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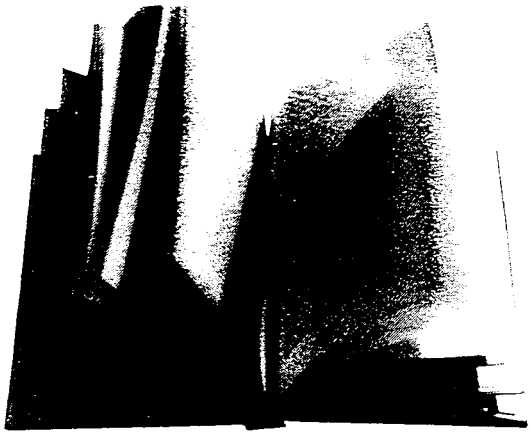
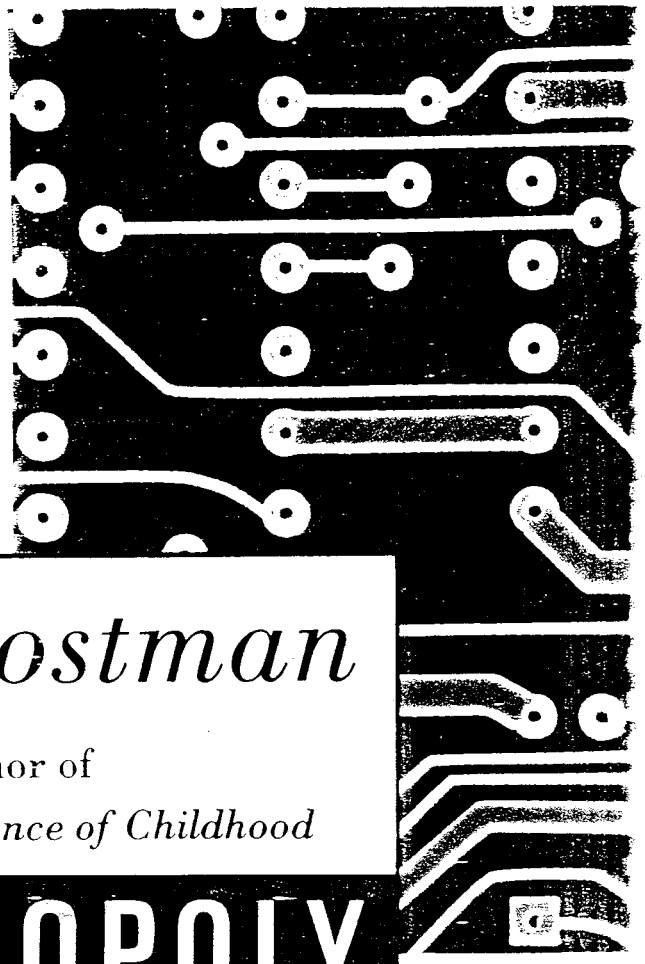




Neil Postman

author of

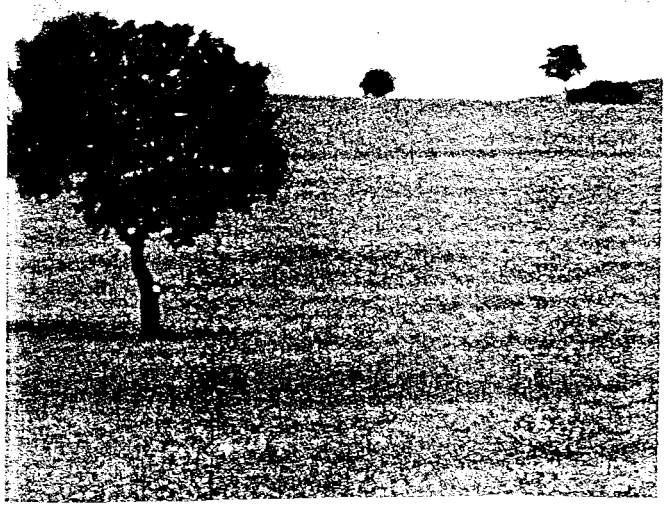
The Disappearance of Childhood

TECHNOPOLY

The Surrender of Culture to Technology

"A provocative book . . . a tool for fighting back against the tools that run our lives."

—*Dallas Morning News*



1

The Judgment of Thamus

You will find in Plato's *Phaedrus* a story about Thamus, the king of a great city of Upper Egypt. For people such as ourselves, who are inclined (in Thoreau's phrase) to be tools of our tools, few legends are more instructive than his. The story, as Socrates tells it to his friend Phaedrus, unfolds in the following way: Thamus once entertained the god Theuth, who was the inventor of many things, including number, calculation, geometry, astronomy, and writing. Theuth exhibited his inventions to King Thamus, claiming that they should be made widely known and available to Egyptians. Socrates continues:

> Thamus inquired into the use of each of them, and as Theuth went through them expressed approval or disapproval, according as he judged Theuth's claims to be well or ill founded. It would take too long to go through all that Thamus is reported to have said for and against each of Theuth's inventions. But when it came to writing, Theuth declared, "Here is an accomplishment, my lord the King,

which will improve both the wisdom and the memory of the Egyptians. I have discovered a sure receipt for memory and wisdom." To this, Thamus replied, "Theuth, my paragon of inventors, the discoverer of an art is not the best judge of the good or harm which will accrue to those who practice it. So it is in this; you, who are the father of writing, have out of fondness for your off-spring attributed to it quite the opposite of its real function. Those who acquire it will cease to exercise their memory and become forgetful; they will rely on writing to bring things to their remembrance by external signs instead of by their own internal resources. What you have discovered is a receipt for recollection, not for memory. And as for wisdom, your pupils will have the reputation for it without the reality: they will receive a quantity of information without proper instruction, and in consequence be thought very knowledgeable when they are for the most part quite ignorant. And because they are filled with the conceit of wisdom instead of real wisdom they will be a burden to society."[1]

I begin my book with this legend because in Thamus' response there are several sound principles from which we may begin to learn how to think with wise circumspection about a technological society. In fact, there is even one error in the judgment of Thamus, from which we may also learn something of importance. The error is not in his claim that writing will damage memory and create false wisdom. It is demonstrable that writing has had such an effect. Thamus' error is in his believing that writing will be a burden to society and *nothing but a burden.* For all his wisdom, he fails to imagine what writing's benefits might be, which, as we know, have been considerable. We may learn from this that it is a mistake to suppose that any technological innovation has a one-sided effect. Every technol-

ogy is both a burden and a blessing; not either-or, but this-and-that.

