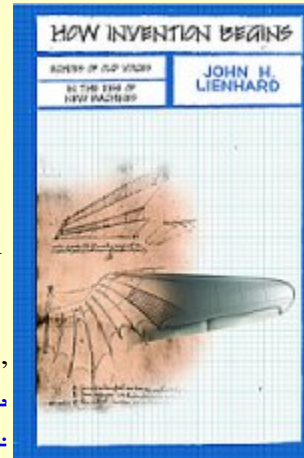


The text below is the transcript of a talk that I gave back in 1998. If the future of an Internet-served world is unclear now, it was very nearly opaque back then.

For that reason, I recommend a look at Chapter 10 of my new book, *How Invention Begins*. There, I have revisited and expanded upon the ideas that I first developed in this old talk.

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WHAT PEOPLE SAID ABOUT BOOKS IN 1498

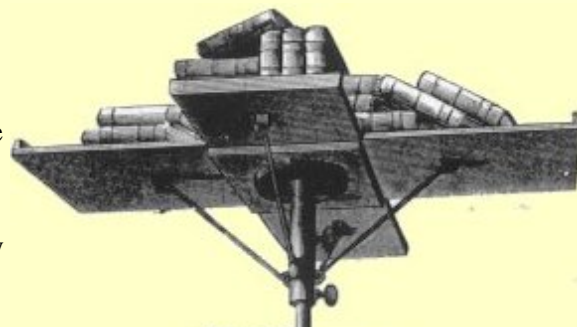
For the Indiana Library Federation 1998 Annual Conference.,
Libraries at the Crossroads: Changes, Choices, & Challenges
Indiana Convention Center, Indianapolis, 12:30 PM, Mon., April 7, 1998

Also for the MENSA Gulf Coast Regional Gathering, Sun., May 24, 1998

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In the year 1456, Johann Gutenberg and Peter Schoeffer printed their great Bible. Now the question: How many new books do you think had been printed by 1498, 42 years later, and just 500 years ago? Some of you may know, but most people I talk with, even most librarians, are astonished when they hear the number.

Five hundred years ago, the new presses had spread like brushfire through Europe. The people had suddenly come into possession of some fifteen million new books. Scholars argue about the number. It could've been as few as eight million or as many as twenty four. But the output of new



books had been staggering by any reasonable estimate. And those books reflected some thirty thousand titles.

Five hundred years ago we had been whacked in the chops by an enormous technological shift, make no mistake. The social order hadn't been unthreaded quite yet, but it was about to be turned inside-out. Fifteen million books had been flung into a world where scholars would travel miles to visit a library stocked with twenty hand-written volumes. And it'd all happened in 42 years or a little more. Let's see if we can put that in perspective.

Where were we, you and I, 42 years ago? Of course a great many of you hadn't been born yet. But 1956 was the year I began my PhD studies in engineering at Berkeley. Five years later I graduated without ever having seen a computer close up. Big mainframes were around, but only rarefied cognoscenti got near them. Let me give you a little time-line here:

The programmable computer, first conceived by Charles Babbage in the 1830s, wasn't finally built until the 1930s. At first, we used fragile radio tubes in its logic circuits. Soon after WW-II, we figured out how to replace those bulky, failure-prone tubes with the new transistors. Then the real fun could begin.

The computer of 1956 was a huge isolated machine. In 1943 Thomas Watson, Chairman of IBM, had said, *I think there's a world market for maybe five computers.* With that kind of thinking, no one paid much attention in 1952 when a British scientist named Dummar wrote this:

It seems now possible to envisage electronic equipment in a solid block with no connecting wires. The block may consist of layers of insulating, conducting, rectifying and amplifying materials, [and] electrical junctions.

The subtle meaning of Dummar's remark came clear as computers grew more complex. When an electronic element in a computer had -- say -- one chance in ten thousand of failing during a day's use, and the computer had ten thousand elements, maintenance was a nightmare. Dummar's idea of casting a set of electronic functions into one monolithic electric element stood to vastly reduce failures. In July, 1958, Jack Kilby of Texas Instruments finally created such an integrated circuit. A few



months later, Robert Noyce, head of Fairchild Semiconductor Corporation, created a slightly better version, independently. And a patent war was underway.

Fairchild and TI dumped money into the courts for years before they saw how foolish their combat was. They finally agreed to forget the lawyers and share the idea. Kilby and Noyce acknowledged one another's contributions, and life went on. That was a very wise thing to do.

