We can hope, anyway. The principle that "the way you think about things shapes the way your reality is" is intended to encourage everyone to face the facts, however ugly, and discover your own truth.

THE FIFTH FUNDAMENTAL
Human Nature and Democracy

The way you think about human nature will shape how you think human beings should be governed. The autocrat assumes that human nature is essentially weak, stupid, and easily manipulated. Thus, the autocrat seeks to control from above, to protect us from ourselves. By contrast, the basic assumption of democracy and the Constitution is that we human beings are essentially strong, intelligent, and capable of thinking for ourselves. We're especially capable of thinking for ourselves when we're fully educated and informed, when we're exposed to all sides of an issue. That's exactly what the First Amendment is designed to ensure.

Because the nature of the Net is a decentralized, many-to-many medium—a remarkably democratic medium—it would appear to be far more effective to empower net users to protect themselves rather than impose intrusive governmental regulation from the top down. The nature of the Net is consonant with the democratic view of human nature. The Net doesn't push content at consumers in quite the same way that television, movies, and radio do. Instead, consumers exercise their ability to think for themselves because they pull content out of the Net at will.

Let's enhance that control, not debilitate it.

Fortunately, some legislators and private developers have recognized this. Senator Patrick Leahy of Vermont has proposed the "Child Protection, User Empowerment, and Free Expression in Interactive Media Study Bill" that specifically aims at empowering the user to control commercial and noncommercial information received over interactive telecommunications systems. And just to show you how fast things are moving in this area, as of June 27, charges were dropped against the university student I mentioned. As of June 28, Newt Gingrich himself has stated he does not support the Exon bill because he believes it is unconstitutional.

It seems to me that parents concerned about who their kids are chatting with have *got* to be the ones who monitor those chats. So far, I've heard of two home censorship programs, KidAccount in Sacramento, California, and SurfWatch in Los Altos, California. Other programs enabling private imposition of censorship based on purely personal choice are sure to be swiftly developed. If censorship has got to be imposed somewhere, I'd much rather it be imposed in *your* home—not in your home *and* my home *and* everyone else's.

Just as educated voters are enlightened voters, so empowered net users are protected net users. Reality may not always live up to theory, but that's the democratic ideal. I think it's an ideal worth defending as we speed into the digital future.

The Internet as a Commons

David Brin

Back in the European middle ages, before the enclosures of the sixteenth through eighteenth centuries, there existed in England and several other kingdoms vast tracts of territory called "common lands." These were fields and pastures which no one owned, left open by tradition for use by all responsible citizens of the neighboring community. Over time, unwritten rules of courtesy and sharing evolved, sometimes enforced by a feudal lord, but more often mediated by consensus among the farmers and herdsmen themselves.

In an influential academic study, *The Tragedy of the Commons*, Garrett Hardin described what happened when the medieval order began breaking down. A combination of increasing population, improved farming technology, and accelerating commerce put ever-greater pressures on the communal land. It began occurring to some individuals and groups that they might gain substantial personal benefit by grazing their herds on the commons until every scrap of greenery was eaten. Water was diverted. Trees were felled and lumber taken without the earlier, cautious, forest-tending techniques of coppicing.

In other words, the logic of competition had arrived. Since it wasn't your land, you did not directly benefit from its wise management, so your short-term incentive was to use up the common-but-unprotected resource as quickly as possible, before anyone else could. Nor is this the only example out of history. Lessons learned from Asia and the Americas are not too dissimilar. A more recent case is the continuing giveaway of federal lands in the western U.S. under hundred-year old mining laws. Companies are still known to pay pennies on the acre, plunder a region of its minerals, and then depart leaving only spoilage and detritus in their wake.

Although one should always be careful in using historical metaphors, the parallel with today's internet is striking. In the strictest sense, all of the Net's parts and components belong to somebody—much of it to the federal government—but for all practical purposes nobody controls the present system.

Some official groups, such as the National Science Foundation (NSF) exercise partial sway over decisions having to do with major infrastructure—the fiber optic web and the switching yards called Network Access Points (NAP). In order to achieve standardization of technology, the Internet Engineering Task Force (IETF) mediates and exchanges ideas, seeking consensus among major users. Countless commercial and private bulletin boards restrict entry into their own sections of cyberspace to members only, just as some parts of the country have private or toll roads. Nevertheless, the macro entity of the Net itself has grown far too diverse, with too many alternate pathways, for anyone to justifiably claim any real dominion. As those Stanford feminists found out, today's Net operates as a collective virtual frontier through which anyone may roam doing pretty much as they please, so long as they have a port of entry.

To some far-seeing thinkers, an analogy with the medieval commons falls short of adequately describing the blithe chaos of today's burgeoning data networks. After all, information can be duplicated endlessly and for free, a trait not shared by pasture or farmland. According to futurist Bruce Sterling:

> The Internet's "anarchy" may seem strange or even unnatural, but it makes a certain deep and basic sense. It's rather like the "anarchy" of the English language. Nobody rents English, and nobody owns English. As an English-speaking person, it's up to you to learn how to speak English properly and make whatever use you please of it (though the government provides certain subsidies to help you learn to read and write a bit). Otherwise, everybody just sort of pitches in, and somehow the thing evolves on its own, and somehow turns out workable. And interesting. Fascinating even. Though a lot of people earn their living from using and exploiting and teaching English, "English" as an institution is public property, a public good. Much the same goes for the Internet. Would English be improved if the "The English Language, Inc." had a board of directors and a chief executive officer, or a President and a Congress? There'd probably be a lot fewer new words in English, and a lot fewer new ideas.[1]

While Sterling's allegory is enthralling, it may be too blithe in its basic premise—that our information networks consist only of information, the abstractions of words and data. Equally important, and binding this

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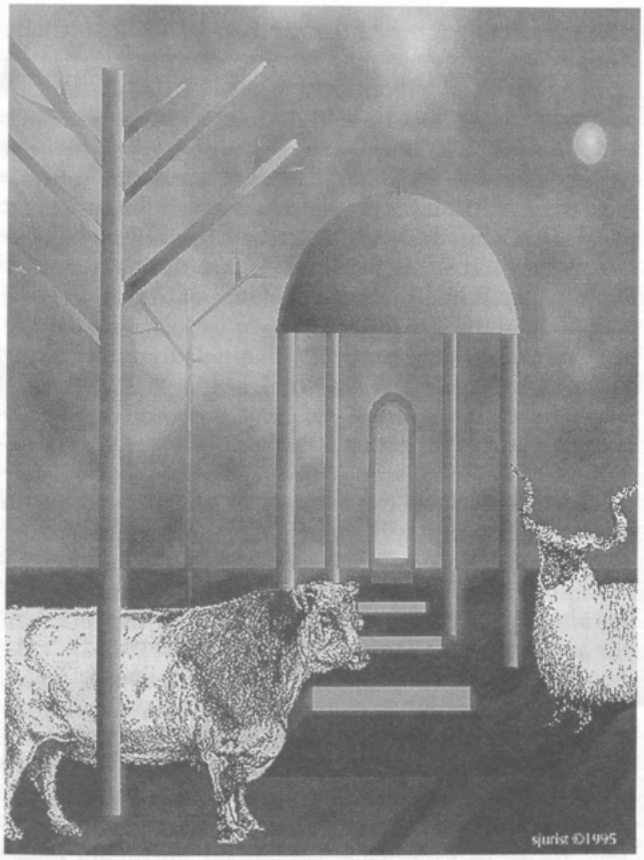
As a scientist, Brin was a fellow at the California Space Institute. More recently he has been a research affiliate at the Jet Propulsion Laboratory and has participated in interdisciplinary activities at UCLA's Center for the Study of Evolution and the Origin of Life. He now lives in San Diego County with his wife, two infants, and about a hundred very demanding trees.



new realm to the pains of the real world, are the pieces of hardware, the fibers, cables, switching yards and nexus points of silicon memory. These are the equivalent of gates, fences, and flowing streams. Today, a kind of chaos does, indeed, reign across fields of throbbing electrons, allowing individuals to ramble across continents under only the loosest of regulation. But can chaos last long when vital pieces of the whole can be owned? Here the parallel with language breaks down.

Like the medieval commons, the electronic realm emerged not out of some grand scheme or design, but from step-by-step evolution of makeshift techniques and trade-offs arranged by a relatively small number of "neighbors" ... the well-educated, highly motivated Brahmin classes of academia, the military, and government research centers. One might even picture this miracle sprouting out of the new computer technology without anyone seeing the big picture—what was being born—but I suspect that image oversimplifies things quite a bit.

In fact, this burgeoning of a new world was aided and abetted by some of the smartest and most influential individuals on the North American continent—vice-presidents of research for major corporations, generals and admirals, heads of foundations and agencies, professors, deans, and Nobel laureates. Surely most of these people were aware, while authorizing funds for the creation of data nodes and capacious information pathways, that the routes they were laying down would be used for more than just the exchange of research data. From the start, scientists, engineers, and bearded UNIX-junkies used the embryonic Internet to exchange birthday greetings, gossip, cartoons, short stories, political opinions, social commentary, quirky ideas, and proposals for ways to make the network even more wild and free.

The big-wigs in charge faced a critical decision. On the surface, they were suffering a small but steady drain of resources toward "frivolous" pursuits and interests. They could have clamped down, as Germany and several other countries have indeed done, reigning in the disorderly mob, establishing firm rules and oversight procedures, enclosing most of the fields and pastures of cyberspace into tidy, fenced-off, accountable territories.

Perhaps it's worth noting for the record that this is not what the network-backers of the nineteen-seventies and eighties did at all. Instead, they willingly let their institutions—their universities, companies, and agencies—"tithe" a steady subsidy for irrelevant, extracurricular, impractical, unprofitable, flippant, and even trivial excess uses. This hidden allowance, this stipend for chaos, was embraced by a cabal of individuals who collectively defied the prosaic image of mean-minded bureaucrats by looking beyond the short term, watering and tending a crop they could but dimly perceive.

Don't expect them to get any credit. The stereotype is too deeply entrenched for their kind ever to be perceived as far-sighted or generous. To their credit, I doubt many of these men and women even care about that. Many are making oodles of money, congratulating themselves over their earlier vision. Others are simply as enthralled as the rest of us by the new world they helped create.

Today the Net has become a truly international commons, one growing at phenomenal rates. The enthusiastic millions now signing up are no longer intellectual aristocrats. They include people from all walks of life—high school teachers, building contractors, journalists, even ambulance-chasing lawyers. From this perspective it is easy to see inevitability in many of the events people are getting so worked up about—flamers, impertinent "free" advertising, child-porn interest groups, FBI "clipper chips," overstrained data nodes—all symptoms of conflict among the countless centrifugal needs and desires of contemporary society at large.

Already there are widespread calls for order, for organization and structure, for legislation and a bureaucracy to enforce rules of the road for the coming

Information Superhighway. The Taxpayer Assets Project (TAP), founded by Ralph Nader, is one of many on the Net calling out alarums over plans by the National Science Foundation to consider a change in pricing structures, so that users would pay for each second they dwell within the cybernet domain, and for each kilobyte of information they send or retrieve along the expressway. Those protesting raise valid points about the difficulty of enforcing such rules. They declaim a threat to privacy whenever some authority starts tracing user identities, keeping detailed logs of who accessed what. They point out that today many local net libraries and servers send out torrents of valuable data free to all who request it, but those sites might have to shut down if such benevolence turns into a fiscal hemorrhage in a system where the sender always pays.

Finally, the protesters denounce what they see as an approaching end to one of the great empancipatory events of modern life, the opening of an untamed, open range, a frontier with possibilities as fertile and hope-filled for its settlers as the Old West was to a prior generation.

Deep down, what they fear is a threat to liberty.

So what if this independence, this sovereignty they now enjoy, is newer than the youngest Net user, a surprise gift few dreamed of, as recently as ten years ago? It is a fact of life that any liberty, once enjoyed, swiftly becomes essential, a requisite as vital to happiness as food and air.

Are we about to see another "tragedy of the commons" on a vastly greater scale? Ask any of the dour pessimists who dwell in electronic discussion forums the way earlier generations of cynics used to mutter warily in smoky coffee houses, unsurprised by any depths society might plunge. To them, Garrett Hardin's scenario is already unfolding, only this time over a span of mere months, rather than the centuries it took in post-feudal England. Indeed popular cyberpunk books and films project tomorrows that have more in common with Dickensian nightmares of the nineteenth century than the supposed innocence of a Saxon village—bleak tales of stalwart individuals struggling for niches between gray, faceless mansions of unassailable power. Realms dominated by vast, corporate entities that have parceled out the territory of data-space, erecting a maze of fences, walls, and for-profit channels that only a few brave, clever souls dare infiltrate, at great risk.

These are disturbing visions. Some of them may even come true, if history is our guide.

On the other hand, I see no reason why history should recapitulate. The analogy to long-ago events in feudal England may be apt as a thought-provoking warning. But the info-network has traits that go far beyond simple parables about medieval farming villages, and we are a more knowing, far mightier folk than our ancestors ever were.

It strikes me as possible at this date to think, argue, innovate, compromise, and think some more . . . until a way emerges to make this dream something greater and more startling than ever. Something diverse, free, and immune to the tragedies that ruined other "commons" in the past.