Nothing could be more obvious, of course, especially to those who have given more than two minutes of thought to the matter. Nonetheless, we are currently surrounded by throngs of zealous Theuths, one-eyed prophets who see only what new technologies can do and are incapable of imagining what they will *undo*. We might call such people Technophiles. They gaze on technology as a lover does on his beloved, seeing it as without blemish and entertaining no apprehension for the future. They are therefore dangerous and are to be approached cautiously. On the other hand, some one-eyed prophets, such as I (or so I am accused), are inclined to speak only of burdens (in the manner of Thamus) and are silent about the opportunities that new technologies make possible. The Technophiles must speak for themselves, and do so all over the place. My defense is that a dissenting voice is sometimes needed to moderate the din made by the enthusiastic multitudes. If one is to err, it is better to err on the side of Thamusian skepticism. But it is an error nonetheless. And I might note that, with the exception of his judgment on writing, Thamus does not repeat this error. You might notice on rereading the legend that he gives arguments *for* and *against* each of Theuth's inventions. For it is inescapable that every culture must negotiate with technology, whether it does so intelligently or not. A bargain is struck in which technology giveth and technology taketh away. The wise know this well, and are rarely impressed by dramatic technological changes, and never overjoyed. Here, for example, is Freud on the matter, from his doleful *Civilization and Its Discontents:*

> One would like to ask: is there, then, no positive gain in pleasure, no unequivocal increase in my feeling of happiness, if I can, as often as I please, hear the voice of a child

> of mine who is living hundreds of miles away or if I can learn in the shortest possible time after a friend has reached his destination that he has come through the long and difficult voyage unharmed? Does it mean nothing that medicine has succeeded in enormously reducing infant mortality and the danger of infection for women in child-birth, and, indeed, in considerably lengthening the average life of a civilized man?

Freud knew full well that technical and scientific advances are not to be taken lightly, which is why he begins this passage by acknowledging them. But he ends it by reminding us of what they have undone:

> If there had been no railway to conquer distances, my child would never have left his native town and I should need no telephone to hear his voice; if travelling across the ocean by ship had not been introduced, my friend would not have embarked on his sea-voyage and I should not need a cable to relieve my anxiety about him. What is the use of reducing infantile mortality when it is precisely that reduction which imposes the greatest restraint on us in the begetting of children, so that, taken all round, we nevertheless rear no more children than in the days before the reign of hygiene, while at the same time we have created difficult conditions for our sexual life in marriage. . . . And, finally, what good to us is a long life if it is difficult and barren of joys, and if it is so full of misery that we can only welcome death as a deliverer?[2]

In tabulating the cost of technological progress, Freud takes a rather depressing line, that of a man who agrees with Thoreau's remark that our inventions are but improved means to an unimproved end. The Technophile would surely answer Freud

by saying that life has always been barren of joys and full of misery but that the telephone, ocean liners, and especially the reign of hygiene have not only lengthened life but made it a more agreeable proposition. That is certainly an argument I would make (thus proving I am no one-eyed Technophobe), but it is not necessary at this point to pursue it. I have brought Freud into the conversation only to show that a wise man—even one of such a woeful countenance—must begin his critique of technology by acknowledging its successes. Had King Thamus been as wise as reputed, he would not have forgotten to include in his judgment a prophecy about the powers that writing would enlarge. There is a calculus of technological change that requires a measure of even-handedness.

So much for Thamus' error of omission. There is another omission worthy of note, but it is no error. Thamus simply takes for granted—and therefore does not feel it necessary to say—that writing is not a neutral technology whose good or harm depends on the uses made of it. He knows that the uses made of any technology are largely determined by the structure of the technology itself—that is, that its functions follow from its form. This is why Thamus is concerned not with *what* people will write; he is concerned *that* people will write. It is absurd to imagine Thamus advising, in the manner of today's standard-brand Technophiles, that, if only writing would be used for the production of certain kinds of texts and not others (let us say, for dramatic literature but not for history or philosophy), its disruptions could be minimized. He would regard such counsel as extreme naïveté. He would allow, I imagine, that a technology may be barred entry to a culture. But we may learn from Thamus the following: once a technology is admitted, it plays out its hand; it does what it is designed to do. Our task is to understand what that design is—that is to say, when we admit a new technology to the culture, we must do so with our eyes wide open.

All of this we may infer from Thamus' silence. But we may learn even more from what he does say than from what he doesn't. He points out, for example, that writing will change what is meant by the words "memory" and "wisdom." He fears that memory will be confused with what he disdainfully calls "recollection," and he worries that wisdom will become indistinguishable from mere knowledge. This judgment we must take to heart, for it is a certainty that radical technologies create new definitions of old terms, and that this process takes place without our being fully conscious of it. Thus, it is insidious and dangerous, quite different from the process whereby new technologies introduce new terms to the language. In our own time, we have consciously added to our language thousands of new words and phrases having to do with new technologies—"VCR," "binary digit," "software," "front-wheel drive," "window of opportunity," "Walkman," etc. We are not taken by surprise at this. New things require new words. But new things also modify old words, words that have deep-rooted meanings. The telegraph and the penny press changed what we once meant by "information." Television changes what we once meant by the terms "political debate," "news," and "public opinion." The computer changes "information" once again. Writing changed what we once meant by "truth" and "law"; printing changed them again, and now television and the computer change them once more. Such changes occur quickly, surely, and, in a sense, silently. Lexicographers hold no plebiscites on the matter. No manuals are written to explain what is happening, and the schools are oblivious to it. The old words still look the same, are still used in the same kinds of sentences. But they do not have the same meanings; in some cases, they have opposite meanings. And this is what Thamus wishes to teach us—that technology imperiously commandeers our most important terminology. It redefines "freedom," "truth," "intelligence," "fact," "wisdom," "memory," "history"—all the words

we live by. And it does not pause to tell us. And we do not pause to ask.

This fact about technological change requires some elaboration, and I will return to the matter in a later chapter. Here, there are several more principles to be mined from the judgment of Thamus that require mentioning because they presage all I will write about. For instance, Thamus warns that the pupils of Theuth will develop an undeserved reputation for wisdom. He means to say that those who cultivate competence in the use of a new technology become an elite group that are granted undeserved authority and prestige by those who have no such competence. There are different ways of expressing the interesting implications of this fact. Harold Innis, the father of modern communication studies, repeatedly spoke of the "knowledge monopolies" created by important technologies. He meant precisely what Thamus had in mind: those who have control over the workings of a particular technology accumulate power and inevitably form a kind of conspiracy against those who have no access to the specialized knowledge made available by the technology. In his book *The Bias of Communication,* Innis provides many historical examples of how a new technology "busted up" a traditional knowledge monopoly and created a new one presided over by a different group. Another way of saying this is that the benefits and deficits of a new technology are not distributed equally. There are, as it were, winners and losers. It is both puzzling and poignant that on many occasions the losers, out of ignorance, have actually cheered the winners, and some still do.

