QUESTIONING TECHNOLOGY, QUESTIONING PATRIARCHY

It is a truism that humans have and will always use tools. Just as obvious, or so it seems to me, is that technology— the use of tools— occurs in a social, political, cultural and economic context, and is never neutral. Tools are always shaped by their use, by the people or institutions which control their production and distribution, and by a culture which validates, circumscribes, or discourages their creation and/or use in different circumstances.

The reverse is of course true as well. Technology and technological decisions structure our minds and, in doing so, our relations with each other and with the natural world. Whether we use tools to control or enhance all our relations is shaped as much by the tools themselves as by any other set of cultural assumptions or social structures.

QUESTIONING TECHNOLOGY helps us identify and trace the threads of technology which are woven into the fabric of our daily lives. It helps us explore the complexity of our personal, political and spiritual interactions with technology; it helps us expose the habits of technological thought which are leading us so quickly and almost unconsciously to environmental disaster; and it helps us examine the mass production and military technologies which are so devastating to so many of our lives.

More crucially, QUESTIONING TECHNOLOGY challenges us to

re-engage our hearts and minds in the search for truly appropriate and accountable technologies. If we are to live as part of an harmonious web of social and ecological relations, we must (re)discover ways to work with other people and species, finding tools which enhance these relations, and renouncing those which threaten the web, whatever their short-term "benefit" to ourselves. We must shift not only our attitudes and actions, but through conscientious decisions concerning our tools, our very habits of thought.

Sadly, there are precious few models to guide those of us who would respond to this challenge. Native, traditional and organic farmers may well have the most to teach in the ongoing work of reconstituting technology in harmony with local communities and the earth. This use of the land demands an attentive awareness of the natural world, patience, a large dose of humility and a stringent accountability to the land, to natural cycles and to the larger human community. To be sure, there's plenty of room for ingenuity, but always within an explicitly cultural, human and natural— not mereley an economic or technological— context.

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It is ironic that in a book dedicated to questioning both the technology we use and the habits of mind behind today's dominant technological forms, there are many articles which exhibit another, similarly pernicious reality and habit of thought: subsuming all experience under men's experience. Not only does this render a huge majority of people (women especially, but often also children and men not of the dominant culture) invisible, it also robs everyone of the fascinating complexity of experience and perspective which comes with attention to the wonderful diversity of people and cultures.

In this case, many would argue that there is some justice in the identity of industrial and military technologies with men. These technologies are overwhelmingly invented and controlled by Caucasian men; often their initial victims are women, children and poorer men from other than the dominant culture. Beyond this, many of the habits of thought identified and challenged by feminists are similar to the ones exposed in QUESTIONING TECHNOLOGY.

It is also true, however, that many of the contributors who use the generic male wrote in times when the pattern was less noticed — at least by their colleagues and publishers who were, overwhelmingly, men. Like technology, patriarchy is insidious.

Examples from more recent publications suggest that the same publishing combines which treat their employees as mere parts of their machines also care little about the words— and even (and one is sometimes tempted to say, especially) the ideas — of the authors they publish, as long as the books earn their share of profit for the company.

Facing as we do limited economic and technological choices, we at New Society Publishers have decided not to redo the work of each of the original publishers by contacting them, their editors and each of the authors (some of them deceased) in an attempt to highlight by hand the places where we think changes are necessary.

By adding a bit of hand work to this mass-produced item, we hope to humanize it just a little, and to enhance its challenge to rethink— and remake— our relationships with technology and with you, our community.

TL Hill
for New Society Publishers

INTRODUCTION

This book presents only one side — the *other* side. Our purpose is to persuade you to think critically about technology.

Forty years ago, no-one thought much about smoking; Ronald Reagan with his Chesterfields was just one instance of the glamour and sophistication associated with cigarettes. Now none but nonentities appear in cigarette ads, and they only on the back covers of magazines, the advertisements having been banned from television. A lot of thought has gone into smoking since a Stetsoned Reagan told its praises, and cigarettes have been officially branded dangerous. Many people have given them up, or are trying hard to do so; almost no-one, apart from tobacco company apologists, promotes cigarette smoking as a good thing.