Reference

1. Bruce Sterling, *Magazine of Fantasy and Science Fiction*, February 1993.

Problems in Information Transfer in the Age of the Computer

Murray S. Martin

Access to information, whether printed, oral, or electronic is basic to the making of choices for living. Yet the complexity of the information world, seemingly inherent restrictions, and the overwhelming amount of information available almost ensure that no-one can ever have ready access to all the information needed for those choices. Information technology promises wide access, yet it also plays a role in screening what is available.

What Is the Future?

What does it matter if information is restricted? Those who are willing to pay will always be able to have access. This elitist attitude is, I posit, directly opposed to such social goals as equality and wide participation in the democratic process. No-one can expect all information problems to be solved, but any resolution aiming at producing a functionally democratic world should be based on two premises.

First, artificial constraints on information access, except for the right to privacy, should be reduced to as few as is economically possible. Control of that access should not rest with any elite, no matter how well intentioned, since this directly opposes one of the goals of society: self-actualization. No one can pretend that providing the means for self-actualization will ensure that everyone will take advantage of the opportunity to achieve that state, but the premise is that no-one should be artificially thwarted in such a pursuit. The costs of that deprivation are, in the long run, far greater than the costs of ensuring personal freedom. There is an analogy here with the cost of preserving the environment, also under attack. If it is not paid currently, it will have to be paid later, at a much higher cost.

In addition it should be borne in mind that the most developed countries are at a great advantage over others. A recent Newsweek article, "When Words Are the Best Weapons,"[1] contains a map of the world distribution of "High Tech and Higher Wires," which shows how disadvantaged most of Africa and significant parts of Asia are in the electronic age. Even if this does not appear directly to affect America's interests, it must certainly add to the difficulties of international understanding.

Second, people will be educated about information access. This means far more than literacy, numeracy, or "computer literacy," whatever the last may mean since it is dependent on the two former skills. This will require a revolution in education with concentration more on the learning process than on the things learned. The goal will be to produce a person capable of continuing to learn. There is no terminal point in such a process, which may be a profoundly disturbing thought for a society that has come to value diplomas and certificates more than the evidence of personal striving to achieve excellence.

Together these premises will promote personal independence of judgment and independent thinking. These changes will, in turn, lead to a revolutionary reconsideration of social goals. To an extent that is not generally recognized, the present educational system is shaped by social goals compatible with a patriarchal, agricultural, and industrial society and may be antipathetic to the needs of a society based on the use of information. In the latter there is much less need for regular work hours, much less dependence on location and season, and more need for changing groupings. Nor can it be a society in which the primary reliance is on an authority figure. The advent of the personal computer offers a release from industrial concentration and allows the achievement of personal goals in ways never before more than chimerical. Some of these issues are explored by Peter Drucker in "The Age of Social Transformation,"[2] where he stresses the centrality of the knowledge that can be gained only by education.

Odd as it may seem, freedom of access is why public and school libraries are such targets for zealotry. Libraries, which are often thought of as conservative, are actually revolutionary because they promote freedom of choice. That was clearly recognized in communist societies which restricted access to information, not perhaps blatantly but in many subtle ways, for example by limiting library privileges and by selectively reserving some kinds of reading for some kinds of readers.

Democratic societies have not truly understood the value to them of freely accessible information services, particularly during times of economic stress, when the individual's ability to purchase information is restricted. For a discussion of some of these issues, see "Bernadine Hoduski Speaks: The Current Crisis in

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Government Education."[3] In one of the most perverse examples of the attraction of opposites, conservatives and fundamentalists have adopted communist totalitarian ideologies that are more interested in control and direction than in freedom. In effect, they say, "If I do not want to read that book, then you should not be able to read it either." The third world countries' challenge to the western domination of world wide news media has become linked to government control of "undesirable" information. These challenges to freedom are often disguised as being in the pursuit of "truth," a value that is often metamorphosed out of recognition.

In a scenario reminiscent of science fiction, we are now finding a societal shift which places heavier and heavier burdens on an ever-reducing proportion of the population. In this case, it is the providers of information as opposed to the consumers. "Thought control" becomes not only possible but likely. One early example was the struggle for editorial rights at Pantheon, where higher management undertook steps designed to increase profit but at the expense of diversity. This was later repeated at Simon and Schuster and has been paralleled by mergers of publishers in countries like Australia and New Zealand, where the decision to publish was determined by the likelihood of overseas sales.

Control over information can be averted only by ensuring that as many people as possible function as providers. Events in the book world suggest that we may be heading towards a setting in which the production of printed and electronic works may be in the hands of an oligarchy. Luckily, in many countries, there are small presses willing to oppose the large corporations and to publish "unprofitable" works, especially those representing minority viewpoints.

The utmost vigilance will be required to maintain individual rights. Even steps taken to preserve family values can lead to the suppression of other people's freedoms, as can be seen from the problems caused by NEA funding of artists considered by some to be pornographic, and the continuing furor over gay rights. Censorship and economic manipulation need constant monitoring, particularly the invisible controls that suppress information.

Such controls are often built into professional education and lead to the tyranny of the expert. I have heard with astonishment a psychologist say that he knew better than his students what they should know and not know. The remark may, on the face of it, simply reflect his superior knowledge but it contains the seeds of thought suppression. In the same way, reliance on reserve reading (one professor even acknowledged to me that he did not want students reading something he might not have read, and another insisted that only a chapter a week be made available because that was all the students should read) or on lecture notes (often handed down through student generations) leads to the belief that information is circumscribed and does not exist outside the prescribed area. At the other extreme we have always to be aware of Tocqueville's statements on the danger to America of the "tyranny of the majority." The surest safeguard against both tyrannies is a public which is aware of and exercises its right of access to information, which includes the right to publish and to read what has been published. These rights, after all, are supposed to be guaranteed by the First Amendment to the Constitution. If we are able to maintain these freedoms, not only will individuals be better able to seek self-actualization, but society will also be the better for being composed of people whose vision of the future is not predetermined by deprivation.

Characteristics of the Information Society

Based on the concept that the possession of information links closely with the possession of power, the presumption is that wider possession of information will tend to spread power more widely. Ironically, this idea is not always found in the many organizations and conferences concerned with "empowerment," perhaps because that word has come to be only the latest in a series of organizational catchwords bent in the service of a particular constituency.

There is no expectation that everyone will take advantage of greater access to information, but those that do will mitigate the concentration of information in the possession of the few, notably such organized groups as industry, government, and expert associations.

Much of our present social behavior is based on confrontation—the legal system for example—where adversarial relationships are accepted as the norm. In such a setting, any person or group deprived of information is at a great disadvantage from the start. This is particularly true for the poor. Hence freely accessible public information systems are especially important because they can counter the power of experts to control others. This leads to the distress expressed in some medical circles over the availability of health and medicine books in public libraries (now with the added power of massive public databases). The distress is rationalized on the grounds that such information in unskilled hands is misinformation, but is it actually concern over loss of power?

The uses and misuses to which information can be put cannot be controlled, but familiarity with and experience in the retrieval and interpretation of information

can at least lead to a society where the willful manipulation of facts can be minimized and dogmas criticized. Here one might ask what advance there has been from the late nineteenth century when Bishop Colenso was charged with heresy because he doubted the literalness of the flood and the middle of the twentieth century when the famous Scopes trial in effect denied evolution, a process still being carried on by those who seek to control textbook content to maintain their own religious and political beliefs. These examples do not suggest that the process of opening information to the general public will be easy. Indeed, many people are unaware that they are being deprived, while others are more concerned with the maintenance of their own belief systems.

Expectations

The following expectations are probably unrealistic, insofar as none are likely to be reached fully, easily, or quickly. The only claim that can be made in each case is that the reduction of artificial constraints on information access will make them more possible.

Society will be open and not closed.

When information is limited to self-selecting groups, those groups tend to draw apart and intercommunication becomes more difficult because of the development of group vocabularies—a modern-day equivalent of the Tower of Babel story. [Ed.: See also Phil Agre's comments on "literatures" in "Institutional Circuitry."] Wider access to information will act as a counterbalance. Recognition that others will have access to and use group information will tend to force that information to be elaborated in more general terms. This leveling tendency may even be speeded up by the growth of databases since their indexing terms have to be, to some extent, interchangeable to be truly useful.

Individual self-respect will be enhanced.

More openness in society will make it possible for individuals to exert more influence. Ability to shape his or her own decisions and those of others by using shared information will decrease feelings of dependence and powerlessness.

Sharing will become more common.

Information is a good that is not consumed by use nor conserved by being hoarded. On the contrary, information that is not used is worthless. With the growth of mechanisms for ensuring shared access, the hoarding of information becomes pointless. Moreover the new organizations envisaged by Drucker will depend much more on the sharing of knowledge than on managerial hierarchy. Sharing can avoid both poles of tyranny—that of the minority and that of the majority.

Potential Dangers

Information, however "free" its access may be, is not without cost. Its generation, conversion into a usable format, and setting into order represents a very great investment. The producers of information require some return over and beyond altruistic satisfaction in order to make the living necessary to enable them to continue producing information. The steadily rising spate of problems over copyright attests to the social divisiveness that can be created over these economic issues. Moreover, certain kinds of information (demographic information, for example) require so great an investment, and also the power of law, that they can only be gathered by the public sector. This can create further uneasy relationships.

Producers of information will always be in the minority. Consequently, consumers will outnumber them. Market theory would say that this guarantees that only worthwhile information will survive, but social decisions are never based solely on information itself. Opinion interferes with this process. If we believe that the earth is flat or that homosexuals are evil, we will tend to suppress or deny any information to the contrary and to produce information supporting our own beliefs.

Such suppression is difficult in a pluralistic society such as the United States, where the process of information generation, storage, and access is widely distributed and constitutionally protected. Someone or some group is always willing to challenge what is seen as error or censorship. The possibility of combining producers and consumers within giant computer systems contains the potential for the control and distortion of information (see George Orwell's 1984 and numerous other dystopian stories). This is only partly countered by the parallel growth of distributed or personal communication systems. Other possible sources of control are the information networks themselves, particularly if they become profit based and commercial in interest.

Objectives

Develop information goals for society, based on equal access, and recognize the role of government in supporting such access. This links to an increased effort to ensure functional literacy, including an understanding of its importance to the individual citizen. The present government interest in developing the information superhighway is only partly conscious of these needs.

Develop systematic ways in which people can take an active role in providing their own information. The individual home computer or laptop, or their successors can be

helpful here, though experience to date suggests that they are well used only by the few. Simpler systems are necessary for most people.

Continue work on communications systems that can reduce barriers, for example protocols for the transfer of information between systems and databanks. It may well be possible to consult the catalogs of 300 libraries separately, but it would be much easier to simply look at one or two union catalogs.

Work on systematic investigation of information transfer and its relationship to learning, particularly on the means for translating special vocabularies for general use and for multi-lingual communication.

Continue and increase support for public information systems, such as libraries, public radio, databanks, and their successors.

Conclusion

No clear pattern is likely to emerge for years to come. There are too many players, and too much is at stake for simple resolution. There are, however, some actions that can be taken. On the more general level, more research can be undertaken into the social and economic nature of information. Research into the efficacy of alternative information systems is essential, and education should pay much more attention to the role of information gathering in the development of learning skills.

One key appears to be the transformation of the concept "library" from that of a repository to that of an information transfer point. This process seems somewhat more advanced with public than academic libraries, and the latter need to look actively at their roles. This process should also include a reconsideration of the roles of public and private information providers.

A complete rethinking of the structure and organization of libraries and of the education of librarians is needed. The same is true of computer professionals, who tend to have the same lack of social understanding as has been the case with the engineers from whom they sprang. Instead of hierarchical structures, the future appears to be with the lateral dispersion of authority. How to achieve that is not now in the least clear, yet the growing importance of information to all parts of society requires that the transformation should be attempted.

References

1. "When Words Are the Best Weapons," *Newsweek*, Feb. 27, 1995, 36–40.
2. Peter Drucker, "The Age of Social Transformation," *Atlantic Monthly*, , Nov. 1994, 53–80.
3. "Bernadine Hoduski Speaks: The Current Crisis in Government Education," *Library Journal* 120, no. 9 (May 15, 1995): 28–29.

Information and Unfictionable Science

John Barnes

Ever since the Enlightenment, when it became clear that from now on significant change would occur within a single human life span, we have tended to see change as originating more in some parts of society than in others—that is, to see some things as drivers or engines of change. These perceived drivers of change, especially when they have been technological, have tended to become (depending on what we think the world is changing into, and how we feel about that) objects of either fear or hope.

Usually the technologies that threaten or promise drastic change appear in fiction as objects of both fear and hope simultaneously. In the 1940s and 1950s as it became clear that space travel would shortly be a reality, there was a great flock of novels in which space would be the new frontier, providing us spiritual redemption, as Americans expect any good frontier to do. The limitless resources and opportunities for adventure would reshape us into a species which was both happy and comfortable and hardy and adventurous, solving both the problem of want and the problem of prosperity. But at the same time there was an abundance of tales of alien invaders, and stories of brutal colonial empires in the stars.

Turn back two decades and you will find the nightmare of aerial massacres of whole cities imagined in Robert Sherwood's *Idiot's Delight* appearing on the stage in the same year that the League of Airmen were bringing us permanent peace and prosperity on the screen, in *Things to Come*.