Let us take as an example the case of television. In the United States, where television has taken hold more deeply than anywhere else, many people find it a blessing, not least those who have achieved high-paying, gratifying careers in television as executives, technicians, newscasters, and entertainers. It should surprise no one that such people, forming as they do a new

knowledge monopoly, should cheer themselves and defend and promote television technology. On the other hand and in the long run, television may bring a gradual end to the careers of schoolteachers, since school was an invention of the printing press and must stand or fall on the issue of how much importance the printed word has. For four hundred years, schoolteachers have been part of the knowledge monopoly created by printing, and they are now witnessing the breakup of that monopoly. It appears as if they can do little to prevent that breakup, but surely there is something perverse about schoolteachers' being enthusiastic about what is happening. Such enthusiasm always calls to my mind an image of some turn-of-the-century blacksmith who not only sings the praises of the automobile but also believes that his business will be enhanced by it. We know now that his business was not enhanced by it; it was rendered obsolete by it, as perhaps the clearheaded blacksmiths knew. What could they have done? Weep, if nothing else.

We have a similar situation in the development and spread of computer technology, for here too there are winners and losers. There can be no disputing that the computer has increased the power of large-scale organizations like the armed forces, or airline companies or banks or tax-collecting agencies. And it is equally clear that the computer is now indispensable to high-level researchers in physics and other natural sciences. But to what extent has computer technology been an advantage to the masses of people? To steelworkers, vegetable-store owners, teachers, garage mechanics, musicians, bricklayers, dentists, and most of the rest into whose lives the computer now intrudes? Their private matters have been made more accessible to powerful institutions. They are more easily tracked and controlled; are subjected to more examinations; are increasingly mystified by the decisions made about them; are often reduced to mere numerical objects. They are inundated by junk mail. They are

easy targets for advertising agencies and political organizations. The schools teach their children to operate computerized systems instead of teaching things that are more valuable to children. In a word, almost nothing that they need happens to the losers. Which is why they are losers.

It is to be expected that the winners will encourage the losers to be enthusiastic about computer technology. That is the way of winners, and so they sometimes tell the losers that with personal computers the average person can balance a checkbook more neatly, keep better track of recipes, and make more logical shopping lists. They also tell them that their lives will be conducted more efficiently. But discreetly they neglect to say from whose point of view the efficiency is warranted or what might be its costs. Should the losers grow skeptical, the winners dazzle them with the wondrous feats of computers, almost all of which have only marginal relevance to the quality of the losers' lives but which are nonetheless impressive. Eventually, the losers succumb, in part because they believe, as Thamus prophesied, that the specialized knowledge of the masters of a new technology is a form of wisdom. The masters come to believe this as well, as Thamus also prophesied. The result is that certain questions do not arise. For example, to whom will the technology give greater power and freedom? And whose power and freedom will be reduced by it?

I have perhaps made all of this sound like a well-planned conspiracy, as if the winners know all too well what is being won and what lost. But this is not quite how it happens. For one thing, in cultures that have a democratic ethos, relatively weak traditions, and a high receptivity to new technologies, everyone is inclined to be enthusiastic about technological change, believing that its benefits will eventually spread evenly among the entire population. Especially in the United States, where the lust for what is new has no bounds, do we find this childlike conviction most widely held. Indeed, in America, social change of any

kind is rarely seen as resulting in winners and losers, a condition that stems in part from Americans' much-documented optimism. As for change brought on by technology, this native optimism is exploited by entrepreneurs, who work hard to infuse the population with a unity of improbable hope, for they know that it is economically unwise to reveal the price to be paid for technological change. One might say, then, that, if there is a conspiracy of any kind, it is that of a culture conspiring against itself.

In addition to this, and more important, it is not always clear, at least in the early stages of a technology's intrusion into a culture, who will gain most by it and who will lose most. This is because the changes wrought by technology are subtle if not downright mysterious, one might even say wildly unpredictable. Among the most unpredictable are those that might be labeled ideological. This is the sort of change Thamus had in mind when he warned that writers will come to rely on external signs instead of their own internal resources, and that they will receive quantities of information without proper instruction. He meant that new technologies change what we mean by "knowing" and "truth"; they alter those deeply embedded habits of thought which give to a culture its sense of what the world is like—a sense of what is the natural order of things, of what is reasonable, of what is necessary, of what is inevitable, of what is real. Since such changes are expressed in changed meanings of old words, I will hold off until later discussing the massive ideological transformation now occurring in the United States. Here, I should like to give only one example of how technology creates new conceptions of what is real and, in the process, undermines older conceptions. I refer to the seemingly harmless practice of assigning marks or grades to the answers students give on examinations. This procedure seems so natural to most of us that we are hardly aware of its significance. We may even find it difficult to imagine that the number or letter is a tool or,

if you will, a technology; still less that, when we use such a technology to judge someone's behavior, we have done something peculiar. In point of fact, the first instance of grading students' papers occurred at Cambridge University in 1792 at the suggestion of a tutor named William Farish.[3] No one knows much about William Farish; not more than a handful have ever heard of him. And yet his idea that a quantitative value should be assigned to human thoughts was a major step toward constructing a mathematical concept of reality. If a number can be given to the quality of a thought, then a number can be given to the qualities of mercy, love, hate, beauty, creativity, intelligence, even sanity itself. When Galileo said that the language of nature is written in mathematics, he did not mean to include human feeling or accomplishment or insight. But most of us are now inclined to make these inclusions. Our psychologists, sociologists, and educators find it quite impossible to do their work without numbers. They believe that without numbers they cannot acquire or express authentic knowledge.

I shall not argue here that this is a stupid or dangerous idea, only that it is peculiar. What is even more peculiar is that so many of us do not find the idea peculiar. To say that someone should be doing better work because he has an IQ of 134, or that someone is a 7.2 on a sensitivity scale, or that this man's essay on the rise of capitalism is an A − and that man's is a C + would have sounded like gibberish to Galileo or Shakespeare or Thomas Jefferson. If it makes sense to us, that is because our minds have been conditioned by the technology of numbers so that we see the world differently than they did. Our understanding of what is real is different. Which is another way of saying that embedded in every tool is an ideological bias, a predisposition to construct the world as one thing rather than another, to value one thing over another, to amplify one sense or skill or attitude more loudly than another.