By 1969, both Fairchild and TI had managed to put complete central processing units on single chips. Then Noyce formed a new company, INTEL, for **IN**Tegrated **E**lectronics, and he started producing whole computer mother-boards. Costs plunged. Integrated circuits first really touched our lives a few years later when we all started carrying pocket calculators. But none of us yet had a clue where all this was going. Even with a calculator in his pocket, the president of Digital Equipment Company could say, as late as 1977, "There's no reason people would want computers in their homes."

Then came a key invention -- one whose radical character we still don't explicitly acknowledge: I speak of the invention of modern software. Software made it possible for you and me to use our computers without writing their programs. At that point computers promptly did enter our homes, and they were soon entering the closest quarters of our daily lives as well.

Now, if we're to form a proper analogy with the new printed books, I think this is where to do so. The software-supplied personal computer did to the old mainframe computer what the printed book did to the manuscript book. We're less than twenty years into that revolution, so we seriously need to ask ourselves what people said in the first years of printing. Print certainly transformed us as few if any other technologies ever have. So let's compare what smart people were doing with and saying about the new books pouring into their world, with what we say as PCs pour into ours.

Actually, for a full thirty years after Gutenberg, people did little more with his idea than produce classical and religious books in the same style they always had. It was the mid-1480s, one full generation, before printers tried to do anything more than blatant counterfeiting of the profitable old manuscript books. Around 1484 the first scientific illustrations started turning up in the incunabula. The first subject of the new fully-representational block prints was botany. It was also right about this time that printers began offering secular books in local languages to their new mass market.

The revolution brought on by the printing press began after a full generation of book printing. (Remember now: we're living only a half-generation beyond the invention of software.) In any case, printers themselves were first to comment on changes being wrought by print, and what they had to say is a big disappointment.

In 1498, title page information still appeared in a colophon at the end of a book. Some early printers expanded on that in a more personal note -- a little like a medieval *explicit*. Explicit were personal notes that scribes were allowed to write at the end, when they finished a handwritten manuscript.

The new printers began adding such notes to their colophons. They would talk about how many books they could now make and how accurately they could make them. But that was advertising; it wasn't social commentary. It wasn't a diagnosis of contemporary social change. A few German writers, fed up with the cultural superiority emanating out of Italy, boasted about German printers.

The closest thing to analysis of the revolution that I've been able to find was something Sebastian Brant wrote just after 1500.

In our time, thanks to the talent and industry of those from the Rhine, books have emerged in lavish numbers. A book that once would've belonged only to the rich -- nay, to a king -- can now be seen under a modest roof. ... There is nothing nowadays that our children ... fail to know.

That remark is interesting. Brant primarily addresses the availability of books. Does he see how all those books are pulling the threads out of medieval social fabric? He does say "there is nothing nowadays that our children ... fail to know." But he speaks in the same *Gee Whiz* voice we're hearing from our schools today. I doubt he begins to see that the very quality of human thought is undergoing radical upheaval.

Back to that notion of a medieval explicit for a moment: In 1474, William Caxton finished volume three of his translation of the histories of Troy. Caxton's explicit sounded like something any scribe might've written. "My pen is worn, mine hand heavy, mine eye even dimmed." But Caxton's explicit was a turning point, because Caxton had *done* something about his tired hand and his dimming eye. The next line of his explicit sends a shiver along my spine.

*... because I have promised [this book] to divers gentlemen
... therefore I have practiced and learned ... to ordain this ...
book in print ... it is not written in pen and ink as other
books are.*

Caxton was English. In 1442 he'd gone to Bruges in the Duchy of Burgundy as apprentice to a merchant. Caxton did well in that great European cultural center. By the time Gutenberg printed his great Bible, Caxton was wealthy, and he'd begun collecting hand-written books. And so he entered the service of Margaret, Duchess of Burgundy. Margaret was a noted scholar and arbiter of good taste in literature.

When Margaret authorized him to translate the histories of Troy, the first two volumes were very popular. Margaret kept asking for copies. Caxton had to write

each one out by hand. So Caxton learned some of the new art of printing, and he invented the rest. His printing looked crude alongside Gutenberg's craftsmanship. The early European printers were fine technicians and only so-so scholars. Caxton was only a fair technician, but he reshaped the very purpose of literature as he printed.