Turn back to industrialization, and the gentle utopia of *Looking Backward* shares image space with Blake's dark satanic mills. Reach back to the Renaissance—and the exuberant dreams of Leonardo and Kepler have more than a little to do with Marlowe's *Doctor Faustus* and Hobbes's *Leviathan*.

Thus it is no accident that in our present day, when sf writers look at information technologies, we look with a similar mixture of hope and fear. The past fifteen years have seen the rise of cyberpunk stories in which the technology of information becomes the mutual weapon of criminals and tyrants—and yet also the dream of nanotech, of information rich environments in which everyone's wishes are fulfilled. As always, utopia and dystopia draw from exactly the same well.

Theodore Sturgeon once pointed out that the "science" in "science fiction" is really knowledge—that fundamentally science fiction is about knowing things and the difference that knowing things makes. I would emphasize that it is *fiction about* science—that is, that it is by definition not science, but stories we make up to surround our constructed or inherited images of science.

It's been a truism for at least fifty years that we really only know a few stories and we tell them over and over. The story of fear is generally this one: some dreadful menace, separate from our innocent selves, menaces the world. A Freudian would say that's a projected id, a Frankfurt school Marxist would say that's bourgeois hegemony, a Christian would say that's evil, an existentialist would say that's the surrender to not-being, but whatever it is, its most important attributes are first that it's Out There and second that it's threatening the good person In Here. Everything is terrible—due to this single force—and in fact if we investigate we will only find that things are worse than we thought, because the forces of evil are more pervasive than we thought.

Fortunately, a stranger comes over the hill—standing in for the ego, working class, impartial intellectual, Christian, alienated but responsible man, whatever your outlook puts its trust in. The stranger cleans the bad guy's clock and restores freedom—roughly defined as freedom from the dread of the Bad Thing From Out There. At which point, rather than become a tyrant himself, the stranger takes off to whatever part of Out There strangers come from.

The story of hope is as simple and as familiar. The world is unrecognizably better because the root of all evil was defeated some time back. But it begins to creep back in, and our hero, this time, will be tempted by it, discover the truth, turn to fight it, and restore Happy Valley to its happiness.

Now what does this have to do with information? I suggest that the picture of the "information age" currently forming in pop culture—most especially in science fiction—owes a lot more to fiction than it does to science.

What do we fear? Drugs, organized crime, the all powerful state, shadowy forces of conspiracy, malevolent corporations, the gradual decay of the social infrastructure . . . and what does information become to the cyberpunks? An extremely valuable commodity that makes you feel like a god, struggled over by organized crime, alternately suppressed and exploited by the all powerful state in its battle with forces that have no names, secretly made and distributed by huge faceless corporations which can nonetheless be brought down by

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it, grabbed onto and exploited by every bright person trapped under the social rubble—in short, information as something combining the major perceived aspects of drugs, illicit influence, intelligence secrets, crime, and opportunity.

We fear, in short, that the new information technologies might be the means by which the people on top ensnare and control everyone else; information becomes the metaphor for everything malevolent that moves in secret, and merges into the stream of stories that runs from Oedipus to Hamlet to Frankenstein, Dr. Jekyll, Conrad's Kurtz, and finally into Chandler, to Freud's case studies, to every story in which a buried secret turns out to have given birth to a monster. What do we fear? We fear the past—we fear that it will come oozing into our future, unredeemed, unredeemable, thick with the poison that it produces from lying in the dark. And because it is our handling of information that is changing rapidly, we focus that fear—that the past is not over with—on information.

What do we hope for? I suppose we hope that we will either conquer or fulfill the past, that either it will turn out that we are free to be better from now on, or that all the evil of memory will turn out to have been for some purpose good enough to justify it. And because conflict is basic to every story, we then find a way to raise the fear again and put it back in the closet . . . so that it can jump out at us again. We know, deep down, that we have the material means to make Earth a paradise—we have had them since the 1920s or so—we know that we have neither reason nor excuse for the poverty and misery in which most of the Earth's population lives, and that the bulk of reasons why so many of our species' young males spend their days waiting for the cue to begin murdering each other are reasons that could be dropped and forgotten in a heartbeat if we had the will. We sense that real determination on the part of everyone—acting on our hopes and not on our fears—could change the world drastically and for the better overnight. And once again, we fictionalize the new information technologies to imagine Vernor Vinge's singularity or K. Eric Drexler's nanotech—we have the information technology do for us what we want so much but cannot quite bring ourselves to do.

But hope and fear, if they are indeed the roots of science fiction, have practically nothing to do with reality. The space age has not led to a new frontier in any of the senses once hoped for, because it costs a small fortune to get a tiny number of people even to the edge of the frontier, because what is in the immediate neighborhood is mainly of interest to specialists, and because our notion of the "frontier" forgets that after all it took 150 years to push the settlement line a couple of hundred miles inland in North America. Frontiers move too slowly to be exciting on a daily basis. Daniel Boone spent a lot of time chopping wood and Meriwether Lewis complained of boredom in his diary. Nor, of course, did the space age lead to vast new colonial empires—of rock and vacuum?—and one definite result of the planetary program is that we now know that any possible invaders have a very long way to come.

The images we find in science fiction always come more from the fiction than from the science—more from what we want than from what we know.

This in part is why we sf writers are notorious for not living up to our own propaganda. I know that for decades we've been telling parents, teachers, librarians, (and anybody else that might keep our books out of the grubby fists of teenagers) that we help prepare kids to live in the future. But I think we were lying. At least I don't recall any studies that showed that habitual science fiction readers were immune from all those mass fainting spells that accompanied the landing on the moon, the personal computer, or the use of genetic alteration in medicine. Experience would seem to show that the young deal with the future pretty well—they go charging right into it at one second per second, then settle down and live there, without much fuss, whether or not they read science fiction. And our sorry record for prediction speaks for itself—it's 1995, folks. Where's the helicopter in my backyard, why doesn't the sidewalk move, and when does the Chicago to Luna City rocket depart, anyway?

If we make the dubious move of deducing what a thing is for from what it seems to do, then the purpose of science fiction—aside from killing a dull afternoon in a small town, which is certainly the major purpose I had for it—is not to prepare us for the future but to assure us that the future will be familiar, that the rescuing stranger, the hometown hero, and the spunky gal will still be there to defeat the dark lord, the omnipotent conspiracy, and the Thing That Crawled Out of the Past.

We are not about promoting wonder, but about containing it, in the sense that NATO contained Communism and a corral contains horses. And in this function we are not only successful, but we actually *do* tell the truth. Our children will not live among wonders. Nobody will, because when the future gets here, it is always just the place where we live.

It will not be wondrous to them, but it will still be outside the farthest reaches of our fiction. As too many people have pointed out, the future is generally stranger than we *can* imagine. The solar system that we now live in—thanks to the Mariners, Vikings, Pioneers, and Voyagers—is far wilder than what was in the sf of the thirties and forties, which was a mere expanded Earth—or expanded group of Hollywood sets. The human immune system is vastly more complex and interesting than what Crichton described in *The Andromeda Strain*, and the

problem of global pollution and ecosystem deterioration is astonishingly more tangled and difficult in the real world than in *The Sheep Look Up*, *No Blade of Grass*, or *The End of the Dream*.

Our science fiction assured us that the future would be strange and filled with wonders. Now that we are here, by the standards of that time, it is unrecognizable. Our sf is revealed as the reassuring fairy tale that allowed us to believe the future would limit itself to being strange and filled with wonders.

I do think information science is going to drive the next march into the future. But forecasts are as premature as always. The serious study of information as a subject is very much in its infancy. Issues like redundancy, self-reference, entropy, signal-to-noise, intelligence, chaos, holographic constructs, and recursivity—which, if the people studying the questions are on the right track, are essential to even naming the problem—are still floating around with multiple not-apparently-compatible definitions. The central questions about perception, creativity, knowledge, communication, thought, consciousness, and all the other aggregate phenomena that seem to arise when a group of organisms, cells, devices, or beings start exchanging and copying messages, are still so badly phrased that we probably wouldn't recognize answers to them right now, even if we were handed them. We do, however, face an increasing realization that the answers to those questions are fundamental to our finding answers that will satisfy us for those nagging older questions—questions like who are we? why are we here? is there any sense in which "why" is a question that matters?

So what we can be fairly sure of is that the future information-based society will resemble neither our hopes nor our fears, and hence will not much resemble science fiction or any other fiction. To point out only the most obvious differences, information will not be like drugs—there's too much of it relative to demand, not too little; often you can resell it after you use it; and sometimes the most effective way to exploit it is to give it away. Neither will information be like magic that allows us to get what we want effortlessly. In the first place there's the problem that "what we want" is itself a message subject to all the ills that information is heir to, and more importantly thermodynamics will demand that the more the product is like the statement of what we want, the more we will have to expend energy on it. New technologies will let us hear messages from all over the world but we can't guarantee that any of them is what we want or need to hear. We will be able to fill information storage beyond our wildest dreams, but as the storage gets fuller, it gets more like the universe it depicts: the information you want is all there but you can't be sure you can find it in a reasonable time.

One thing that does seem likely is that our concept of truth will do some shifting. As the techniques of replication and modification become better, the authentication of information (in the sense we know it today) will become impossible—and yet people will keep right on going on with their lives, in ways we can't easily imagine. Does it matter if there are six different people on the news who all say they're the President of the United States, as long as there's bread at the corner store? If we never reach beyond the moon, will it matter if everyone can live in a world too various ever to be explored? If you have the option of living entirely among people who agree with you, so that you need not ever be aware of dissension, will the people who live next door (but electronically in another universe) in the Village of Unending Contention ever have a reason to knock on your door? And if there's no longer a common reality to which to refer, if we can't believe the world around us, it seems unlikely that we will have much room either for cold, comforting fact or for the willing suspension of disbelief.

And if we get to any of those worlds of competing realities and informational overloads, will the "we" that gets there even think those are questions? This is what we sneak up on every time we sit down to tell lies about the future. You will get there and you will experience it as more of the same. But will you be the same?

The reassuring message of science fiction is in the prevention of wonder. We assure you that the companions who people your imagination—the cynical tough scarred good guy, the cackling mad scientist, the captive princess, the comic sidekick, the corrupt plutocrat, all the rest of them—will be there with you, and even if the six-gun turns out to be a neural disrupter, the knight's armor is made of cellular automata, the lady with a past is only virtually real, and the secret Nazi stronghold is an orbiting computer the size of a pingpong ball, finally it will all be the same. It's okay to go to the future because we can all be tourists in the country of wonder, reassured that just behind all that frightening newness there is going to be the same old, and therefore we can point and gawk and say "gee whiz" and enjoy the sense of the world's exoticness and our adventurousness.

It is not the job of the storyteller, but of reality, to slam the gate behind all us travelers to the future and lock us up, stranded in time, in an unfamiliar future, to deal with it as best we can. But once we find ourselves in the future, we hardly hear the gate slam at all. By the time we get there it has become home.

The deepest truth behind science fiction is this: we always live at the edge of wonder and it's never wonder once we cross that edge. The transcendence for which we reach is like a childhood surgery: you're scared, but you'll feel just fine afterwards, and you'll hardly remember what happened at all.

The Matrix, Cyberpunk Literature, and the Apocalyptic Landscapes of Information Technology

Paul F. Starrs
and Lynn Huntsinger

Perhaps no theme has so attracted the febrile imaginings of postmodern scholars as the creations—and the technological culture—of cyberpunk literature. Cyberpunk science fiction is "the apotheosis of post-modernism," in one assessment, "dystopian anticipation," in the lights of another, and "the only art systematically dealing with the most crucial political, philosophical, moral, and cultural issues of our day," as envisioned by a third.[1] For such fervor there is solid backing. A great theme in cyberpunk literature is the Matrix, an "abstract representation of the relationship between data systems," in the words of William Gibson.[2] Enormously complex and almost impossible to map, the geometry and particularities of this cybernetic space are not qualities easily defined. Among the unearthly delights of the Matrix is assessing its elusive dimensions.