This is what Marshall McLuhan meant by his famous apho-

rism "The medium is the message." This is what Marx meant when he said, "Technology discloses man's mode of dealing with nature" and creates the "conditions of intercourse" by which we relate to each other. It is what Wittgenstein meant when, in referring to our most fundamental technology, he said that language is not merely a vehicle of thought but also the driver. And it is what Thamus wished the inventor Theuth to see. This is, in short, an ancient and persistent piece of wisdom, perhaps most simply expressed in the old adage that, to a man with a hammer, everything looks like a nail. Without being too literal, we may extend the truism: To a man with a pencil, everything looks like a list. To a man with a camera, everything looks like an image. To a man with a computer, everything looks like data. And to a man with a grade sheet, everything looks like a number.

But such prejudices are not always apparent at the start of a technology's journey, which is why no one can safely conspire to be a winner in technological change. Who would have imagined, for example, whose interests and what world-view would be ultimately advanced by the invention of the mechanical clock? The clock had its origin in the Benedictine monasteries of the twelfth and thirteenth centuries. The impetus behind the invention was to provide a more or less precise regularity to the routines of the monasteries, which required, among other things, seven periods of devotion during the course of the day. The bells of the monastery were to be rung to signal the canonical hours; the mechanical clock was the technology that could provide precision to these rituals of devotion. And indeed it did. But what the monks did not foresee was that the clock is a means not merely of keeping track of the hours but also of synchronizing and controlling the actions of men. And thus, by the middle of the fourteenth century, the clock had moved outside the walls of the monastery, and brought a new and precise regularity to the life of the workman and the merchant.

"The mechanical clock," as Lewis Mumford wrote, "made possible the idea of regular production, regular working hours and a standardized product." In short, without the clock, capitalism would have been quite impossible.[4] The paradox, the surprise, and the wonder are that the clock was invented by men who wanted to devote themselves more rigorously to God; it ended as the technology of greatest use to men who wished to devote themselves to the accumulation of money. In the eternal struggle between God and Mammon, the clock quite unpredictably favored the latter.

Unforeseen consequences stand in the way of all those who think they see clearly the direction in which a new technology will take us. Not even those who invent a technology can be assumed to be reliable prophets, as Thamus warned. Gutenberg, for example, was by all accounts a devout Catholic who would have been horrified to hear that accursed heretic Luther describe printing as "God's highest act of grace, whereby the business of the Gospel is driven forward." Luther understood, as Gutenberg did not, that the mass-produced book, by placing the Word of God on every kitchen table, makes each Christian his own theologian—one might even say his own priest, or, better, from Luther's point of view, his own pope. In the struggle between unity and diversity of religious belief, the press favored the latter, and we can assume that this possibility never occurred to Gutenberg.

Thamus understood well the limitations of inventors in grasping the social and psychological—that is, ideological—bias of their own inventions. We can imagine him addressing Gutenberg in the following way: "Gutenberg, my paragon of inventors, the discoverer of an art is not the best judge of the good or harm which will accrue to those who practice it. So it is in this; you, who are the father of printing, have out of fondness for your off-spring come to believe it will advance the cause of the Holy Roman See, whereas in fact it will sow discord

among believers; it will damage the authenticity of your beloved Church and destroy its monopoly."

We can imagine that Thamus would also have pointed out to Gutenberg, as he did to Theuth, that the new invention would create a vast population of readers who "will receive a quantity of information without proper instruction . . . [who will be] filled with the conceit of wisdom instead of real wisdom"; that reading, in other words, will compete with older forms of learning. This is yet another principle of technological change we may infer from the judgment of Thamus: new technologies compete with old ones—for time, for attention, for money, for prestige, but mostly for dominance of their world-view. This competition is implicit once we acknowledge that a medium contains an ideological bias. And it is a fierce competition, as only ideological competitions can be. It is not merely a matter of tool against tool—the alphabet attacking ideographic writing, the printing press attacking the illuminated manuscript, the photograph attacking the art of painting, television attacking the printed word. When media make war against each other, it is a case of world-views in collision.

In the United States, we can see such collisions everywhere—in politics, in religion, in commerce—but we see them most clearly in the schools, where two great technologies confront each other in uncompromising aspect for the control of students' minds. On the one hand, there is the world of the printed word with its emphasis on logic, sequence, history, exposition, objectivity, detachment, and discipline. On the other, there is the world of television with its emphasis on imagery, narrative, presentness, simultaneity, intimacy, immediate gratification, and quick emotional response. Children come to school having been deeply conditioned by the biases of television. There, they encounter the world of the printed word. A sort of psychic battle takes place, and there are many casualties—children who can't learn to read or won't, children who

cannot organize their thought into logical structure even in a simple paragraph, children who cannot attend to lectures or oral explanations for more than a few minutes at a time. They are failures, but not because they are stupid. They are failures because there is a media war going on, and they are on the wrong side—at least for the moment. Who knows what schools will be like twenty-five years from now? Or fifty? In time, the type of student who is currently a failure may be considered a success. The type who is now successful may be regarded as a handicapped learner—slow to respond, far too detached, lacking in emotion, inadequate in creating mental pictures of reality. Consider: what Thamus called the "conceit of wisdom"—the unreal knowledge acquired through the written word—eventually became the pre-eminent form of knowledge valued by the schools. There is no reason to suppose that such a form of knowledge must always remain so highly valued.

To take another example: In introducing the personal computer to the classroom, we shall be breaking a four-hundred-year-old truce between the gregariousness and openness fostered by orality and the introspection and isolation fostered by the printed word. Orality stresses group learning, cooperation, and a sense of social responsibility, which is the context within which Thamus believed proper instruction and real knowledge must be communicated. Print stresses individualized learning, competition, and personal autonomy. Over four centuries, teachers, while emphasizing print, have allowed orality its place in the classroom, and have therefore achieved a kind of pedagogical peace between these two forms of learning, so that what is valuable in each can be maximized. Now comes the computer, carrying anew the banner of private learning and individual problem-solving. Will the widespread use of computers in the classroom defeat once and for all the claims of communal speech? Will the computer raise egocentrism to the status of a virtue?