Computers and automation are now being sold in much the same way that cigarettes were purveyed three or four decades ago. The promise of profit sounds a clarion call to a society reeling from the social and economic dislocations of the past twenty years. Technology is sold as a means of control. Get behind the wheel, run your fingers over the user-friendly keyboard, bark numbers into a headset mike, press a button and watch spreadsheets lay out their graphs. Give in to change, fork over some cash, or better yet, use plastic money — be the emperor of neon green, put yourself in the driver's seat. Be a tamed Charlie Chaplin, at peace with modern times.

Questioning Technology is a purgative, an antidote to the transparent bunkum trafficked by techno wallahs, from the US Army ("technology is taking over the world") to Jazz by Lotus ("You made me love you; I didn't want to do it.") To

question technology is to look askance at what our lives are made of, to wonder how our cultural experience has distorted our vision and deformed our human nature. We may be empty of answers and alternatives, but we are full, suddenly, of the need to search them out.

In short, this book is intended to make you mad, wake you up, and get you thinking and talking. Heaving it at the wall is an expected response. Unplugging your computer (or unplugging yourself from one) may be an unexpected outcome, one with happy results for your personal life, health, and future well-being.

You can close the book now . . . and go right on for the next 40 years, smoking your way into the cancer ward. Or you can turn the page . . .

I

TECHNOLOGY
It's History and our Future

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1. How has technology developed — or encroached? Are the computer, nuclear power, and recombinant DNA comparable to the wheel, the printing press, and gunpowder — or do they represent an entirely new order?

> "The interrelationships of the Greek *tekhne*, a manual skill, and the Greek *tekton*, a carpenter, with the Latin *tegere*, to cover, and *texere*, to weave, are not entirely clear; but that the two Latin words are related to each other, and the Greek to the Latin, can hardly be doubted. Semantically, building (literal and figurative) is either stated or implied in all three groups; phonetically, the relationship is abundantly clear." (Eric Partridge, *Origins: A Short Etymological Dictionary of Modern English*)

Aside from the occasional cataclysm of earthquake or landslide, the earth changes slowly, nearly imperceptibly. Most animal populations make do with what they find and leave their habitats little altered. The few insect, fish, bird, and animal species that build nests, bowers, and other created forms are fascinating to humans, as are the remains of archaic and historic human building.

Technology changes the earth by building. With technology, we select materials abstractly from a variety of settings and

meld them into an artificial whole — then sit back to see what will happen. Technology is an impulse, a thought form, before it has anything to do with tools. It grows from the desire to rival the awesome, unfathomable creativity of the earth. This is where domination of nature begins.

In this section, Lewis Mumford discusses democratic and anti-democratic modes of technology, showing the profound impact of what is often overlooked in "political" discourse. Computer pioneer Weizenbaum asks thoughtful questions about the relationship of technical progress to human values, and Michael Shallis also poignantly wonders whether a totally new technological order is upon us.

Mumford is one of many writers who have distinguished between the balanced, bounded technologies of preliterate peoples and the rampant destruction brought on by modern factory industrialism. As you read these selections, make up your own mind: is the difference between archaic and modern technology a difference of degree, or of kind?

Computer Power and Human Reason

JOSEPH WEIZENBAUM

This book is only nominally about computers. In an important sense, the computer is used here merely as a vehicle for moving certain ideas that are much more important than computers. The reader who looks at a few of this book's pages and turns away in fright because {he}* spots an equation or a bit of computer jargon here and there should reconsider. {He} may think that {he} does not know anything about computers, indeed, that computers are too complicated for ordinary people to understand. But a major point of this book is precisely that we, all of us, have made the world too much into a computer, and that this remaking of the world in the image of the computer started long before there were any electronic computers. Now that we have computers, it becomes somewhat easier to see this imaginative transformation we have worked on the world. Now we can use the computer itself — that is the idea of the computer — as a metaphor to help us understand what we have done and are doing. . . .