The broad cyberpunk literary "movement," as it is often described, blends fast-paced and imaginative writing with a pungent if admiring wariness for computers.[3] Rather more importantly, "cyberpunk" takes an often-savage delight in roaming the information networks that especially personal computers make possible. Altogether gone is the bland worship of technology that once defined science fiction; no part survives in cyberpunk. Instead there is edgy opposition, awareness of the intrusive give-and-take of everything from hi-tech drugs to the mirrored sunglasses that are a common motif in cyberpunk writing—reflective shades slamming shut unilaterally and peremptorily the "window to the soul." Yes, cyberpunk is "alienated," but hardly alien.[4]

The geography is ineluctable. Punched into cyberpunk writing and the world it anoints lies a remarkable new frontier of geographical exploration and discovery, couched in a most visceral form: cyberpunk delves through the canyons of the mind by navigating pure information. For all its estimable presence, the Matrix poses nasty dilemmas, including notable quandaries for the geographers and other traders in the information of places who live and breathe for maps and the mappable. While conventional libraries are challenged by computer data, so too are the descriptive powers of cartographers—not a group, as Jorge Luis Borges once suggested, generally known for being easy to intimidate.[5] What is the structure, the map, of this informational nether world? [6] That it exists is certain enough. Net statistics show a rate of growth that leaves no doubt about the current existence of this world that is exposed in bits and bytes. The world created is cyberspace—a territory of facts and lies; of binary naughts and ones; sustained by data packets, ethernets, and network links; a virtual reality existing in the eyes of the beholder, wherever, in Michael Benedikt's phrasing, "electricity runs with intelligence."[7] Yet, for all their value as speculative devices for positing the dimensions of future society, cyberspace and the Matrix are here now:

> And the Yakuza would be settling its ghostly bulk over the city's data banks, probing for faint images of me reflected in numbered accounts, securities transactions, bills for utilities. We're an information economy. They teach you that in school. What they don't tell you is that it's impossible to move, to live, to operate at any level without leaving traces, bits, seemingly meaningless fragments of personal information. Fragments that can be retrieved, amplified . . .[8]

As any number of commentators on the technological scene note, computers are useful these days, not as dandy encapsulations of technological wizardry, but for the legion ways that computer *networks* offer to improve an otherwise all-too limited human capacity to communicate and absorb information. That 1990s daily life is enmeshed with computers is obvious, if not always welcome: witness e-mail addresses that appear in professional paper abstracts, the World Wide Web, online catalogs that all major university libraries maintain, computer-accessible bank accounts, *Wired*, electronic chat groups, or (now yesterday's news) the BBS—the computer bulletin board. All this is (relatively) sanitized and above board, safe and accessible, whether by 28.8k modem, ISDN line, or an ethernet connection. In a sanguine view, what exists now is at least potentially an absolute democratization of the possibilities of information (although access to hardware will always vary by class, nation, education, and occupation), a vehicle for journeying through a "new" geography of electronic landscapes. Such, perhaps, is the humanistic perspective.[9]

Cyberspace . . .

The term "cyberpunk" applies both to a proficient clan of computer hackers that recognizes no borders and to

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an active cadre of science fiction writers. While hackers—data pirates or adepts in navigating computer information networks—operate in the real world (and in virtual reality create their own), the literary cyberpunk movement is precocious, imaginative, and journeys through fictional landscapes fully as complex as the hacker's.

"Cyberpunks" occupy the dark fringes of a data world with two distinct realms. On the side of convention, there is no doubt that computers and computer networks today make up a distinctive landscape. Its familiar geography, although fast-changing, is worldwide and increasingly tenacious and inescapable. This, to hackers and authors of cyberpunk fiction, is "The Matrix," an ever-growing net of information: data kept in storage ranging from small computers to gigabyte servers, accessible from ethernets or cellular satellite uplinks, all the stuff of new space, with a dollar worth in billions, if not trillions. Not mapped, maybe not even mappable, cyberspace is information, technology, data, credit reports, corporate secrets, encrypted government files, the rawest of resources in the most sophisticated of forms. Reach them by "jacking in," an appropriately suggestive cyberpunk phrase that puts the human mind into the machine. Cyberspace, in Gibson's *Count Zero*, is:

> the infinite reaches of that space that wasn't space, mankind's unthinkably complex consensual hallucination, the matrix, cyberspace, where the great corporate hotcores burned like neon novas, data so dense you suffered sensory overload if you tried to apprehend more than the merest outline.[10]

Dramatic and important, the Matrix has a mundane, everyday reality—but it is also the far-reaching, violent, and apocalyptic landscape of information technology that is addressed most directly in the mental maps of cyberpunk science fiction authors. They chart where the search for information, the pirating of data, the culture of the keyboard cowboys manipulating the latest cyberspace decks and consoles, will go. With the vision of William Gibson, Neal Stephenson, Bruce Sterling, Kathy Acker, Vernor Vinge, John Shirley, and other writers who might be collared with the "cyberpunk" label, the "now" of cyberspace transmutes to a dystopian, anarchic, yet somehow conventionally heroic future: a quintessentially post-humanistic form.[11]

Antecedents . . .

> No more relation could he discover between the steam and the electric current than between the Cross and the cathedral. The forces were interchangeable if not reversible, but he could see only an absolute *fiat* in electricity as in faith.
>
> . . . Satisfied that the sequence of men led to nothing and that the sequence of their society could lead no further, while the mere sequence of thought was chaos, he turned at last to the sequence of force.—*Henry Adams*[12]

Crude, intimate, nihilistic, and invasive, the cyberpunk literary landscape is the stellar creation of several dozen authors parsing a bleak if inventive future. The principals—mostly men and nearly all North American—borrow extensively from the canon of science fiction, from movies, and from modern-day hackers whose exploits are the stuff of legend.[13] Literary antecedents include Philip K. Dick, John Brunner, Samuel R. Delaney, Ursula LeGuin, Alfred Bester, and even Burroughs, Zamiatin, Pynchon, Orwell, and Raymond Chandler. Go figure. Nor should film's role go uncountenanced: *Bladerunner, Buckaroo Banzai, Brazil, Road Warrior, Repo Man, Alien, The Man Who Fell to Earth,* and *Max Headroom* are examples of the current work, but *Kiss Me Deadly, Pickup on South Street, A Touch of Evil,* and the whole underside of 1950s *film noir* contribute a sensibility—a *mise en scene*—that supports the literary cyberpunk ethos. Here is what Manny Farber some time ago called "termite art."[14]

The sensibility is dark, fractured, and generally pessimistic. The creativity of cyberpunk literature, however, generates a view of the world that's far from brooding. Borrowings from film are frequent and reliance on their common images alludes in perfect post-modern form to a body of work that many of the cyberpunk authors obviously found revelatory. The recombination of themes is a constant sensual assault: full of rootless movement with cascading themes. In form and style, cyberpunk writing emphasizes advanced technique, an effortless cannibalizing of popular culture, and the latest—but not too far ahead—high tech. Invasion and crossing boundaries are ongoing topics. In some stories the invasion is literal. Biosoft, or biologically-based software, is plugged into sockets to augment the user with an instantaneous fix of special knowledge—a foreign language, engineering skills, a slice of blue entertainment. Sim-stim goads the brain, making possible a perpetual soap opera of direct cerebral stimulation. Or there are the memorable gargoyles—festooned with intrusive data-gathering devices like infrared scanners and lasers—of Neal Stephenson's *Snow Crash*. Then again, computer data might be packed, in idiot/savant form for safe transportation, onto silicon in the brain of a human courier, coded and unreachable without the equivalent of a private cipher key, as played in the summer 1995 film *Johnny Mnemonic* (based on the like-titled, and better, short story by William Gibson). Jack

into a computer deck and travel by mind through fiber optic networks, into terabyte storage banks, roaming the unseen. It used to be fantasy as much as science fiction. Make that now, unmistakable fact.

The apocalyptic literary landscape that cyberpunk authors create is partly a pessimistic view of the future, partly a crime-adventure story, partly a wry sarcastic and playful digest of techniques and visions borrowed from hackers and their sojourns through electronic information networks. Yet finally, cyberpunk fiction embraces certain repeated themes, unmistakable shared elements that cyberpunk authors seem to agree are a part of our technological and cultural future, if not already among us.

"The Topography of Data"

> He uploads it to the CIC database—the Library, formerly the Library of Congress, but no one calls it that anymore. Most people are not entirely clear on what the word "congress" means. And even the word "library" is getting hazy. It used to be a place full of books, mostly old ones. Then they began to include videotapes, records, and magazines. Then all of the information got converted into machine-readable form, which is to say, ones and zeroes. And as the number of media grew, the materials became more up to date, and the methods for searching the Library became more and more sophisticated, it approached the point where there was no substantive difference between the Library of Congress and the Central Intelligence Agency. Fortuitously, this happened just as the government was falling apart anyway. So they merged and kicked out a big fat stock offering.
> —*Neal Stephenson*[15]

If there's some ambiguity as to just who the cyberpunks are, there's no doubt about the geography that they inhabit. "Cyberspace" is, quite reasonably, cybernetic space—an information landscape created by networked information stored in computers world-round that can be "accessed," to use the correct term, through computers.[16] Imagine all the satellites in earth orbit and the information relayed to them daily. The quantity of data is staggering. The category "LC" has been expropriated as a data measurement—it stands for information equivalent to all the pages of materials deposited in the Library of Congress. On any given day about three LCs of information move through world satellites; more impressive, perhaps, is that the information is then stored for later analysis. The "cyberlibrary" is a complicated phenomenon, and something that gives little comfort to many librarians.[17]

Information is the protagonist in cyberspace—subject and verb. Data is wealth, power, information, but also knowledge, with all that portends—and maybe the abiding delight of cyberspace is that there is, even today, what William Gibson calls a "topography of data," a high-low, back-and-forth, deep-and-near.[18] One of Ed Dorn's stanzas in *Gunslinger*—projective verse from Carl Sauer-disciple Charles Olson's best-known students—offers a nifty, pre-cyberpunk summary set as a western epic-poem:

> As he travels across
> the cabaret may I ask
> a question? Move on he said.
> Are those rounds
> in the 44
> of your own making?
> No bullets, I rarely use
> ordinary ammunition.
> What then?
> Straight Information.
> What?
> You're not ready.
> Look, into each chamber
> goes one bit of my repertoire
> of pure information,
> into each gesture, what
> you call in your innocence
> "the draw"
> goes Some Dark Combination . . . [19]

What is the geography of information? "The Matrix" is partially an answer, the world within a world. If Gibson's formulation is especially rich, it finds intellectual forebears with Vernor Vinge's Mr. Slippery, the Coven, and the Other Plane in "True Names," and in the structural details of *A Fire Upon the Deep*.[20] Little surprise that The Street in Stephenson's *Snow Crash*, so wonderfully constructed into an online Ramblas, is not only reminiscent of Allan Jacobs's magnificent book-length study of the dimensions of worldwide street culture, but The Street (tens of thousands of electronic miles long; a site for virtual motorcycle drag races at Mach 1, and growing more complex as additional millions of people travel the figurative sidewalks) has a remarkable architectural richness.[21]

The disappearance of governments as formal bodies in William Gibson's cyberpunk trilogy, *Neuromancer*, *Count Zero*, and *Mona Lisa Overdrive*, deservedly the most lauded examples of the cyberpunk genre, leaves no great void. As a seamless replacement there is a hegemony of multinational corporations, trafficking (surprise) primarily in the commodity of information. While access to this information is one key element of the Matrix, a world traveled by console cowboys who patch electrodes or goggles to their heads and slap the "on" switch of a hot-rodded cyberdeck, there is more. In the cyberspace world, data literally has shape and sub-

stance, a three-dimensional existence where among the greatest perils is being lost in time (Jeremy Rifkin denounced the diminished sense of time several years ago in *Time Wars* from a rather less admiring perspective). In Gibson's words again, the console cowboy sees "Towers and fields of [data] ranged in the colorless non-space of the simulation matrix, the electronic consensus-hallucination that facilitates the handling and exchange of massive quantities of data."[22] But as anyone realizes who has followed the progress of Netscape's "Navigator" client in its sub-cardinal number alpha and beta rounds, the data of the Internet or the Matrix has a fixed geography that manages at once to be both elusive and compelling. And, indeed, there is a tidal quality to Net access, shifting with the Earth's terminator as servers are freed from daylight hour use and demands change from local area network to serve more exotic masters.

For all the compelling portrait of corporate manipulation in the punkish venues of cyberspace fiction, what is striking about Matrix yarns is a conclusion that extreme individualism matters: a hacker sensibility triumphs. The console cowboys of Gibson's novels are popular culture heroes easily substituted for any of the callused private eyes of '50s movies or the bigger-than-life figures of cowboy dime novels. Adventurous iconoclasts, keyboard cowboys put Indiana Jones to rest; their treasures are data purloined from any of the highly protected sources that place and value them. They are "casing mankind's extended electronic nervous system," in William Gibson's words.[23] Screw up and artificial intelligence-produced ice—for Intrusion Countermeasures Electronics—fries the neurons. A good icebreaker can crack data protection—at some risk of flatlining the brain waves. In a technically complex future world, it's striking that it is still skeptics, the poachers, the defiant who are the central players.

Dystopia/Utopia

> From the all-enclosed capsule that provides a life-support system in space to the cities on earth that snatch a space from nature, humans seek to control their environment by building it, rather than accepting it as given. The extent of their desire—and their success—places humans at the end of a spectrum in this regard.—*Bruce Mazlish*[24]

Cyberpunk fiction embraces varied conventions that form the pavement surface sealing its means to an end. The central aim of many of the narratives, aside from the essential telling of a carefully plotted and finite story, is describing how computers and information technology mature and the place these devices assume in future life. Nothing elite sticks to the visions; it is a mainstream vernacular or popular culture where hacker and rocker meet.

The visions are often alarming. Cities degenerated. Corporate defections brokered as mercenary military operations. Drugs rampant. Gang violence casually fatal. Organized crime is, . . . well, "organized," with the Yakuza and an engagingly heterogeneous world culture (sporting a Japanese flavor) triumphant. Turing police monitor artificial intelligence sources, trying to guarantee that artificial intelligences don't become too bright or self-aware.

There is beauty too: Perfect holographic reproductions of works of art. An abandoned orbiting world of junked satellites. The spare challenge of placing computer viruses that, properly seeded, penetrate security barriers. The impeccable vision of virtual reality—the world of data, perceived in four dimensions, a realm to walk and explore and glide, with only the limits of personal ability.

And the great charm is that all this already exists. The information Matrix, console cowboys, vast multinational corporations, implants, the Yakuza, viruses, and killer "ice" are only a few of the cyberpunk authors' tools, part of a post-modern literary landscape of computers, networks, people, and power. There are motes in cyberpunk writing that are entirely contemporary, but also bits and slices of vision and information so abrupt as to be unthinkable.