These are the kinds of questions that technological change brings to mind when one grasps, as Thamus did, that technological competition ignites total war, which means it is not possible to contain the effects of a new technology to a limited sphere of human activity. If this metaphor puts the matter too brutally, we may try a gentler, kinder one: Technological change is neither additive nor subtractive. It is ecological. I mean "ecological" in the same sense as the word is used by environmental scientists. One significant change generates total change. If you remove the caterpillars from a given habitat, you are not left with the same environment minus caterpillars: you have a new environment, and you have reconstituted the conditions of survival; the same is true if you add caterpillars to an environment that has had none. This is how the ecology of media works as well. A new technology does not add or subtract something. It changes everything. In the year 1500, fifty years after the printing press was invented, we did not have old Europe plus the printing press. We had a different Europe. After television, the United States was not America plus television; television gave a new coloration to every political campaign, to every home, to every school, to every church, to every industry. And that is why the competition among media is so fierce. Surrounding every technology are institutions whose organization—not to mention their reason for being—reflects the world-view promoted by the technology. Therefore, when an old technology is assaulted by a new one, institutions are threatened. When institutions are threatened, a culture finds itself in crisis. This is serious business, which is why we learn nothing when educators ask, Will students learn mathematics better by computers than by textbooks? Or when businessmen ask, Through which medium can we sell more products? Or when preachers ask, Can we reach more people through television than through radio? Or when politicians ask, How effective are messages sent through different media? Such questions have

an immediate, practical value to those who ask them, but they are diversionary. They direct our attention away from the serious social, intellectual, and institutional crises that new media foster.

Perhaps an analogy here will help to underline the point. In speaking of the meaning of a poem, T. S. Eliot remarked that the chief use of the overt content of poetry is "to satisfy one habit of the reader, to keep his mind diverted and quiet, while the poem does its work upon him: much as the imaginary burglar is always provided with a bit of nice meat for the house-dog." In other words, in asking their practical questions, educators, entrepreneurs, preachers, and politicians are like the house-dog munching peacefully on the meat while the house is looted. Perhaps some of them know this and do not especially care. After all, a nice piece of meat, offered graciously, does take care of the problem of where the next meal will come from. But for the rest of us, it cannot be acceptable to have the house invaded without protest or at least awareness.

What we need to consider about the computer has nothing to do with its efficiency as a teaching tool. We need to know in what ways it is altering our conception of learning, and how, in conjunction with television, it undermines the old idea of school. Who cares how many boxes of cereal can be sold via television? We need to know if television changes our conception of reality, the relationship of the rich to the poor, the idea of happiness itself. A preacher who confines himself to considering how a medium can increase his audience will miss the significant question: In what sense do new media alter what is meant by religion, by church, even by God? And if the politician cannot think beyond the next election, then *we* must wonder about what new media do to the idea of political organization and to the conception of citizenship.

To help us do this, we have the judgment of Thamus, who, in the way of legends, teaches us what Harold Innis, in his way,

tried to. New technologies alter the structure of our interests: the things we think *about.* They alter the character of our symbols: the things we think *with.* And they alter the nature of community: the arena in which thoughts develop. As Thamus spoke to Innis across the centuries, it is essential that we listen to their conversation, join in it, revitalize it. For something has happened in America that is strange and dangerous, and there is only a dull and even stupid awareness of what it is—in part because it has no name. I call it Technopoly.

7

The Ideology of Machines:

Computer Technology

That American Technopoly has now embraced the computer in the same hurried and mindless way it embraced medical technology is undeniable, was perhaps inevitable, and is certainly most unfortunate. This is not to say that the computer is a blight on the symbolic landscape; only that, like medical technology, it has usurped powers and enforced mind-sets that a fully attentive culture might have wished to deny it. Thus, an examination of the ideas embedded in computer technology is worth attempting. Others, of course, have done this, especially Joseph Weizenbaum in his great and indispensable book *Computer Power and Human Reason.* Weizenbaum, however, ran into some difficulties, as everyone else has, because of the "universality" of computers, meaning (a) that their uses are infinitely various, and (b) that computers are commonly integrated into the structure of other machines. It is, therefore, hard to isolate specific ideas promoted by computer technology. The computer, for example, is quite unlike the stethoscope, which has a limited function in a limited context. Except for safecrackers, who, I am told, use stethoscopes to hear

the tumblers of locks click into place, stethoscopes are used only by doctors. But everyone uses or is used by computers, and for purposes that seem to know no boundaries.

Putting aside such well-known functions as electronic filing, spreadsheets, and word-processing, one can make a fascinating list of the innovative, even bizarre, uses of computers. I have before me a report from *The New York Times* that tells us how computers are enabling aquatic designers to create giant water slides that mimic roller coasters and eight-foot-high artificial waves.[1] In my modest collection, I have another article about the uses of personal computers for making presentations at corporate board meetings.[2] Another tells of how computer graphics help jurors to remember testimony better. Gregory Mazares, president of the graphics unit of Litigation Sciences, is quoted as saying, "We're a switched-on, tuned-in, visually oriented society, and jurors tend to believe what they see. This technology keeps the jury's attention by simplifying the material and by giving them little bursts of information."[3] While Mr. Mazares is helping switched-on people to remember things, Morton David, chief executive officer of Franklin Computer, is helping them find any word in the Bible with lightning speed by producing electronic Bibles. (The word "lightning," by the way, appears forty-two times in the New International version and eight times in the King James version. Were you so inclined, you could discover this for yourself in a matter of seconds.) This fact so dominates Mr. David's imagination that he is quoted as saying, "Our technology may have made a change as momentous as the Gutenberg invention of movable type."[4] And then there is an article that reports a computer's use to make investment decisions, which helps you, among other things, to create "what-if" scenarios, although with how much accuracy we are not told.[5] In *Technology Review*, we find a description of how computers are used to help the police locate the addresses of callers in distress; a prophecy is made that in time police officers

will have so much instantly available information about any caller that they will know how seriously to regard the caller's appeal for help.

One may well wonder if Charles Babbage had any of this in mind when he announced in 1822 (only six years after the appearance of Laënnec's stethoscope) that he had invented a machine capable of performing simple arithmetical calculations. Perhaps he did, for he never finished his invention and started work on a more ambitious machine, capable of doing more complex tasks. He abandoned that as well, and in 1833 put aside his calculator project completely in favor of a programmable machine that became the forerunner of the modern computer. His first such machine, which he characteristically never finished, was to be controlled by punch cards adapted from devices French weavers used to control thread sequences in their looms.