If it plesse any man spirituel or temporel to bye any
 pyes of two and thre comemoracions of salisbury use
 enpryntid after the forme of this prelet lettre whiche
 ben wel and truly correct, late hym come to westmo-
 nester in to the almonestye at the reed pale and he that
 haue them good chepe .x.

Supplico flet cedula

Bodleian Library, Oxford.

FACSIMILE OF CAXTON'S ADVERTISEMENT OF HIS BOOKS

After his third printed book, Caxton left Burgundy and set up England's first press at Westminster Abbey. There he changed the rules of the game. European printers had given patrons what they expected -- fine copies of Latin and Greek manuscripts. None of that for Caxton! He knew books must interact with living readers. He published in English -- *The Canterbury Tales*, a French-English dictionary, romances. He was preparing his one-hundredth title when he died in 1491.

Caxton's England was a cultural backwater, but he helped change that. He did far more than just take up printing. He reconnected high culture with the people and set the stage for Shakespeare. When Caxton took books to the people, he changed the meaning of the new technology.

Yet all he'd set out to do was mechanize a laborious task. Was he a visionary? I don't think so. He merely suffered from writer's cramp. Technology is like that. We don't understand what the synergy between ourselves and our machines is doing until it's done.

One of the first people who caught on was the humanist scholar Erasmus. Erasmus used the new print medium to shape his own image as well as to promote his ideas. Some scholars have called Erasmus the first *spin doctor*. He worked hand in glove with the great Swiss printer, Froben. He knew that print meant a whole lot more than increased production. Finally, in 1517, he cried out, "Immortal God, what a world I see dawning. Why can I not be young again?"

That was *61 years* after Gutenberg. If it takes us that long to realize that the computer is no mere tool for speeding communication, we'll be in real trouble. Let

me tell you the strange tragicomical tale of Menocchio:

The miller Menocchio was born in 1532 -- 76 years after Gutenberg. He was a friendly, loquacious fellow, always shooting off his mouth. Menocchio could read, and he knew those new books held wonderful secrets. Historian Carlo Ginzburg tells how he read and talked. He spent his precious money on precious books. He swapped books with literate friends in other towns. The words made only patchwork sense to him, but those bits and pieces of learning obsessed Menocchio. He collared friends on the street to harangue them about the Trinity, the Virgin Birth, and cosmic origins.

Finally, of course, the Italian Inquisition haled him into court. "Keep your mouth shut," his family told him. Menocchio tried but couldn't. He faced a panel of real scholars who were ready to listen. He faced a notary who would write down every word. It was a dream fulfilled. Menocchio talked -- and talked.

His theology violated all orthodoxy. It contradicted itself. It was earthy and filled with rich metaphors. He'd created a cosmology of putrefaction. The heavens, he said, formed when the vast primordial chaos curdled into planets and stars -- the way cheese curdles out of cream. Angels came into being in this ferment -- the way worms appear in rotting cheese. (Now, as telescopes reach the far fringe of the universe, that sounds less silly. For now we can see stars curdling out of the chaos of 15 billion years ago, just as Menocchio imagined.)

As Menocchio talks, we hear random echoes from all the great forbidden books of his age -- the *Vulgate Bible*, the *Decameron*, the *Koran*. He's angry at the Church for controlling all that knowledge. His anger keeps spilling out. The court found Menocchio guilty of heresy and threw him in prison for life. Three years later, a sick and thoroughly chastened Menocchio convinced authorities he'd changed. They released him. He went back to work.

But those beautiful new printed books were still there, and he was soon talking again. This time the trial was shorter. This time they subjected Menocchio, now 67, to a half-hour of torture. In the end, they burned him at the stake.

Menocchio had been seized by the magic of the new technology of printing. Today, we read those old court records in a book. Now Menocchio speaks to scholars once more, for the printed book has let him outlive his inquisitors. Today, he really does charm scholars. Menocchio finally takes his own place in the very medium that changed history -- at the same time it ended his simple life.

What did the new books really do? We spend so much time praising them that we overlook the mischief. The new books led us to rediscover the writings and values of classical Greece. As part of that we coupled Aristotle's almost-forgotten observational science with the new widespread use of block-print illustration -- soon followed by more refined copperplate engravings.