As a bottom line, the literature of cyberpunk science fiction is profoundly dystopian, while preserving an almost absolute faith in the ability of individuals, acting alone, to outwit and avoid any universalizing culture. Free will—to explore, flaunt, steal, pioneer—is as much a part of the conception of cyberspace and the cyberpunks as it ever was on the American frontier. The ethos is alive. That so fraught a vision is sated with initiative may seem ironic. But that is part of the post-modern mix, and what makes cyberpunk writing and the apocalyptic landscapes of information technology that cyberpunk authors create and embrace, so altogether memorable.

The cyberspace world of information technology is a post-humanist vision in which people ARE the machine; there is no separation. This is an embodiment of what Bruce Mazlish has called "The Fourth Discontinuity," in which, following upon the Copernican, Darwinian, and Freudian revolutions, we are now seeing the fourth shock to the human system, a realization that people and machines are really not so separate.[25] This is either a frightening undertaking or a refreshing one; this depends on the viewer's point of leverage and perspective. What cannot be dodged is that American English is full of terms that frankly address and admit to this

dissolution of boundaries—interface, download, "crash," brain dump, downtime.[26] The cyberpunk world posits a high value for socially marginalized members of future society—a punk sensibility. It plays to the puckishness of computer culture and technology as a partial power equalizer (if still largely an elite tool). The culture is mongrelized, diverse, with technology that provides both liberation and limitation. Again, that is. But perhaps the most memorable aspect of this new fictional world bears on the sense of place that cyberspace affords:

Almost anyone can visit cyberspace—but no one lives there.

References

1. Istvan Csicsery-Ronay, Frederic Jameson, and Larry McCaffery. There is comparably couched hyperbole from Donna Haraway, Jean Beaudrillard, Andrew Ross, and Ihab Hassan. While there is an expected and logical assortment of nay-sayers, the most skeptical commentators are the highbrow critics who are not about to privilege or consume "science fiction" by reading it, which means that Generation X (as a class or group distinguished by its singular comfort with computers—far more so than with printed books and catalogues, for example!) could be emerging with noteworthy speed as a generation that is heir-apparent in the computer revolution.

2. William Gibson, "Burning Chrome," in *Burning Chrome* (New York: Ace, 1986), 169.

3. While there are many treatments of "cyberpunk," the "Frequently Asked Questions" file at alt.cyberpunk or the science fiction files at gandalf.rutgers.edu/pub/sfi/sfarchive are probably as good as any for an overview. A more formal definition comes in Bruce Sterling's introduction to the *Mirrorshades* anthology (New York: Ace, 1986).

4. While cyberpunk fiction is not hard to read or understand, for the most part, it has attracted sufficient scholarly attention that the literary plaintiffs are forming into separate camps. In the interest of full disclosure, then, it bears noting that some people have voiced major reservations about cyberpunk writing and its supporters. Gary Westfahl's review in *Extrapolation* of Larry McCaffery's *Storming the Reality Studio* denounces McCaffery for insisting that cyberpunk is a "postmodern movement," (34, no. 2, Summer 1993: 188–91). Neil Easterbrook is even less happy in "The Arc of Our Destruction: Reversal and Erasure in Cyberpunk," *Science-Fiction Studies* 19, no. 3 (Nov. 1992): 378–94. Randy Schroeder raises a variety of procedural questions about the nature of criticism and reality in "Neu-Criticizing William Gibson," *Extrapolation* 34, no. 4 (1994): 330–42. Charles V. Stivale's essay entitled "Mille/Punks/Cyber/Plateaus: Science Fiction and Deleuzo-Guattarian 'Becomings'" is of such dense construction that likely no one will ever entirely untangle its tropes (*Sub-Stance*, 66, 1991: 66–84).

5. "... In that Empire, the craft of Cartography attained such Perfection that the Map of a Single province covered the space of an entire City, and the Map of the Empire itself an entire Province. In the course of Time, these Extensive maps were found somehow wanting, and so the College of Cartographers evolved a Map of Empire that was of the same Scale as the Empire and that coincided with it point for point." *Travels of Praiseworthy Men* (1658) by J. A. Suarez Miranda, quoted by Jorge Luis Borges, "Of Exactitude in Science," *A Universal History of Infamy* (E. P. Dutton, New York, 1972), 141.

6. On the general phenomenon of the geography of the Internet, see Timothy Ostler, "Revolution in Reality—Virtual Geography" and Mike Holderness, "Welcome to the Global Village," *The Geographical Magazine* 66, no. 3 (May 1994): 12–20.

7. Michael Benedikt, *Cyberspace: First Steps* (Cambridge: MIT Press, 1991), 2.

8. William Gibson, "Johnny Mnemonic," in *Burning Chrome* (New York: Ace, 1986), 16–17.

9. Andrew Ross's reservations about technology and his restrained enthusiasm for the cyberpunk agenda or "project" are laid out in *Strange Weather: Culture, Science, and Technology in the Culture of Limits* (New York: Verso, 1991). See especially "Hacking Away at the Counterculture." His argument is dealt with also by Frederic Jameson in his "Cultural Studies" essay and in Jameson's commentary on science fiction, "Review Article," *Science-Fiction Studies* 17, no. 1 (March 1990): 93–102.

10. William Gibson, *Count Zero* (New York: Ace Books, 1986), 39.

11. Among the better studies is Veronica Hollinger's "Cybernetic Deconstructions: Cyberpunk and Postmodernism," *Mosaic* 23, no.2 (Spring 1990): 29–44. Among the enthusiasts for William Gibson's specific versions of cyberpunk are Lance Olsen, "The Shadow of Spirit in William Gibson's Matrix Trilogy," *Extrapolation* 32, no. 3 (Fall 1991): 278–89, and the remarkable essay by David Tomas, "The Technophilic Body: On Technicity in William Gibson's Cyborg Culture," *New Formations* 8 (1989): 113–29.

12. Henry Adams, *The Education of Henry Adams: An Autobiography*, v. 2 (New York: Time, 1964) 163, 165.

13. The versions could be many. See Bruce Sterling, *The Hacker Crackdown: Law and Disorder on the Electronic Frontier* (New York: Bantam, 1992); Katie Hafner and John Markoff, *Cyberpunk: Outlaws and Hackers on the Computer Frontier* (New York: Simon & Schuster, 1991); or comparable volumes by Clifford Stoll or Steven Levy.

14. Manny Farber, "White Elephant Art vs. Termite Art," in *Negative Space: Manny Farber on the Movies* (New York: Praeger, 1971), 134–44.

15. Neal Stephenson, *Snow Crash* (New York: Bantam, 1992), 22.

16. Timothy Leary reminds us that "cyber" means "pilot," so the word cyberspace includes its own navigation systems.

17. See Eric Davis's essay, "Cyberlibraries: Marion the Librarian meets Philip K. Dick—Bleeping with the Enemy?" *Lingua Franca* 2, no. 3 (Feb. 1, 1992): 46–51.

18. The "mind's eye" may really mean something.

19. Ed Dorn, *Gunslinger*, Book I (Los Angeles: Black Sparrow Press, 1968), 45.

20. Vernor Vinge, *A Fire Upon the Deep* (New York: Tom Doherty Associates, 1993); Vinge, "True Names," in *True Names and Other Dangers* (New York: Baen Books, 1991). The latter

story is possibly the best, and certainly the earliest, of the truly cyberpunk *fablios*.

21. Allan B. Jacobs, *Great Streets* (Cambridge: MIT Press, 1993).

22. Gibson, "Burning Chrome," 170.

23. Ibid.

24. Bruce Mazlish, *The Fourth Discontinuity: The Co-Evolution of Humans and Machines* (New Haven: Yale University Press, 1993), 213.

25. Vernor Vinge has made much the same argument, in "Technological Singularity," *The Whole Earth Review* no. 88 (Winter 1993).

26. Guy Steele, Jr., *The Hacker's Dictionary: A Guide to the World of Computer Wizards* (New York: Harper & Row, 1983).

Robots: Our Future Information Intermediaries

Joanne Pransky

Your TV wakes you at 7:00 a.m. just as The Today Show comes on. Your eyes aren't even open and in 30 seconds you're caught up on the important world news that you missed while you slept: if Japan didn't get another earthquake . . . if Israel's still on the map. . . if another virus hasn't wiped out half of Africa . . . and most likely you'll hear the latest in the O.J. Simpson trial.

While still listening to TV, you eat breakfast and read your local morning newspaper. You quickly scan the headlines and the sports page. You find out what the weather is going to be like today.

Get ready for work: make sure you have your beeper on and your cellular with you. God forbid you should be out of communication during the 30 minute drive to work.

Once at the office, you get all the faxes that came in overnight, turn your computer on, read your e-mail, and the info-exchange workday begins. Hands on the keyboard, mouth on the phone, eyes on the screen, (preferably all three at once for the maximum infoglut), you do your best to stay on top of your industry.

At home the same night, you surf the Net, read an article or two in Wired *magazine, and catch a few minutes of Dateline (or any one of hundreds of channels), while trying to fall asleep. After all, you have to see what Marcia Clark wore at the O.J. trial today.*

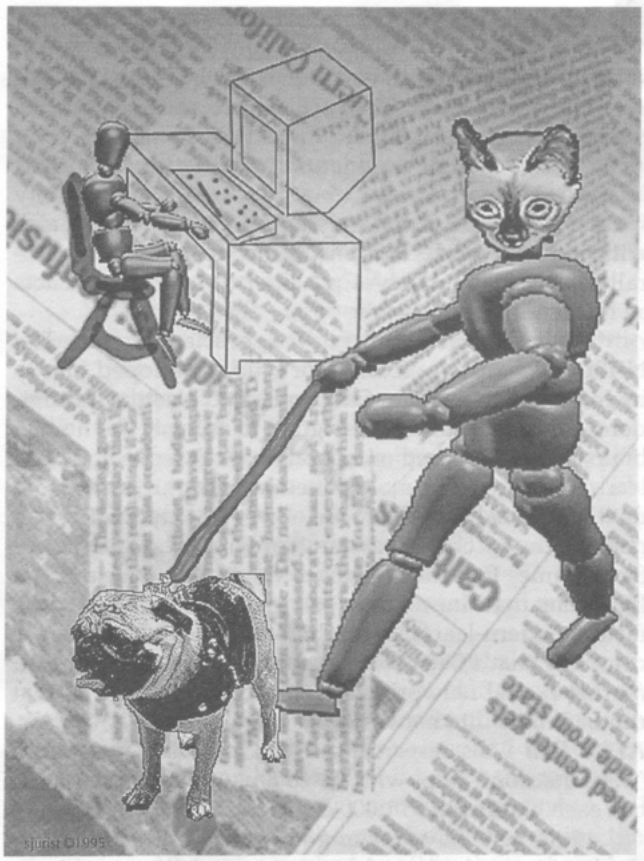
We are all "info-maniacs," trying to handle the information overload and manage the influx of data in our lives. Even in our most productive modes, there will always be too much information to process. How do we keep up? How do we control the flow and quality of information?

One answer may be information filters to help us organize some of the inrush. Already available in today's market are several "software servants" or integrated expert computer systems that manage e-mail, handle phone calls, and read and organize your junk mail.

Take *Wildfire*, for example. She (not "it") is an electronic intelligent assistant equipped with speech recognition to place phone calls, take messages, route calls to you wherever you are, and remind you of your appointments. She does this all in a businesslike voice although she does whisper, especially if she has to interrupt your phone conversation with another important call. This Pentium-based system is the creation of Wildfire Communications, in Lexington, Massachusetts.[1]

Other information "agents" that act according to preset parameters, include *MailBot*, developed by Daxtron Laboratories of Fort Worth, Texas. *MailBot* categorizes and processes mail messages. It can sort and save important files, delete junk mail, and forward e-mail, all based on your personal preferences.[2]

General Magic, a company located in Sunnyvale, California, in conjunction with AT&T, Sony, and Motorola, is developing a personal digital assistant that will be able to shop, pick a restaurant and make dinner reservations, and order concert tickets from Ticketmaster.[3]



If reading through all the various newspapers and magazines is overwhelming, Individual Inc., in Burlington, Massachusetts, offers a service that scans 500 news and information sources to pick articles that are pertinent for each subscriber and delivers them via fax, hard-copy, or as Internet e-mail. What separates *Individual* from other text-retrieval systems is a more advanced and dependable method in which word location and occurrence are used to sort documents according to their degree of pertinence.

"Dr." Joanne Pransky, the world's first robotic psychiatrist, brings Isaac Asimov's science fiction character robopsychologist Susan Calvin to life. "Dr." Pransky appears on radio and television to discuss the emotional aspects and psychological implications of a society where robots are part of everyday life. She also speaks on this topic at national and international conferences. In addition, she is a sales and marketing representative at Sankyo Robotics, the world leader of small assembly industrial robots, in Boca Raton, Florida.

And then there were robots

Wildfire and her relatives are just the beginning of the info-filter revolution. They are the precursors to robots, the next generation of the information intermediaries.

At the current exponential rate that technology is increasing, it won't be long before robots enter our daily lives and provide us not only with information, but also with answers and solutions. The best assistant, naturally, is one like ourselves, a helper that thinks and acts as human-like as possible.