Babbage kept improving his programmable machine over the next thirty-seven years, each design being more complex than the last.[6] At some point, he realized that the mechanization of numerical operations gave him the means to manipulate nonnumerical symbols. It is not farfetched to say that Babbage's insight was comparable to the discovery by the Greeks in the third century B.C. of the principle of alphabetization—that is, the realization that the symbols of the alphabet could be separated from their phonetic function and used as a system for the classification, storage, and retrieval of information. In any case, armed with his insight, Babbage was able to speculate about the possibility of designing "intelligent" information machinery, though the mechanical technology of his time was inadequate to allow the fulfillment of his ideas. The computer as we know it today had to await a variety of further discoveries and inventions, including the telegraph, the telephone, and the application of Boolean algebra to relay-based circuitry, resulting in Claude Shannon's creation of digital logic circuitry. Today,

when the word "computer" is used without a modifier before it, it normally refers to some version of the machine invented by John von Neumann in the 1940s. Before that, the word "computer" referred to a person (similarly to the early use of the word "typewriter") who performed some kind of mechanical calculation. As calculation shifted from people to machines, so did the word, especially because of the power of von Neumann's machine.

Certainly, after the invention of the digital computer, it was abundantly clear that the computer was capable of performing functions that could in some sense be called "intelligent." In 1936, the great English mathematician Alan Turing showed that it was possible to build a machine that would, for many practical purposes, behave like a problem-solving human being. Turing claimed that he would call a machine "intelligent" if, through typed messages, it could exchange thoughts with a human being—that is, hold up its end of a conversation. In the early days of MIT's Artificial Intelligence Laboratory, Joseph Weizenbaum wrote a program called ELIZA, which showed how easy it was to meet Turing's test for intelligence. When asked a question with a proper noun in it, ELIZA's program could respond with "Why are you interested in," followed by the proper noun and a question mark. That is, it could invert statements and seek more information about one of the nouns in the statement. Thus, ELIZA acted much like a Rogerian psychologist, or at least a friendly and inexpensive therapist. Some people who used ELIZA refused to believe that they were conversing with a mere machine. Having, in effect, created a Turing machine, Weizenbaum eventually pulled the program off the computer network and was stimulated to write *Computer Power and Human Reason,* in which, among other things, he raised questions about the research programs of those working in artificial intelligence; the assumption that whatever a computer *can* do, it *should* do; and the effects of computer technol-

ogy on the way people construe the world—that is, the ideology of the computer, to which I now turn.

The most comprehensive idea conveyed by the computer is suggested by the title of J. David Bolter's book, *Turing's Man.* His title is a metaphor, of course, similar to what would be suggested by saying that from the sixteenth century until recently we were "Gutenberg's Men." Although Bolter's main practical interest in the computer is in its function as a new kind of book, he argues that it is the dominant metaphor of our age; it defines our age by suggesting a new relationship to information, to work, to power, and to nature itself. That relationship can best be described by saying that the computer redefines humans as "information processors" and nature itself as information to be processed. The fundamental metaphorical message of the computer, in short, is that we are machines—thinking machines, to be sure, but machines nonetheless. It is for this reason that the computer is the quintessential, incomparable, near-perfect machine for Technopoly. It subordinates the claims of our nature, our biology, our emotions, our spirituality. The computer claims sovereignty over the whole range of human experience, and supports its claim by showing that it "thinks" better than we can. Indeed, in his almost hysterical enthusiasm for artificial intelligence, Marvin Minsky has been quoted as saying that the thinking power of silicon "brains" will be so formidable that "If we are lucky, they will keep us as pets."[7] An even giddier remark, although more dangerous, was offered by John McCarthy, the inventor of the term "artificial intelligence." McCarthy claims that "even machines as simple as thermostats can be said to have beliefs." To the obvious question, posed by the philosopher John Searle, "What beliefs does your thermostat have?," McCarthy replied, "My thermostat has three beliefs—it's too hot in here, it's too cold in here, and it's just right in here."[8]

What is significant about this response is that it has redefined

the meaning of the word "belief." The remark rejects the view that humans have internal states of mind that are the foundation of belief and argues instead that "belief" means only what someone or something does. The remark also implies that simulating an idea is synonymous with duplicating the idea. And, most important, the remark rejects the idea that mind is a biological phenomenon.

In other words, what we have here is a case of metaphor gone mad. From the proposition that humans are in some respects like machines, we move to the proposition that humans are little else but machines and, finally, that human beings *are* machines. And then, inevitably, as McCarthy's remark suggests, to the proposition that machines are human beings. It follows that machines can be made that duplicate human intelligence, and thus research in the field known as artificial intelligence was inevitable. What is most significant about this line of thinking is the dangerous reductionism it represents. Human intelligence, as Weizenbaum has tried energetically to remind everyone, is not transferable. The plain fact is that humans have a unique, biologically rooted, intangible mental life which in some limited respects can be simulated by a machine but can never be duplicated. Machines cannot feel and, just as important, cannot *understand.* ELIZA can ask, "Why are you worried about your mother?," which might be exactly the question a therapist would ask. But the machine does not know what the question means or even *that* the question means. (Of course, there may be some therapists who do not know what the question means either, who ask it routinely, ritualistically, inattentively. In that case we may say they are acting like a machine.) It is meaning, not utterance, that makes mind unique. I use "meaning" here to refer to something more than the result of putting together symbols the denotations of which are commonly shared by at least two people. As I understand it, meaning also includes those things we call feelings, experiences, and sensations that

do not have to be, and sometimes cannot be, put into symbols. They "mean" nonetheless. Without concrete symbols, a computer is merely a pile of junk. Although the quest for a machine that duplicates mind has ancient roots, and although digital logic circuitry has given that quest a scientific structure, artificial intelligence does not and cannot lead to a meaning-making, understanding, and feeling creature, which is what a human being is.

All of this may seem obvious enough, but the metaphor of the machine as human (or the human as machine) is sufficiently powerful to have made serious inroads in everyday language. People now commonly speak of "programming" or "deprogramming" themselves. They speak of their brains as a piece of "hard wiring," capable of "retrieving data," and it has become common to think about thinking as a mere matter of processing and decoding.