"Concepts have been reduced to summaries of the characteristics that several specimens have in common. By denoting similarity, concepts eliminate the bother of enumerating qualities and thus serve better to organize the material of knowledge. They are thought of as mere abbreviations of the items to which they refer. Any use transcending auxiliary, technical summarization of factual data has been eliminated as a last trace of superstition. Concepts have become 'streamlined', rationalized, labor-saving devices . . . thinking itself [has] been reduced to the level of industrial processes . . . in short, made part and parcel of production."[1]

No one who does not know the technical basis of the systems we have been discussing can possibly appreciate what a chillingly accurate account of them this passage is. It was written by the

philosopher-sociologist Max Horkeimer in 1947, years before the forces that were even then eclipsing reason, to use Horkeimer's own expression, came to be embodied literally in machines.

This passage, especially in view of when and by whom it was written, informs us once again that the computer, as presently used by the technological elite, is not a cause of anything. It is rather an instrument pressed into the service of rationalizing, supporting, and sustaining the most conservative, indeed, reactionary, ideological components of the current *Zeitgeist*.

As we see so clearly in the various systems under scrutiny, meaning has become entirely transformed into function. Language, hence reason too, has been transformed into nothing more than an instrument for affecting the things and events in the world. Nothing these systems do has any intrinsic significance. There are only goals dictated by tides that cannot be turned back. There are only means-ends analyses for detecting discrepancies between the way things are, the "observed condition", and the way the fate that has befallen us tells us we wish them to be. In the process of adapting ourselves to these systems, we, even the admirals among us, have {castrated} not only ourselves (that is, resigned ourselves to impotence), but our very language as well. For now that language has become merely another tool, all concepts, ideas, images that artists and writers cannot paraphrase into computer-comprehensible language have lost their function and their potency. Forrester tells us this most clearly — but the others can be seen nodding their agreement: "Any concept and relationship that can be clearly stated in ordinary language can be translated into computer model language." The burden of proof that something has been "stated clearly" is on the poet. No wonder, given this view of language, that the distinction between the living and the lifeless, between {man} and machine, has become something less than real, at most a matter of nuance!

Corrupt language is very deeply imbedded in the rhetoric of the technological elite. We have already noted the transformation of the meaning of the word "understand" by Minsky into a purely instrumental term. And it is this interpretation of it that, of course, pervades all the systems we have been discussing. Newell and Simon's use of the word "problem" is another example and one just as significant.

During the times of trouble on American university campuses, one could often hear well-meaning speakers say that the unrest, at

*See "Questioning Technology, Questioning Patriarchy," p. 1.

least on their campuses, was mainly caused by inadequate communication among the university's various constituencies, e.g., faculty, administration, students, staff. The "problem" was therefore seen as fundamentally a communication, hence a technical, problem. It was therefore solvable by technical means, such as the establishment of various "hotlines" to, say, the president's or the provost's office. Perhaps there were communcia-tion difficulties; there usually are on most campuses. But this view of the "problem" — a view entirely consistent with Newell and Simon's view of "human problem solving" and with instrumental reasoning — actively hides, buries, the existence of real conflicts. It may be, for example, that students have genuine ethical, moral, and political interests that conflict with interests the university administration perceives itself to have, and that each constituency understands the other's interests very well. Then there is a genuine problem, not a communication difficulty, certainly not one that can be repaired by the technical expedient of hotlines. but instrumental reason converts each dilemma, however genuine, into a mere paradox that can then be unraveled by the application of logic, by calculation. All conflicting interests are replaced by the interests of technique alone.

This, like Philip Morrison's story, is a parable too. Its wider significance is that the corruption of the word "problem" has brought in its train the mystique of "problem solving", with catastrophic effects on the whole world. When every problem on the international scene is seen by the "best and brightest" problem solvers as being a mere technical problem, wars like the Viet Nam war become truly inevitable. The recognition of genuinely conflicting but legitimate interests of coexisting societies — and such recognition is surely a precondition to conflict resolution or accommodation — is rendered impossible from the outset. Instead, the simplest criteria are used to detect differences, to search for means to reduce these differences, and finally to apply operators to "present objects" in order to transform them into "desired objects". It is, in fact, entirely reasonable, if "reason" means instrumental reason, to apply American military force, B-52's, napalm, and all the rest, to "communist-dominated" Viet Nam (clearly an "undesirable object"), as the "operator" to transform it into a "desirable object", namely, a country serving American interests.

The mechanization of reason and of language has consequences far beyond any envisioned by the problem solvers we have cited.