Robotic assistants are no longer science fiction. The Ni1000 recognition accelerator chip, developed jointly by Intel, of Santa Clara, California, and Nestor, of Providence, Rhode Island, is designed to emulate the human brain. The chip, based on neural network technology, can learn on its own. The more patterns it recognizes, the more data it can analyze.[4] There are others that are working on neural network chip hardware: Stanford researchers David Stork, James Burr, and Michael Murray are developing a Bolzmann machine neural network that promises to be the fastest pattern-learning machine ever built. Corticon, a company that's been formed specifically to develop and market neural network chips, has premiered a chip that can be linked into networks of several thousand neurons. AT&T Bell Labs researcher H. P. Graf has developed a "superneuron" chip, with up to 8 neurons at a time that can each handle up to 1,000 connections.[5]

Scientists have far to go to achieve the powers of the human brain, but given the extraordinary achievements of the past decade, imagine the supercomputing capability 10 years from now. MIT professor, Seth Lloyd, who has made advances in quantum computation, believes that by then the world will have computers 100 million times as powerful as the Pentium-based PC.[6]

If computers will have tremendous processing power and if everything we come in contact with will be an integrated intelligent system, why will robots be necessary?

Although all systems will become "smart," able to verbally communicate on a conversational basis with people and even physically capable of some human movement, we will still need and desire robotic beings for the following reasons:

Strong human desire to anthropomorphize man

Whether in science fiction or reality, we've always attempted to build a machine in our image. As renowned MIT artificial intelligence guru, Rodney Brooks admits, "Scratch all the AI researchers and you'll find that building a humanoid robot was their original motivation for getting into the field."[7] Researcher or hobbyist, "droids" and the like are progressing in labs (don't think that the military isn't funding some of this) and garages throughout the world. Skin that breathes and sweats, electromechanical body parts, facial muscles that are capable of showing emotion—all controlled by a neural net brain—are getting closer and closer to a human replica.

Mobility

Although new "intelligent" materials will give enormous adaptive and self-organizing power to objects, they will still require motility to meet our convenience needs. Nanoplastics will allow a chair to automatically alter its shape and temperature according to its occupant, sinks will let dishes wash themselves, bowls will form around food, and the dining room table will be voice activated to increase or decrease table size based on the seating capacity.[8]

Undoubtedly the home of the future will be a total system, communicating with its products and users to create an ideal home of luxury. Wouldn't the next logical step be to have a servant to fill in the small gaps that "smart appliances" won't be able to do? For instance, who will walk the dog? What will put the groceries away after our smart shelves have directly updated the supermarket to deliver when low on inventory? If we're in the living room and we want a soda, how will it get to us? If we forgot our eyeglasses in the bathroom, what in the smart house will bring it to us? The cheapest form of an in-home transportation system will be a mobile, autonomous, intelligent robot that can not only be applied in the home, but also in the office.

Companionship

The need for robots to be our companions and to alleviate our loneliness may be the most influencing factor of all. Whether we're elderly and alone, young and single, or an only child, a robot can (and will) serve as a friend, lover, and teacher. Though it will be possible for any computerized object to converse with us, we will find that a biped form of ourselves will be the most desirable, the most accepted, and easiest to assimilate into our lives. We are already witnessing "social interface" programs, such as Microsoft's *Bob*. Although it's the first of its kind and not very sophisticated, its logo, a smiley face, is representative of the beginnings of a "personality". Notice that *Bob* is a human name, not a model number, and not an eight character file name. For most of us, the computer screen will be our main interface and gateway to the infoworld. We may spend more time with our screen than in direct interpersonal communications. Doesn't it make sense to make that screen as friendly and

charming as possible? And to eventually give it a torso and legs so it can follow us around?

Master Domo

Master Domo as his name indicates, will serve as a mobile head of the household, supervising and managing the information in our homes and in our lives. He (or she or other) will be the one that helps your elderly mother walk downstairs, makes last minute dentist appointments, brings the self-cooking dinner from the stove to the dining room, takes care of your personal finances monitoring the stock market 24 hours a day, repairs networked household systems should any diagnostics indicate failure, puts garbage in the smart receptacles, and, if no one else is around, you may try to ask *Master D* what your teenage daughter did last weekend while you were away.

Ms. Information

Ms. Information is your ideal work assistant. *Ms. Information* (she doesn't like to be called Miss Information, since misinformation is something she tries to prevent) will constantly filter and analyze data, check sources and update the company's existing libraries, and use the new information to output spreadsheets and reports. She'll be able to prepare a 100,000 mail-merge marketing piece, do payroll, alert you to ongoing news in your industry, and *Ms. I* will do this all as she packs boxes and interfaces with UPS and FedX for deliveries (though we won't have paper or hard copies, we'll still have materials that will require shipping and receiving). Additionally, this robosecretary will stock supplies throughout the office, bring you your coffee (and lunch) and clean the office at night. And, you don't have to worry about sexual harassment (at least not yet).

You may, however, be worried about job replacement when it comes to having future assistants like *Ms. Information*. In the '80s, many secretaries questioned the same when the personal computer arrived, bringing with it automated word processing, spreadsheets, and databases. The PC actually created more and new positions. Though secretaries need to be computer literate and skilled in specific software packages, there are now approximately 18 different classifications for this position, as compared to just three—receptionist, secretary, executive secretary—a decade ago. The new areas include: transcription specialist, specialized secretary, administrative assistant, senior secretary/assistant, executive secretary assistant, statistical typist, desktop publishing/graphics specialist, production word processor, word processor/ administrative assistant, switchboard operator, receptionist, administrative receptionist, receptionist/word processor, office clerk, records clerk, data/order-entry clerk, customer-service clerk, and office manager.[9] Like the computer revolution, new proficiencies must be learned, but robotics still promises to create more and new job opportunities.

Eventually, *Ms. Information*, *Master Domo*, and other robot assistants will be purchased at Sears, Office Depot, Robots R Us, or similar retailers in a variety of mortal colors, shapes, genders, and age. Do you want your robo-servant to look like Demi Moore or be more of a grandfather type such as Fred MacMurray? Or, would you prefer an automaton looking helper like Rosie from the Jetsons or R2D2? Perhaps you'd like a clone of yourself. Do you want your humanoid nanny to have an equivalent to a masters degree in teaching from Harvard, to be "warm and nurturing," or to have a "cold and authoritative" persona?

The behavior or emotional functions of these androids will be built upon a flexible, self-teaching software that is preprogrammed with sets of rules and conditions, thus allowing the robot to respond to different social stimuli. Upon hearing a child's cry, the robot may pick the child up, use a quiet, soothing voice, and look into the child's eyes. Or the robot may determine that the crying child, who pushed another child, should receive a stern, loud voice, with its eyebrows pointed in and its arms crossed over each other as if to show an angry and strict expression.

Different faces and mannerisms will correspond to the appropriate emotions. Even now there is *Smileys*, a dictionary that is used by e-mail users to simulate facial expressions. Isn't this the basis for an emotional response system in robots? Naturally, emotions are subjective. Love, hate, fear, anger, humor, sympathy, courage, kindness, impulsiveness, boldness, all of these are individually defined. However, a basic description with examples will provide an intelligent robotic system a model to interpolate courses of actions based on its knowledge and its experiences (much like a child's behavior). But who will decide what its postulate set of emotional data will be? We haven't even created a standard of morals for ourselves, so what laws will govern who creates machine behaviors and what behaviors robots will be given?

If there are no safeguards for behavior at all, then robots may form their own adaptable schematics. If a robot has only known how to survive in a violent slum of New York, isn't it possible that a robot will deem

violence to be appropriate? As electronic intelligence evolves, will robots ever be capable of consciousness or rebelling against their creators?

If robots are programmed with Isaac Asimov's Three Laws of Robotics[10] or something similar, how do we fill in the gaps for the necessary exceptions? Living with people requires constant change and adaptation. The Three Laws may not be the appropriate laws for ruling all robot actions. (The exceptions provided a lifetime of stories from Asimov.) However, the Three Laws of Robotics may be the best robot principles to date.

Now is the time for us to examine our goals and objectives for the robotic assistants and companions who will enable us to manage the rising flood of information that dominates our lives. Although there are many considerations, a future that includes robots could create an infotopia in the next millennium. In a world of accelerating demands, robots can make our work and our lives significantly more manageable. In addition, since robots have no use for money, we could reap the financial benefits of their productivity. Best of all, a robot may prove to be our ideal companion!

To err is human, to perfect is robot.

References and Notes

1. Katie Hafner, "Have Your Agent Call Mine," *Newsweek* (Feb. 27, 1995): 76.
2. "Source: Daxtron Laboratories, Inc.," *The Futurist* (March–April 1995): 5.
3. Hafner, 77.
4. "Brainpower," *Discover* (Oct. 1994): 61.
5. David H. Freedman, *Brainmakers* (New York: Touchstone, 1994).
6. Charles Platt, "A Million MHz CPU?" *Wired* (March 1995): 125.
7. David H. Freedman, "Bringing Up RoboBaby," *Wired* (Dec. 1994): 78.
8. Kevin McGuinness, "Nanoplastics," *The Futurist* (Jan.–Feb. 1995): 50–53.
9. "Source: Reinventing the Secretary," *The Futurist* (Jan.–Feb. 1995): 46.
10. Asimov's "Three Laws of Robotics" are: (1) A Robot may not injure a human being, or, through inaction, allow a human being to come to harm; (2) A robot must obey orders given it by human beings except where such orders would conflict with the First Law; and (3) A robot must protect its own existence as long as such protection does not conflict with the First or Second Law. Isaac Asimov, *I Robot* (New York: Ballantine Books, 1983).

Intelligent Information Filters and Enhanced Reality

Alexander Chislenko

I started seriously thinking about the ideas of augmented perception and personalized views of reality after reading a number of Internet messages with proposals to introduce language standards for online communications. Usually people suggest restricting certain forms of expression or polishing the language of the posts to make them less offensive and more generally understandable. I suggest going one step further by providing tools that would make the language mix of the Net both more free and more diverse. I propose active information filtering technologies to help us approach this goal for both textual and multimedia information. These tools would set the stage for augmented perception and Enhanced Reality.

Text Translations and Their Consequences

We are all used to having incoming email filtered, decrypted, formatted, and shown in our favorite colors and fonts. These techniques can be taken further. Customization of spelling (e.g., American/British or archaic/modern) would be trivial. Relatively simple conversions could also let you see any text with your favorite date and time formats, use metric or British measures, implement obscenity filters, abbreviate or expand acronyms, omit or include technical formulas, personalize synonym selection and punctuation rules, and use alternative numeric systems and alphabets (including phonetic and pictographic). A text could be digested for a given user, translated to his native language, and read aloud with his favorite actor's voice.

My friend Gary Bean suggested possible implementation of "cliché translators" that would explicitly convey the meaning of a sentence known to the translator but not to the reader; e.g., "that's an interesting idea" could be translated as "I have serious reservations about this."

Translation between various dialects and jargons, though difficult, should still take less effort than the translation between different natural languages, since only a part of message semantics has to be processed. Good translation filters would give "linguistic minorities," from Pig Latin to E-Prime, a chance to practice their own languages while communicating with the rest of the world.

Such translation agents would allow rapid linguistic and cultural diversification, to the point where the language you use to communicate with the world could diverge from everybody else's as far as the requirement of general semantic compatibility may allow. It is interesting that today's HTML Guide already calls for the "divorce of content from representation," suggesting that you should focus on what you want to convey rather than on how people will perceive it.

Some of these features will require full-scale future AI (such as "sentient translation programs" described by Vernor Vinge in *A Fire Upon The Deep*) but in the meantime could be successfully emulated by human agents.

Surprisingly, even translations between different measurement systems can be difficult. Your automatic translator could have trouble converting such expressions as "a few inches away," "the temperature will be in the 80s" or "a duck with two feet." A proficient translator may still be able to convey the original meaning, but the best approach may be to write the message in a general semantic form that would store the information explicitly, indicating in the examples above where the terms refer to measurements, whether you insist on the usage of the original system, and the intended degree of precision.

Currently, we can structure our mental images any way we want as long as we can translate them to a common language. This has led to relatively stable standardized languages and great variability among minds. Intelligent software translators could let us make our languages as liberated as our minds are and could push the communication standards away from our biological bodies. It really means just further exosomatic expansion of the human functional body, but the libera-

Sasha Chislenko says, "I was born in Leningrad, U.S.S.R., in 1959. My mother taught Latin and Greek in the Leningrad University. My father is a biologist with strong philosophical interests. In my young years, I was mostly interested in science fiction, the evolution of everything, biology, cosmology, elementary physics, and other natural wonders. Then my interests shifted to social sciences, politics, economics, and general theory of technology. I got my M.S. in math and computer science, as these seemed the closest ideologically neutral subjects to my sphere of interests, and worked in the computer industry and the Soviet Academy of Sciences. I also worked with various alternative environmental, political, educational, and peace groups. In 1989 I gave up on Russia and, after spending six months in refugee camps, in 1990 was allowed to enter the United States—the promised land where all people were free from communists and could devote all their time to search for truth and beauty. Currently I earn my living programming computers and spend my spare time playing with my son, reading and writing about the grand-scale structural evolution of human civilization and the universe, and (quite impatiently) waiting until this topic draws enough social attention to bring me decent employment. You can find some of my writings and information about my favorite organizations on my home page: http://oingomth.uwc.edu/~sasha/home.html."

tion still goes beyond the traditional human interpretation of "skin-encapsulated" personal identity.