Perhaps the most chilling case of how deeply our language is absorbing the "machine as human" metaphor began on November 4, 1988, when the computers around the ARPANET network became sluggish, filled with extraneous data, and then clogged completely. The problem spread fairly quickly to six thousand computers across the United States and overseas. The early hypothesis was that a software program had attached itself to other programs, a situation which is called (in another human-machine metaphor) a "virus." As it happened, the intruder was a self-contained program explicitly designed to disable computers, which is called a "worm." But the technically incorrect term "virus" stuck, no doubt because of its familiarity and its human connections. As Raymond Gozzi, Jr., discovered in his analysis of how the mass media described the event, newspapers noted that the computers were "infected," that the virus was "virulent" and "contagious," that attempts were made to "quarantine" the infected computers, that attempts were also being made to "sterilize" the network, and that programmers

hoped to develop a "vaccine" so that computers could be "inoculated" against new attacks.[9]

This kind of language is not merely picturesque anthropomorphism. It reflects a profound shift in perception about the relationship of computers to humans. If computers can become ill, then they can become healthy. Once healthy, they can think clearly and make decisions. The computer, it is implied, has a will, has intentions, has reasons—which means that humans are relieved of responsibility for the computer's decisions. Through a curious form of grammatical alchemy, the sentence "We use the computer to calculate" comes to mean "The computer calculates." If a computer calculates, then it may decide to miscalculate or not calculate at all. That is what bank tellers mean when they tell you that they cannot say how much money is in your checking account because "the computers are down." The implication, of course, is that no person at the bank is responsible. Computers make mistakes or get tired or become ill. Why blame people? We may call this line of thinking an "agentic shift," a term I borrow from Stanley Milgram to name the process whereby humans transfer responsibility for an outcome from themselves to a more abstract agent.[10] When this happens, we have relinquished control, which in the case of the computer means that we may, without excessive remorse, pursue ill-advised or even inhuman goals because the computer can accomplish them or be imagined to accomplish them.

Machines of various kinds will sometimes assume a human or, more likely, a superhuman aspect. Perhaps the most absurd case I know of is in a remark a student of mine once made on a sultry summer day in a room without air conditioning. On being told the thermometer read ninety-eight degrees Fahrenheit, he replied, "No wonder it's so hot!" Nature was off the hook. If only the thermometers would behave themselves, we could be comfortable. But computers are far more "human" than thermometers or almost any other kind of technology. Unlike

most machines, computers do no work; they direct work. They are, as Norbert Wiener said, the technology of "command and control" and have little value without something to control. This is why they are of such importance to bureaucracies.

Naturally, bureaucrats can be expected to embrace a technology that helps to create the illusion that decisions are not under their control. Because of its seeming intelligence and impartiality, a computer has an almost magical tendency to direct attention away from the people in charge of bureaucratic functions and toward itself, as if the computer were the true source of authority. A bureaucrat armed with a computer is the unacknowledged legislator of our age, and a terrible burden to bear. We cannot dismiss the possibility that, if Adolf Eichmann had been able to say that it was not he but a battery of computers that directed the Jews to the appropriate crematoria, he might never have been asked to answer for his actions.

Although (or perhaps because) I came to "administration" late in my academic career, I am constantly amazed at how obediently people accept explanations that begin with the words "The computer shows . . ." or "The computer has determined . . ." It is Technopoly's equivalent of the sentence "It is God's will," and the effect is roughly the same. You will not be surprised to know that I rarely resort to such humbug. But on occasion, when pressed to the wall, I have yielded. No one has as yet replied, "Garbage in, garbage out." Their defenselessness has something Kafkaesque about it. In *The Trial,* Josef K. is charged with a crime—of what nature, and by whom the charge is made, he does not know. The computer turns too many of us into Josef Ks. It often functions as a kind of impersonal accuser which does not reveal, and is not required to reveal, the sources of the judgments made against us. It is apparently sufficient that the computer has pronounced. Who has put the data in, for what purpose, for whose convenience, based on what assumptions are questions left unasked.

This is the case not only in personal matters but in public decisions as well. Large institutions such as the Pentagon, the Internal Revenue Service, and multinational corporations tell us that their decisions are made on the basis of solutions generated by computers, and this is usually good enough to put our minds at ease or, rather, to sleep. In any case, it constrains us from making complaints or accusations. In part for this reason, the computer has strengthened bureaucratic institutions and suppressed the impulse toward significant social change. "The arrival of the Computer Revolution and the founding of the Computer Age have been announced many times," Weizenbaum has written. "But if the triumph of a revolution is to be measured in terms of the social revision it entrained, then there has been no computer revolution."[11]

In automating the operation of political, social, and commercial enterprises, computers may or may not have made them more efficient but they have certainly diverted attention from the question whether or not such enterprises are necessary or how they might be improved. A university, a political party, a religious denomination, a judicial proceeding, even corporate board meetings are not improved by automating their operations. They are made more imposing, more technical, perhaps more authoritative, but defects in their assumptions, ideas, and theories will remain untouched. Computer technology, in other words, has not yet come close to the printing press in its power to generate radical and substantive social, political, and religious thought. If the press was, as David Riesman called it, "the gunpowder of the mind," the computer, in its capacity to smooth over unsatisfactory institutions and ideas, is the talcum powder of the mind.

I do not wish to go as far as Weizenbaum in saying that computers are merely ingenious devices to fulfill unimportant functions and that the computer revolution is an explosion of nonsense. Perhaps that judgment will be in need of amendment

in the future, for the computer is a technology of a thousand uses—the Proteus of machines, to use Seymour Papert's phrase. One must note, for example, the use of computer-generated images in the phenomenon known as Virtual Reality. Putting on a set of miniature goggle-mounted screens, one may block out the real world and move through a simulated three-dimensional world which changes its components with every movement of one's head. That Timothy Leary is an enthusiastic proponent of Virtual Reality does not suggest that there is a constructive future for this device. But who knows? Perhaps, for those who can no longer cope with the real world, Virtual Reality will provide better therapy than ELIZA.

What is clear is that, to date, computer technology has served to strengthen Technopoly's hold, to make people believe that technological innovation is synonymous with human progress. And it has done so by advancing several interconnected ideas.