Horkeimer, long before computers became a fetish and gave concrete form to the eclipse of reason, gave us the needed perspective:

"Justice, equality, happiness, tolerance, all the concepts that . . . were in preceding centuries supposed to be inherent in or sanctioned by reason, have lost their intellectual roots. They are still aims and ends, but there is no rational agency authorized to appraise and link them to an objective reality. Endorsed by venerable historical documents, they may still enjoy a certain prestige, and some are contained in the supreme law of the greatest countries. Nevertheless, they lack any confirmation by reason in its modern sense. Who can say that any one of these ideals is more closely related to truth than its opposite? According to the philosophy of the average modern intellectual, there is only one authority, namely, science, conceived as the classification of facts and the calculation of probabilities. The statement that justice and freedom are better in themselves than injustice and oppression is scientifically unverifiable and useless. It has come to sound as meaningless in itself as would the statement that red is more beautiful than blue, or that an egg is better than milk."[2] . . .

The theories — or, perhaps better said, the root metaphors — that have hypnotized the artificial intelligentsia, and large segments of the general public as well, have long ago determined that life is what is computable and only that. As Professor John McCarthy, head of Stanford University's Artificial Intelligence Laboratory said, "The only reason we have not yet succeeded in formalizing every aspect of the real world is that we have been lacking a sufficiently powerful logical calculus. I am currently working on that problem."

Sometimes when my children were still little, my wife and I would stand over them as they lay sleeping in their beds. We spoke to each other in silence, rehearsing a scene as old as mankind itself. It is as Ionesco told his journal: "Not everything is unsayable in words, only the living truth."

1 M. Horkeimer, *Eclipse of Reason* (New York: Seabury, 1974), p. 21. This important book was first published by the Oxford University Press, New York, in 1947.
2 *Ibid.*, pp. 23-24.

2. *Was there a point in history when technology came to dominate the individual? How could this have happened?*

In Arcadia, the mythic Golden age, we were naked, beautiful, and unashamed. Nature was neither landscape nor background; we were of the world, not set against it. Human noises blended with bird song, the hum of insects, and the cries of animals.

Tasting the forbidden fruit, opening Pandora's box, stealing fire from the gods — these are the sorts of chosen, willful acts that, in the stories, bring the Golden Age to a catastrophic close.

What truths lie behind these legends? Did everything begin to shift when humans first spoke words, planted seeds, or put each other forcibly to work?

We can only speculate about the origins of technology; the imagined scenario is a mirror of present awareness. This startling reflection displays the accepted world as it really is — arbitrary and imposed. There is nothing inevitable about the technological landscape. It has been chosen, and human participation sustains its reality moment by moment, building an ever higher rampart to keep out the world we once were part of.

Here, anthropologist Stanley Diamond contemplates what we may have lost as technical evolution destroyed traditional society. Historian Carolyn Merchant sees the seventeenth century as the definitive period that established modern — and anti-human — science and technology. Jacques Ellul has offered perhaps the most systematic philosophical indictment of technology's trajectory; here is a representative, essential piece of his argument, excerpted from *The Technological Society*.

And, outside the glass wall of his utopian city which had arisen out of the ruin of the "final" war between the country and the city is a green wilderness in which primitive rebels live off the land, alive to their humanity, and seek to free the ultimately urbanized brother within.

The Death of Nature

CAROLYN MERCHANT

The fundamental social and intellectual problem for the seventeenth century was the problem of order. The perception of disorder, so important to the Baconian doctrine of dominion over nature, was also crucial to the rise of mechanism as a rational antidote to the disintegration of the organic cosmos. The new mechanical philosophy of the mid-seventeenth century achieved a reunification of the cosmos, society, and the self in terms of a new metaphor — the machine. Developed by the French thinkers Mersenne, Gassendi, and Descartes in the 1620s and 1630s and elaborated by a group of English emigrés to Paris in the 1640s and 1650s, the new mechanical theories emphasized and reinforced elements in human experience developing slowly since the late Middle Ages, but accelerating in the sixteenth century.

New forms of order and power provided a remedy for the disorder perceived to be spreading throughout culture. In the organic world, order meant the function of each part within the larger whole, as determined by its nature, while power was diffused from the top downward through the social or cosmic hierarchies. In the mechanical world, order was redefined to mean the predictable behavior of each part within a rationally determined system of laws, while power derived from active and immediate intervention in a secularized world. Order and power together constituted control. Rational control over nature, society, and the self was achieved by redefining reality itself through the new machine metaphor.