So will there be more variety or more standardization? Most likely both. Flexible translation will help integrate knowledge domains currently isolated by linguistic and terminological barriers and at the same time will protect linguistically adventurous intellectual excursions from the danger of losing contact with the semantic mainland.

Client translation software will provide an emulation of the traditional world of "natural" human interactions. The semantic richness of the system will gradually shift away from biological brains, just as data storage, transmission, and computation have in recent history. Humans will enjoy growing benefits from the system they launched but at the expense of understanding of the increasingly complex "details" of its internal structure. For a while they will play an important role in guiding the flow of events. Later, after the functional entities liberate themselves from the realm of flesh that gave them birth, the involvement of humans in the evolutionary process will be of little interest to anybody except humans themselves.

Multimedia

Similar image transformation techniques can be applied to multimedia messages. Recently, there was a commercial announcement of a video system that allows you to "soften the facial features" of the person on the screen. Advanced real-time video filters could remove wrinkles and pimples from your face or the faces of your favorite political figures. Such filters could caricature the opponents or give your mother-in-law a Klingon persona on your video-phone.

It also seems possible to augment human senses with transparent external information pre-processors. For example, if your audio/video filters notice an object of potential interest that fails to differ from its signal environment enough to catch the attention of your biological sensors, the filters could amplify or otherwise differentiate (move, flash, change pitch, etc.) the signal momentarily, to give you enough time to focus on the object. In effect, you would instantly see your name in a text or find Waldo in a puzzle as easily as your biological sensors let you immediately notice a source of loud noise or a bright light.

While such filters do not have to be transparent, this may be a way to provide a comfortable "natural" feeling of augmented perception for the next few generations of humans, until the forthcoming integration of technological and neural processing systems makes such kludgy patches obsolete. Some non-transparent filters can already be found in military applications. Called "target enhancement," they allow military personnel to see the enemy's tanks and radars nicely outlined and blinking.

More advanced filtering techniques could put consistent dynamic edits into the perceived world. Volume controls would sharpen your senses by allowing you to adjust the level of the signal or to zoom in on small or distant objects when you focus on them (and double-blink?). Calibration tools could expand the effective spectral range of your perception by changing the frequency of the signal to allow you to hear ultrasound or perceive X-rays and radio waves as visible light. Conversions between different types of signals could allow you, for example, to "see" noise as fog while you enjoyed the quiet. Possibly you could convert radar readings from decelerating pedestrians in front of you into images of red brake lights on their backs. Artificial annotations in perceived images would add text tags with names and descriptions for chosen objects, e.g., warning labels with skull and crossbones on boxes that emit too much radiation. Perception utilities would give you additional information in a familiar way, e.g., projected clocks, thermometers, weather maps, and your current EKG readings on the wall in front of you. They could build on existing techniques that present us with recordings of the past and forecasts of the future to help people develop an immersive trans-temporal perception of reality. "World improvement" enhancements could paint things in new colors, put smiles on faces, "babify" figures of your incompetent colleagues, change night into day, erase shadows, and improve landscapes. Completely artificial additions could project northern lights, meteorites, and supernovas upon your view of the sky or could superimpose your favorite mythical characters and imaginary companions on your image of the real world.

I would call the resulting image of the world **Enhanced Reality** (ER).

Structure of Enhanced Reality

One may expect that as long as there are things left to do in the physical world, there will be interest in application of ER technology to improve our interaction with real objects, while Virtual Reality (VR) in its traditional sense of a pure simulation can provide us with safe training environments and high-bandwidth fiction. Later, as ER becomes considerably augmented with ar-

tificial enhancements, and VR incorporates a large amount of archived and live recordings of the physical world, the distinctions between the two technologies may blur.

Some of the interface enhancements could be made common, temporarily or permanently, for large communities of people. This would allow people to interact with each other using, and referring to, the ER extensions as if they were parts of the real world, thus elevating the ER entities from individual perceptions to parts of shared, if not objective, reality. Such enhancements might use existing metaphors. For example, a person who has a reputation as a liar, would appear to have a long nose.

Other extensions could be highly individualized. An interstate truck driver might see a "No Go" sign projected on his windshield, while the driver of the car behind him will sea a sign saying "Bob's house—next right." Personal illusions should be built with some caution however. The joy of seeing the desired color on the traffic light in front of you may not be worth the risk. As a general rule, the more control you want over the environment, the more careful you should be in your choice of filters. However, if the system creating your personal world also takes care of all your real needs, you may feel free to live in any fairy tale you like.

In some cases, ER can provide us with more true-to-life information than our "natural" perception of reality. It could edit out mirages, show us our "real" images in a virtual mirror instead of the mirror images provided by the real mirror, allow to see into—and through—objects, or show us things that human sensors cannot perceive at all.

Historical Observations

People have been building artificial symbolic "surrealities" for quite a while now, though their artifacts (from art to music to fashions to traffic signs) have been mostly based on the physical features of the perceived objects. Shifting some of the imaging workload to the perception software may make communications more balanced, flexible, powerful, and inexpensive.

The implementation of ER extensions would vary depending on the available technology. At the beginning, it could be a computer terminal, later a headset, then a brain implant. The advancement of human input processing beyond the skin boundary is not a novel phenomenon. In the audiovisual domain, it started with simple optics and hearing aids centuries ago and is now making rapid progress with all kinds of recording, transmitting, and processing machinery. With such development, eventually "live" contacts with the "raw" world data might become rare and may be considered inefficient, unsafe, and even illegal. This may seem an exaggeration, but this is exactly what has already happened during the last few thousand years to our "perception" of a more traditional resource—food. Using nothing but one's bare hands, teeth, and stomach for obtaining, breaking up, and consuming naturally growing food is quite unpopular in all modern societies for these very reasons. In the visual domain, contacts with objects that have not been intentionally enhanced for one's perception (in other words, looking at real, unrearranged, unpainted objects without glasses) are still rather frequent for many people, and the process is still gaining momentum, in both usage time and the intensity of the enhancements.

Rapid evolution of technological artifacts and comparatively stable human body construction create a functional imperative for continuing gradual migration of all aspects of human functionality beyond the boundaries of the biological body, with human identity becoming increasingly exosomatic (non-biological).

Truth vs. Convenience

Enhanced Reality could bring good news to privacy lovers. If the filters prove sufficiently useful to become an essential part of the [post]human identity architecture, the ability to filter information about your body and other possessions out of the unauthorized observer's view may be implemented as a standard feature of ER client software. In Privacy-Enhanced Reality, you can be effectively invisible.

Of course, unless you are forced to "wear glasses," you can take them off any time and see the things the way they "are" (i.e., processed only by your biological sensors and filters that had been developed by the blind evolutionary process for jungle conditions and obsolete purposes). In my experience, though, people readily abandon the "truth" for the convenience of the interface and, as long as the picture looks pleasing, have little interest in peeking into the binary or HTML source code or studying the nature of the physical processes they observe—or listening to those who understand them. Most likely, your favorite window into the real world is already not the one with the curtains—it's the one with the controls . . .

Many people seem already quite comfortable with the thought that their environment might have been purposefully created by somebody smarter than them-

selves, so the construction of ER shouldn't come to them as a great epistemological shock. Canonization of chief ER engineers (probably, well-deserved) could help these people combine their split concepts of technology and spirituality into the long-sought-after "holistic world view."

Biofeedback and Self-perception

Perception enhancements may also be used for augmenting people's view of their favorite object of observation: themselves. Biological evolution provided us with a number of important self-sensors, such as physical pain, that supply us with information about the state of our body, restrict certain actions and change our emotional states, invented by nature for pushing our primitive ancestors to taking actions, they wouldn't be able to select rationally. Unfortunately, pain is not a very accurate indicator of our bodily problems. Many serious conditions do not produce any pain until it is too late to act. Pain focuses our attention on symptoms of the disease rather than causes, and is non-descriptive, uncontrollable, and often counterproductive.

Technological advances may provide us with the informational, restrictive and emotional functions of pain without the above handicaps. Indicators of all important/critical/abnormal bodily functions could be put on your screen, watch, or skin. It is also possible to restrain your body slightly when, for example, your blood pressure climbs too high, and to emulate other restrictive effects of pain. It may also be possible to create "artificial symptoms" of some diseases. For example, showing to a patient a dial indicating a spectral divergence of his alpha and delta rhythms that may indicate some neurotransmitter deficiency, may not be very useful. It would be much better to give the patient a diagnostic device that is easier to understand and more "natural-looking":

"Hello, Doctor, my toenails turned green!"
"Don't worry, it's a typical arti-symptom of the XYZ condition, I'm sending you the pills."

(Actually, a watch may serve a lot better than toenails as a display.)

Similar techniques could be used to connect inputs from external systems to human biological receptors. Wiring exosomatic sensors to our nervous systems may allow us to better feel our environments and start perceiving our technological extensions as parts of our bodies, which they already are. On the other hand, poor performance of your company could now give you a real pain in the neck . . .

Distant Future

You must realize that most ER technologies suggested in this article have little to do with changing reality and everything to do with changing our perception of it. So at this point it would be better to call these techniques EP, for Enhanced Perception, and reserve the ER term for conceptualizing traditional technologies. The traditional technologies have always been aimed at improvement of human perception of the environment, from digestion of physical objects by the stomach (cooking) to digestion of info-features by the brain (time/clock). Since there is hardly any functional difference in how and at what stage the clock face and other images are added to our view of the world, and as the technologies will increasingly intermix, the more appropriate term may be Enhanced Interface of Self with the Environment and, as in the case of biofeedback, the Enhanced Interface of Self with Self. With future waves of structural change dissolving the borders between self and environment, the term may generalize into Harmonization of Structural Interrelations. Still later, when interfaces become so smooth and sophisticated that human-based intelligence will hardly be able to tell where a system ends and interface begins, we'd better just call it Improvement of Everything. Immediately after that, we will lose any understanding of what is going on and what constitutes an improvement, and should not try to name things anymore. Not that it would matter much if we did . . .

Social Implications

We can imagine that progress in human information processing will face some usual social difficulties. Your angry "Klingon" relatives may find unexpected allies among "proboscically enhanced" (aka big-nosed) people protesting against using their alternative standard of beauty as a negative stereotype. The girl next door may be wary that your "reclothing" filters leave her in Eve's dress. Parents could be suspicious that their clean-looking kids appear to each other as tattooed skin-heads that they have replaced their obscenity masks with the popular "Beavis and Butthead" obscenity enhancement filter. Extreme naturalists will demand that the radiant icons of the Microsoft logo and Coca-Cola bottle gracefully crossing their sky should be replaced by sentimental images of the sun and the moon that once occupied their place. Libertarians would lobby their governments for the "freedom of impression" laws, while drug enforcement agencies may declare that the new perception altering techniques are just a technological successor of

simple chemical drugs and should be prohibited as not providing an approved perception of reality.

My readers often tell me that if any version of Enhanced, Augmented, or Annotated Reality gets implemented, it might be abused by people trying to manipulate other people's views and force perceptions upon them. I realize that all human history is filled with people's attempts to trick themselves and others into looking at the world through the wrong glasses. New, powerful technologies may become very dangerous tools if placed in the wrong hands, so adding safeguards to such projects is more than important.

Unfortunately, a description of any idea sufficiently complex for protecting the world from such disasters wouldn't fit into an article that my contemporaries would take time to read. So I just do what I can—clean my glasses and observe the events—and share some impressions.

Acknowledgments

I am grateful to Ron Hale-Evans, Bill Alexander, and Gary Bean for inspiration and for discussions that helped me shape this text.

The Impossible Dream

Steven Barnes

The word "impossible" received new shadings in the 19th century. Three of my favorites:

First, from an 1857 essay on poetry by Guissipi Mazzini, "Byron and Goethe":

> There is no absolute type on earth: the absolute exists in the Divine Idea alone; the gradual comprehension of which man is destined to attain; although *its complete realization is impossible* on earth; earthly life being but one stage of the eternal evolution of life, manifested in thought and action; strengthened by all the achievements of the past, and advancing from age to age towards a less imperfect expression of that idea. Our earthly life is one phase of the eternal aspiration of the soul towards progress, which is our law; ascending in increasing power and purity from the finite towards the infinite; from the real towards the ideal; from that which is, towards that which is to come. In the immense storehouse of the past evolutions of life constituted by universal tradition, and in the prophetic instinct brooding in the depths of the human soul, does poetry seek inspiration.

Second, the following:

In 1844, Samuel Morse talked the United States Congress out of $30,000 needed for an experimental telegraph line between Washington and Baltimore. The common wisdom was that such an enterprise was utter foolishness—an absolute impossibility. Remarkably, Morse's technical abilities exceeded his powers of verbal persuasion. Once decoded, the dots and dashes of that first message read: *"What God Hath Wrought."*

Third and finally, Sherlock Holmes said, "When you have eliminated the impossible, whatever remains, however improbably, must be the truth."

We will return to that thought.

We've come so terribly far, so quickly. Humanity often seems like a man running down the side of a mountain, afraid that the attempt to halt might bring disaster. But it is vital to occasionally stop, to contemplate the nature and progress of our existence. Otherwise we may ignore evidence of grave trouble—or become so enmeshed in the day to day stresses that we miss the sweetness of impending victory.