It has, as already noted, amplified beyond all reason the metaphor of machines as humans and humans as machines. I do not claim, by the way, that computer technology originated this metaphor. One can detect it in medicine, too: doctors and patients have come to believe that, like a machine, a human being is made up of parts which when defective can be replaced by mechanical parts that function as the original did without impairing or even affecting any other part of the machine. Of course, to some degree that assumption works, but since a human being is in fact not a machine but a biological organism all of whose organs are interrelated and profoundly affected by mental states, the human-as-machine metaphor has serious medical limitations and can have devastating effects. Something similar may be said of the mechanistic metaphor when applied to workers. Modern industrial techniques are made possible by the idea that a machine is made up of isolatable and interchangeable parts. But in organizing factories so that workers are also conceived of as isolatable and interchangeable parts, industry

has engendered deep alienation and bitterness. This was the point of Charlie Chaplin's *Modern Times*, in which he tried to show the psychic damage of the metaphor carried too far. But because the computer "thinks" rather than works, its power to energize mechanistic metaphors is unparalleled and of enormous value to Technopoly, which depends on our believing that we are at our best when acting like machines, and that in significant ways machines may be trusted to act as our surrogates. Among the implications of these beliefs is a loss of confidence in human judgment and subjectivity. We have devalued the singular human capacity to see things whole in all their psychic, emotional and moral dimensions, and we have replaced this with faith in the powers of technical calculation.

Because of what computers commonly do, they place an inordinate emphasis on the technical processes of communication and offer very little in the way of substance. With the exception of the electric light, there never has been a technology that better exemplifies Marshall McLuhan's aphorism "The medium is the message." The computer is almost all process. There are, for example, no "great computerers," as there are great writers, painters, or musicians. There are "great programs" and "great programmers," but their greatness lies in their ingenuity either in simulating a human function or in creating new possibilities of calculation, speed, and volume.[12] Of course, if J. David Bolter is right, it is possible that in the future computers will emerge as a new kind of book, expanding and enriching the tradition of writing technologies.[13] Since printing created new forms of literature when it replaced the handwritten manuscript, it is possible that electronic writing will do the same. But for the moment, computer technology functions more as a new mode of transportation than as a new means of substantive communication. It moves information—lots of it, fast, and mostly in a calculating mode. The computer, in fact, makes possible the fulfillment of Descartes' dream of the mathematization of the

world. Computers make it easy to convert facts into statistics and to translate problems into equations. And whereas this can be useful (as when the process reveals a pattern that would otherwise go unnoticed), it is diversionary and dangerous when applied indiscriminately to human affairs. So is the computer's emphasis on speed and especially its capacity to generate and store unprecedented quantities of information. In specialized contexts, the value of calculation, speed, and voluminous information may go uncontested. But the "message" of computer technology is comprehensive and domineering. The computer argues, to put it baldly, that the most serious problems confronting us at both personal and public levels require technical solutions through fast access to information otherwise unavailable. I would argue that this is, on the face of it, nonsense. Our most serious problems are not technical, nor do they arise from inadequate information. If a nuclear catastrophe occurs, it shall not be because of inadequate information. Where people are dying of starvation, it does not occur because of inadequate information. If families break up, children are mistreated, crime terrorizes a city, education is impotent, it does not happen because of inadequate information. Mathematical equations, instantaneous communication, and vast quantities of information have nothing whatever to do with any of these problems. And the computer is useless in addressing them.

And yet, because of its "universality," the computer compels respect, even devotion, and argues for a comprehensive role in all fields of human activity. Those who insist that it is foolish to deny the computer vast sovereignty are singularly devoid of what Paul Goodman once called "technological modesty"—that is, having a sense of the whole and not claiming or obtruding more than a particular function warrants. Norbert Wiener warned about lack of modesty when he remarked that, if digital computers had been in common use before the atomic bomb was invented, people would have said that the bomb could not

have been invented without computers. But it was. And it is important to remind ourselves of how many things are quite possible to do without the use of computers.

Seymour Papert, for example, wishes students to be epistemologists, to think critically, and to learn how to create knowledge. In his book *Mindstorms*, he gives the impression that his computer program known as LOGO now makes this possible. But good teachers have been doing this for centuries without the benefit of LOGO. I do not say that LOGO, when used properly by a skilled teacher, will not help, but I doubt that it can do better than pencil and paper, or speech itself, when used properly by a skilled teacher.

When the Dallas Cowboys were consistently winning football championships, their success was attributed to the fact that computers were used to evaluate and select team members. During the past several years, when Dallas has been hard put to win more than a few games, not much has been said about the computers, perhaps because people have realized that computers have nothing to do with winning football games, and never did. One might say the same about writing lucid, economical, stylish prose, which has nothing to do with word-processors. Although my students don't believe it, it is actually possible to write well without a processor and, I should say, to write poorly with one.

Technological immodesty is always an acute danger in Technopoly, which encourages it. Technopoly also encourages insensitivity to what skills may be lost in the acquisition of new ones. It is important to remember what can be done without computers, and it is also important to remind ourselves of what may be lost when we do use them.

I have before me an essay by Sir Bernard Lovell, founder of Britain's Jodrell Bank Observatory, in which he claims that computers have stifled scientific creativity.[14] After writing of his awe at the ease with which computerized operations provide

amazing details of distant galaxies, Sir Bernard expresses concern that "literal-minded, narrowly focused computerized research is proving antithetical to the free exercise of that happy faculty known as serendipity—that is, the knack of achieving favorable results more or less by chance." He proceeds to give several examples of monumental but serendipitous discoveries, contends that there has been a dramatic cessation of such discoveries, and worries that computers are too narrow as filters of information and therefore may be antiserendipitous. He is, of course, not "against" computers, but is merely raising questions about their costs.

Dr. Clay Forishee, the chief FAA scientist for human performance issues, did the same when he wondered whether the automated operation of commercial aircraft has not disabled pilots from creatively responding when something goes wrong. Robert Buley, flight-standards manager of Northwest Airlines, goes further. He is quoted as saying, "If we have human operators subordinated to technology then we're going to lose creativity [in emergencies]." He is not "against" computers. He is worried about what we lose by using them.[15]

M. Ethan Katsch, in his book *The Electronic Media and the Transformation of Law*, worries as well. He writes, "The replacement of print by computerized systems is promoted to the legal profession simply as a means to increase efficiency."[16] But he goes on to say that, in fact, the almost unlimited capacity of computers to store and retrieve information threatens the authority of precedent, and he adds that the threat is completely unrecognized. As he notes, "a system of precedent is unnecessary when there are very few accessible cases, and unworkable when there are too many." If this is true, or even partly true, what exactly does it mean? Will lawyers become incapable of choosing relevant precedents? Will judges be in constant confusion from "precedent overload"?

We know that doctors who rely entirely on machinery have

lost skill in making diagnoses based on observation. We may well wonder what other human skills and traditions are being lost by our immersion in a computer culture. Technopolists do not worry about such things. Those who do are called technological pessimists, Jeremiahs, and worse. I rather think they are imbued with technological modesty, like King Thamus.