As the unifying model for science and society, the machine has permeated and reconstructed human consciousness so totally that today we scarcely question its validity. Nature, society, and the human body are composed of interchangeable atomized parts that can be repaired or replaced from outside. The "technological fix" mends an ecological malfunction, new human beings replace the old to maintain the smooth functioning of industry and bureaucracy, and interventionist medicine exchanges a fresh heart for a worn-out, diseased one. . . .

The removal of animistic, organic assumptions about the cosmos constituted the death of nature — the most far-reaching effect of the Scientific Revolution. Because nature was now viewed as a system of dead, inert particles moved by external, rather than inherent forces, the mechanical framework itself could legitimate the manipulation of nature. Moreover, as a conceptual framework, the mechanical order had associated with it a framework of values based on power, fully compatible with the directions taken by commercial capitalism . . . .

The mechanistic view of nature, developed by the seventeenth-century natural philosophers and based on a Western mathematical tradition going back to Plato, is still dominant in science today. This view assumes that nature can be divided into parts and that the parts can be rearranged to create other species of being. "Facts" or information bits can be extracted from the environmental context and rearranged according to a set of rules based on logical and mathematical operations. The results can then be tested and verified by resubmitting them to nature, the ultimate judge of their validity. Mathematical formalism provides the criterion for rationality and certainty, nature the criterion for empirical validity and acceptance or rejection of the theory.

The work of historians and philosophers of science notwithstanding, it is widely assumed by the scientific community that modern science is objective, value-free, and context-free knowledge of the external world. To the extent to which the sciences can be reduced to this mechanistic mathematical model, the more legitimate they become as sciences. Thus the reductionist hierarchy of the validity of the sciences first proposed in the nineteenth century by French positivist philosopher August Comte is still widely assumed by intellectuals, the most mathematical and highly theoretical sciences occupying the most revered position.

The mechanistic approach to nature is as fundamental to the twentieth-century revolution in physics as it was to classical Newtonian science, culminating in the nineteenth-century unification of mechanics, thermodynamics, and electromagnetic theory. Twentieth-century physics still views the world in terms of fundamental particles — electrons, protons, neutrons, mesons, muons, pions, taus, thetas, sigmas, pis, and so on. The search for the ultimate unifying particle, the quark, continues to engage the efforts of the best theoretical physicists.

Mathematical formalism isolates the elements of a given quantum mechanical problem, places them in a latticelike matrix, and rearranges them through a mathematical function called an *operator*. Systems theory extracts possibly relevant information bits from the environmental context and stores them in a computer memory for later use. But since it cannot store an infinite number of "facts", it must select a finite number of potentially relevant pieces of data according to a theory or set of rules governing the selection process. For any given solution, this mechanistic approach very likely excludes some potentially relevant factors.

Systems theorists claim for themselves a holistic outlook, because they believe that they are taking into account the ways in which all the parts in a given system affect the whole. Yet the formalism of the calculus of probabilities excludes the possibility of mathematizing the gestalt — that is, the ways in which each part at any given instant take their meaning from the whole. The more open, adaptive, organic, and complex the system, the less successful is the formalism. It is most successful when applied to closed, artificial, precisely defined, relatively simple systems. Mechanistic assumptions about nature push us increasingly in the direction of artificial environments, mechanized control over more and more aspects of human life, and a loss of the quality of life itself.

In the social sphere, the mechanistic model helps to guide technological and industrial development. In *The Technological Society*, Jacques Ellul discussed the techniques of economics and the mechanistic organization of specialties inherent in and entailed by the machines and mathematical methods themselves. The calculating machine, punch card machine, microfilm, and computer transform statistical methods and administrative organization into specialized agencies centered around one or more statistical categories.

Econometric models and stochastics are used to operate on

statistical data in order to analyze, compare, and predict. In social applications, attempts to predict public reaction through the calculus of probabilities may make a public informed of its confirmation to a trend act in the inverse manner.