Consider, please:

In 77 AD, Pliny the Elder completed his *Naturalis Historia*, summarizing Roman learning in the fields of astronomy, geography, botany, agriculture, medicine, geology, stones, metals and their uses in art and technology. It was, in essence, the first encyclopedia. Hand copied on scrolls, it was available only to the cream of the intellectual elite.

In 1455, Johannes Gansfleisch zur laden zum Gutenberg of Mainz completed his masterpiece, a version of the Latin bible with his *moveable type printing press*. It was the first real step toward making information available to all. This first attempt, his Mazarin Bible, was so expensive to print it *bankrupted* him.

Today, a compact disc costs about a dollar to press. A typical "Library" CD, with full cross referencing and search capacities, holds about 300 books. A single CD-ROM has the potential to store over 522 megabytes—over a *quarter million* pages.

What does this imply for the future of humanity?

Linguistic scientists have proven that no individual can "create a language." In other words, the pseudo-languages individuals devise all bear certain hallmarks that distinguish them from the structural syntax of living human language.

In one sense, civil laws and international treaties are attempts to resolve conflicts without resorting to violence. Instead of being created by a billion daily interactions between human beings, such laws and treaties are the result of "experts" engaged in acts of conscious creation. A synthetic tongue.

Language is a dialogue between individuals bent on communication, and wars result from individuals and groups who have no more efficient or desirable means of achieving their aims. In other words, wars take place when negotiation, or language, fails. It has been noted that in prison populations, there is an inverse correlation between range of vocabulary and violence of crime.

Call it the "Billy Budd" syndrome, where the inability to express needs, rage, or frustration in words leads to the communication of emotion through direct physical action.

Suppose, for a moment, that nations have no future. That nations, per se, are geopolitical entities whose death knell was sounded by the telegraph—by the ability, in other words, to instantaneously speak across any given distance. They will rage on for another hundred years or so, but are, in the main, dinosaurs whose bellowing death knells are filled with sound, and fury, and requests for directions to the nearest tar pit.

Even today, a single individual might belong to five or six organizations, each of which is more powerful than many nations: the Catholic Church, an interna-

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tional union, Standard Oil, the United States, and perhaps the Masons. Each claims a different level of allegiance, each offers different rewards and extracts a different price—but only one is bounded by geography.

Alvin Toffler talks about the different evolutionary stages of the concept of wealth. Wealth as food, as land, as gold, as power—and, at the close of the 20th century, wealth as information. And information is the only form of wealth that can be shared without dilution. Knowledge of how to read, maintain your health, make love, raise healthy children, complete a 1040—these things are wealth. None diminish in the sharing. In fact, sharing knowledge of lovemaking can have positively spectacular results, most of which are, unfortunately, beyond the scope of the afternoon's symposium.

Some say that the popularization of online computer services will make books obsolete. Hardly—no more than television made film obsolete, or film made stage plays obsolete—all that happens is that the market share shifts. Often, the entire market expands.

The person who can access a dozen different sources of information can act with more speed and flexibility than the person who can use only one or two. Those who can use books, television, computers, radio, or the Internet with equal facility are less dependent upon the largess and integrity of strangers—and far less vulnerable to censorship and propaganda. He can act with far greater flexibility and speed.

And in the business world, obtaining a crucial piece of information twenty-four hours before a competitor constitutes a devastating advantage. The future belongs to those who can read, and hear, and see, and think.

Sociobiologically, a society is that group within which information flows freely, its boundary defined by an interruption of this information flow.

It seems that the human mind works in two basic manners: to find similarities between, and differences among. What is me and what is not-me. Differences lead to war. Similarity leads to love, understanding, and spiritual union.

The truth is that we have a need to understand and be understood. We have a need to speak, to sing, to dance, to write, to share our unique perceptions of the world. The teacher wants to share her passion for learning, the dancer to share the ecstasy of human movement.

A mother wants to open the world to her children, to show them the things she has seen.

Why? Partially out of pure love. And partially from selfishness. We know that we are going to die. The more closely we bond to our friends and loved ones, the less we are afflicted by existential despair.

The truth is that our hunger for communication is no less important than the urge to breathe, to eat, to make love. It has, until this point in our history, simply been less imperative.

There is food enough for all, if only we could find the means of distribution.

There is a common threat to air and water, and we must convey our concerns to the industrial giants who stride our planet. They are not evil. They are the shadows of men and women who strive to create wealth and jobs and safety for our children. Corporations are a kind of organism, possessed of an urge to survive and grow and reproduce, even if they are not quite conscious beings. We must tell them that they have won the war with mother earth. It is time to negotiate an honorable peace.

The prospective parents of the world must be told that we need children—but we do not need to create six children to guarantee that one will survive to reproduce. Communicating an idea this radical will require all of the integrity, energy, and compassion we have. Massive reproduction is a basic part of our genetic heritage, a holdover from a time when nature's dispassion took a far greater toll.

A computer running Windows software, complete with fax/modem and CD-ROM drive can be obtained for under 1000 dollars. This means that any group of five families can pool their resources, and for less than 250 dollars each, have personal access to information equal to the Library of Congress. Never in human history has such a possibility existed.

You can pick up a cellular telephone and talk to someone in Tanzania—without censorship or government intervention.

1880—*La Telescope Electrique* is the first book ever written about television.

1928—WGY, a General Electric station located in Schenectady, New York, begins the first regular schedule of programs on May 11.

Throughout most of our history, small groups of human beings created their own myths about the nature of human life and its place in the universe.

Joseph Campbell's ground-breaking work proved that there was a common thread running through all human culture, whether Eskimo or Ubangi, Celtic or Aztec. He called this thread the Hero's Journey. The Hero's Journey is the story of our progress from birth to death, inclusive of the challenges, victories, failures, lessons, loves and agonies of life. It is absolutely universal, and no matter how it may manifest, world mythology carries the same message.

Only the individual expressions of the journey are different and tailored to the needs of small social groups the world over. The creation of television, the most powerful communications medium the world had ever seen, was both blessing and curse—a curse in the sense that a few small groups of human beings had control of

the myth-making machinery for the rest of the culture and the power to project those myths so convincingly that they appeared to be reality. As realer than real. After all—in the 1970s, experiments were conducted in which a live lecturer spoke to a class while his image was simultaneously broadcast into the room over a television set. *And all of the students watched the television!*

1969 was an incredible year. On July 20 of that year, Neil Armstrong took a small step that was a giant leap for mankind.

In August of that same year, the Woodstock Music and Art Fair in the Catskill Mountains at Bethel, N.Y., drew 300,000 youths from all over America for four days of Jimi Hendrix, Joan Baez, Ritchie Havens, The Jefferson Airplane, The Who, The Grateful Dead, Carlos Santana, and other rock stars. Despite traffic jams, thunderstorms, and shortages of food, water, and medical facilities, the gathering was orderly, filled with a profound sense of loving and sharing.

And that same year, the Department of Defense Advanced Research Projects Agency—ARPA—created the ARPANET. ARPANET was designed to link university and government researchers working on defense projects. ARPANET grew up—way up. Today, we call it the Internet.

Today, over a million new computers log onto the Internet every month. It is a nonlinear information network impossible to police, linking every nation in the world into a neural web nearing the complexity of a living organism.

You can access the Internet, and post a question on any subject, and within minutes get answers from around the world.

Do you want to learn faster and better than you ever have in your life? Over the Internet, you can find a Polish company called SuperMemo World, which sells a computer program which increases learning efficiency to very near the theoretical maximum of the human brain—10 to 50 times faster than any other method. The software is unavailable in the United States (questions about it can be directed to me at lifewrite@aol.com). This is a small company, struggling to survive in the aftermath of the fall of communism. Its president, Piotr Wozniak, speaks in a language familiar to the American business community. He dreams of profits and growth, of building an empire and a family, of contributing something to the history of the world.

How many other businesses around the world will find customers only through the Internet and the World Wide Web? There is no way to estimate.

And how many will find friends? Lovers? Support for political movements? Intellectual stimulation? Financial backing for new enterprise? There is no way to estimate.

Never, ever, has an opportunity like this existed.

If nations exist to protect geographic boundaries which are growing less important all the time . . .

If human beings resort to violence only when there are no more efficient means of obtaining what they want . . .

If communication is seen as the ability to convey with greater and greater clarity our desires, needs, and view of existence . . .

Then the exploration of electronic communications mediums creates, for the first time, a central nervous system for the body human. The tribe living just over the hill have always been baby-eaters and barbarians. When we can speak to them personally, we can see and feel the commonalities for ourselves. We get to see that they are more "Us" than "Not-us," and with that knowledge subsides some of the automatic and universal fear and loneliness.

And we can take another step toward our ultimate global destiny.

The printing press, the radio, television. And now emerges a new mutant technology which will combine and surpass all of these. It will enable five billion very individual human beings to have a single congruent view of human nature and existence. Able to live in Seattle and work in Singapore. Able to spend three thousand dollars and have access to 90% of the accumulated knowledge of humanity.

It is, quite literally, the age that humanity has looked forward to since the dawn of time. The Age of Communication, future generations will call it.

We are reaching a threshold, a line of demarcation, and on the other side of that line we will finally confront the true nature of Man. Some of us look forward to that confrontation with trepidation. What is that true nature? Is it confusion? Hatred and war? Selfishness?

Perhaps.

But the suffering and pain of human existence, all of the cruelties and indignities we heap upon each other arise from two simple facts: Every human being on this planet feels alone and afraid. With communication we can reach out. We can push back the darkness. We can satisfy our needs for food, water, shelter, and sex. Then, we can go beyond them to intellectual expression, and freeing of the human spirit.

Psychologist Abraham Maslow suggested that basic human needs must be met incrementally. Those basic needs would be, in order: survival, food, water, shelter, sex, clothing, emotional connection—and then communication. But the basic needs must be met or it is impossible to move on to the next level.

Ah, the word *impossible* again.

Remember what Sherlock Holmes said?

"When you have eliminated the impossible, whatever remains, however improbable, must be the truth."

We have seen the impossible become real. We've seen the collection of scattered and secret knowledge. The production of books by the hundreds of millions. "What God hath wrought," finally flashing across the continent in dots and dashes. Spoken words and pictures flying through the air. Man walking on the moon. A city of 300,000 without a single violent crime. And instantaneous economical communication between any two human beings who can access a computer and a telephone line.

Is it more "impossible" than these to think that most human beings, offered alternatives to darkness, pain and loneliness, would not embrace light, and love, and joy?

Not impossible. Merely unlikely. Improbable.

And, when you have eliminated the impossible, whatever remains, however improbable . . .

Must be the truth.

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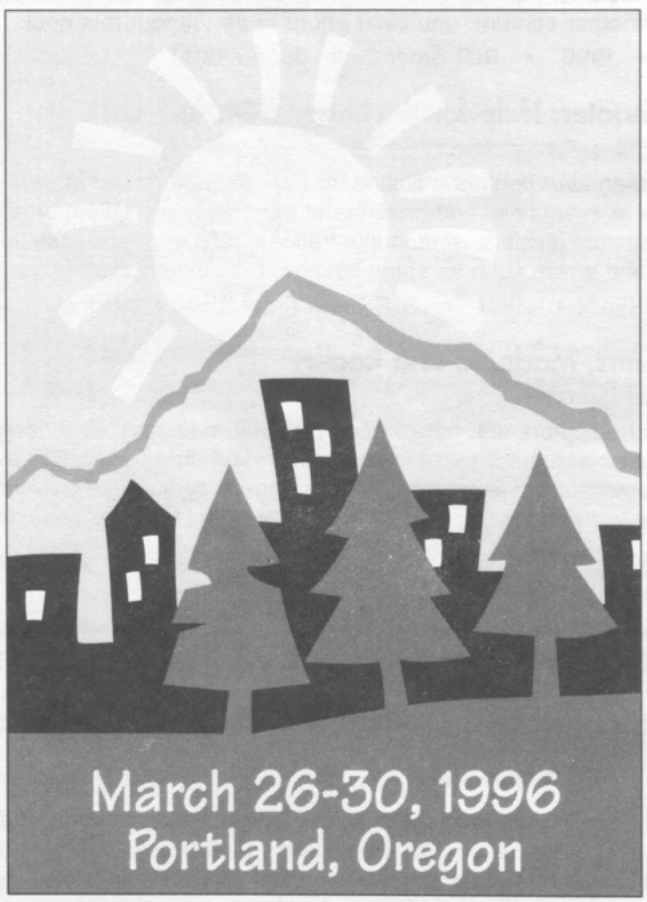

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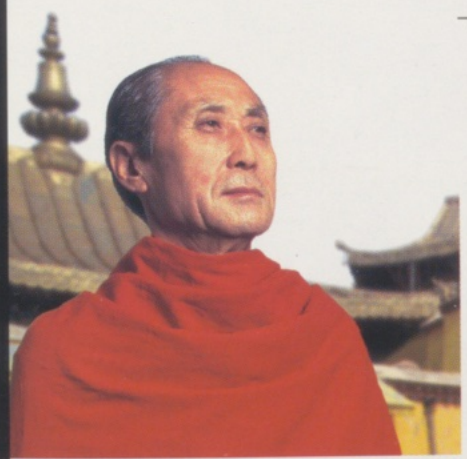

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