Medieval scholarship had been Platonist through and through. For those of you who know the Myers-Briggs test, Medieval scholars were dominantly N-types, not S-types. They looked inside their mind for understanding, not to the outside world. But the message embedded in all those books was that knowledge comes from outside ourselves. The new scientists of the 16th century all became Aristotelian S-types.

That led to the creation of a whole set of new observational sciences -- botany, anatomy, geography, ethnography. It also led us away from the deductive philosophies. We had to wait for a crypto-chemist named Isaac Newton to create a new synthesis of internal and external thinking.

So the new books stirred science up and redirected it. That new direction was a bit mono-thematic and limited. Nevertheless, science needed a shaking up at that point, and science got a shaking up. But other dimensions of classical Greek thinking were a lot more sinister. Hellenic civilization had highly honed such institutions as slavery, male dominance, and organized war.

Now those values came back with a vengeance. The new Central-European Protestants were the first and major book printers, and they were also the worst of the new witch-burners. Don't for a minute think that the new book-readers were an entirely enlightened people. Books meant trouble. People derived all kinds of mischief from them. Like Menocchio, they caught bits and pieces, and they drew all kinds of strange conclusions out of those bits and pieces. So let's come back to our question:

What did people say in 1498? Well, they said only, "How wonderful it is to have all these new books." Those same people were engaged in turning the known world inside out, but they didn't for a minute see what they were doing.

And what are people saying in 1998? Well, we've watched technology turning us inside out for about 200 years now. So we expect the computer to change us. But technology has never been predictable. We always miss the point. Visionaries looked at transportation in 1948 and predicted we'd have a helicopter in every garage by 1960. They looked at the new computers in 1960 and predicted that one big mother computer would organize the world by 1980. We never get the future right.

Today, visionaries fall oddly quiet while the rest of us run about saying Gee Whiz, look at how much information our children can access. The real changes that the computer is bringing about are changes in the way we see reality. And we do not yet have an adult generation that's known the computer from the cradle. All of us see the computer against the background of the not-computer. All of us typed before we word-processed. All of us learned the algorithms of arithmetic before we used hand calculators. All of us see the PC against the backdrop of a world without it. What we cannot see at all is how a mind will work when it's never known anything but the

PC.

What did they say in 1498? In the end it doesn't matter, because it was -- *ipso facto* -- useless commentary. For everyone looking at the new books in 1498, the future was as hopelessly unpredictable as it is now. We cannot have a clue as to what any technological future will be until we learn it from a new generation of users. The new generation of computer users will be one for whom spelling exercises and long division and drafting and ledger books are no more than words cropping up, now and then, in old novels.

But (and here's the big catch) we're completely responsible for shaping a future that no one can begin to predict. And, more than anyone else, it is we teachers, librarians, and the other managers of information who will shape the future. How are we supposed to do that? How are we supposed to shape a future we cannot predict?

The answer lies in riding the present so that it turns into a decent future. I'll finish by suggesting that we let three principles guide us as we try to do that.

1.) **Seek out our ignorance.** I believe it was poet Wallace Stevens who said, *To impose is not to discover*. We have to identify what it is we don't know. The troublemaker in times like this is the expert, confident in his ability to read the crystal ball. The beginning of wisdom is delineating our own ignorance.

2.) **Good people make good machines. Bad people make bad machines.** That simplistic message comes at me again and again in everything I learn about technological change. Technology lies right next to the human heart. If we create a good future with our machines, it will be because we've genuinely cared about the people we've served as we've worked.

3.) **Don't try to plan the future.** We cannot plan what cannot be predicted. We cannot adhere to long-term plans in a shifting technological climate. All that does is to delay inevitable change until it has to occur catastrophically instead of by evolution. What we can do is create a flexible present so the future can bend and follow a path that'll come out in a good place.

You've subtitled your conference *Changes, Choices, & Challenges*. As I face the winds of today's astonishing array of changes, challenges and choices, I can only hope to be like the willow tree and not the oak -- to bend and flex and not to break. I can only hope to remember how everyone missed the point in 1498.

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It is a not-insignificant footnote to my comments on what people were saying in the late 15th century that I obtained much of the source material for it from the EXLIBRIS Listserv. EXLIBRIS is an internet bulletin board for rare-books people that uses late-20th-century technology to share information about old books.

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Many facsimile volumes of Caxton's works are available. Check your local library. The actual title of his first printed book was *Recuyell of the Trojan Histories*. (*Recuyell* is an old French word meaning "collection.")