But the public, by so reacting falls under the influence of a new prediction which is completely determinable . . . . It must be assumed, however, that one remains within the framework of rational behavior. The system works all the better when it deals with people who are better integrated into the mass . . . whose consciousness is partially paralyzed, who lend themselves willingly to statistical observations and systematization.

Such attempts to reduce human behavior to statistical probabilities and to condition it by such psychological techniques as those developed by B. F. Skinner are manifestations of the pervasiveness of the mechanistic mode of thought developed by the seventeenth century scientists. . . .

The March 1979 accident at the Three-Mile Island nuclear reactor near Harrisburg, Pennsylvania, epitomized the problems of the "death of nature" that have become apparent since the Scientific Revolution. The manipulation of nuclear processes in an effort to control and harness nature through technology backfired into disaster. The long-range economic interests and public image of the power company and the reactor's designer were set above the immediate safety of the people and the health of the earth. The hidden effects of radioactive emissions, which by concentrating in the food chain could lead to an increase in cancers over the next several years, were initially downplayed by those charged with responsibility for regulating atomic power.

Three-Mile Island is a recent symbol of the earth's sickness caused by radioactive wastes, pesticides, plastics, photochemical smog, and fluorocarbons. The pollution "of her purest streams" has been supported since the Scientific Revolution by an ideology of "power over nature", an ontology of interchangeable atomic and human parts, and a methodology of "penetration" into her innermost secrets. The sick earth, "yea dead, yea putrified", can probably in the long run be restored to health only by a reversal of mainstream values and a revolution in economic priorities. In this sense, the world must once again be turned upside down.

As natural resources and energy supplies diminish in the future, it

will become essential to examine alternatives of all kinds so that, by adopting new social styles, the quality of the environment can be sustained. Decentralization, nonhierarchical forms of organization, recycling of wastes, simpler living styles involving less-polluting "soft" technologies, and labor-intensive rather than capital-intensive economic methods are possibilities only beginning to be explored. The future distribution of energy and resources among communities should be based on the integration of human and natural ecosystems. Such a restructuring of priorities may be crucial if people and nature are to survive.

3. How has industrial technology adversely affected individuals, societies, and the planet as a whole?

The anthropologist Gene Weltfish once told of interviewing a very old Pawnee woman who had watched emigrant wagon trains roll westward across the plains. "We told each other that for them to bear the suffering of their journey," she told Weltfish, "it must have been really awful where they came from."

Not the usual perspective on pioneer-Indian relationships! And with their arrival in great numbers in the West, Euroamerican settlers put an abrupt end to stable hunter-gatherer cultures that had persisted for thousands of years, as these settlers proceeded to recreate what they had left behind.

"Pioneers" are still hacking away at the last remaining "frontiers", in the Amazon Basin, the Arctic, and the Antarctic. Wilderness, the reservoir of Earth's nutrients, has become quaint and confined, as small in proportion to the planet as parks are in proportion to the commercial and residential city.

Our awareness of the precariousness of this state comes and goes. Awareness brings us to despair, while denial robs us of our affiliation with the natural world. Are the positive benefits of medical technology and domestic comfort worth the cost in almost every other area of human life, not to mention all life on earth?

George Bradford answers with an anguished summation of the political economy of technology out of control. Siegel and Markoff have studied the new high-tech mecca, Silicon Valley, and found appalling, not promising, prospects, while Morris Berman proposes that modernity itself must be deeply reordered if we are to deal with the new world wrought by industrial technology.

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We All Live in Bhopal

GEORGE BRADFORD

The cinders of the funeral pyres at Bhopal are still warm, and the mass graves still fresh, but the media prostitutes of the corporations have already begun their homilies in defense of industrialism and its uncounted horrors. Some 3,000 people were slaughtered in the wake of the deadly gas cloud, and 20,000 will remain permanently disabled. The poison gas left a 25 square mile swath of dead and dying, people and animals, as it drifted southeast away from the Union Carbide factory. "We thought it was a plague", said one victim. Indeed it was: a chemical plague, an *industrial plague,*
Ashes, ashes, all fall down!
A terrible, unfortunate, "accident", we are reassured by the propaganda apparatus for Progress, for History, for "Our Modern Way of Life". A price, of course, has to be paid — since the risks are necessary to ensure a higher Standard of Living, a Better Way of Life.
The *Wall Street Journal*, tribune of the bourgeoisie, editorialized, "It is worthwhile to remember that the Union Carbide insecticide plant and the people surrounding it were where they were for compelling reasons. India's agriculture has been thriving, bringing a better life to millions of rural people, and partly because of the use of modern agricultural technology that includes applications of insect killers." The indisputable fact of life, according to this sermon, is that universal recognition that India, like everyone else, "needs technology. Calcutta-style scenes of human deprivation can be replaced as fast as the country imports the benefits of the West's industrial revolution and market economics." So, despite whatever dangers are involved, "the benefits outweigh the costs". (Dec. 13 1984)
The *Journal* was certainly right in one regard — the reasons for the plant and the people's presence there are certainly compelling:

capitalist market relations and technological invasion are as compelling as a hurricane to the small communities from which those people were uprooted. It conveniently failed to note, however, that countries like India do not import the *benefits* of industrial capitalism; those benefits are *exported* in the form of loan repayments to fill the coffers of the bankers and corporate vampires who read the *Wall Street Journal* for the latest news of their investments. The Indians only take the risks and pay the costs; in fact, for them, as for the immiserated masses of people living in the shantytowns of the Third World, there are no risks, only certain hunger and disease, only the certainty of death squad revenge for criticizing the state of things as they are.

Green Revolution a Nightmare

In fact, the Calcutta-style misery is the result of Third World industrialization and the so-called industrial "Green Revolution" in agriculture. The Green Revolution, which was to revolutionize agriculture in the "backward" countries and produce greater crop yields, has only been a miracle for the banks, corporations and military dictatorships who defend them. The influx of fertilizers, technology, insecticides and bureaucratic administration exploded millennia-old rural economies based on subsistence farming, creating a class of wealthier farmers dependent upon western technologies to produce cash crops such as coffee, cotton and wheat for export, while the vast majority of farming communities were destroyed by capitalist market competition and sent like refugees into the growing cities. These victims, paralleling the destroyed peasantry of Europe's Industrial Revolution several hundred years before, joined either the permanent underclass of unemployed and underemployed slumdwellers eking out a survival on the tenuous margins of civilization, or became proletarian fodder in the Bhopals, Sao Paulos and Djakartas of an industrializing world — an industrialization process, like all industrialization in history, paid for by the pillage of nature and human beings in the countryside.

Food production goes up in some cases, of course, because the measure is only quantitative — some foods disappear while others are produced year round, even for export. *But subsistence is destroyed.* Not only does the rural landscape begin to suffer the consequences of constant crop production and use of chemicals, but the masses of people — laborers on the land and in the teeming hovels growing around the industrial plants — go hungrier in a vicious cycle of

exploitation, while the wheat goes abroad to buy absurd commodities and weapons.

But subsistence is culture as well: culture is destroyed with subsistence, and people are further trapped in the technological labyrinth. The ideology of progress is there, blared louder than ever by those with something to hide, a cover-up for plunder and murder on levels never before witnessed.

Industrialization of the Third World

The industrialization of the Third World is a story familiar to anyone who takes even a glance at what is occurring. The colonial countries are nothing but a dumping ground and pool of cheap labor for capitalist corporations. Obsolete technology is shipped there along with the production of chemicals, medicines and other products banned in the developed world. Labor is cheap, there are few if any safety standards, and *costs are cut*. But the formula of cost-benefit still stands: the costs are simply borne by others, by the victims of Union Carbide, Dow, and Standard Oil.

Chemicals found to be dangerous and banned in the US and Europe are produced instead overseas — DDT is a well-known example of an enormous number of such products, such as the unregistered pesticide Leptophos exported by the Velsicol Corporation to Egypt which killed and injured many Egyptian farmers in the mid-1970's. Other products are simply dumped on Third World markets, like the mercury-tainted wheat which led to the deaths of as many as 5,000 Iraqis in 1972, wheat which had been imported from the US. Another example was the wanton contamination of Nicaragua's Lake Managua by a chlorine and caustic soda factory owned by Pennwalt Corporation and other investors, which caused a major outbreak of mercury poisoning in a primary source of fish for the people living in Managua.

Union Carbide's plant at Bhopal did not even meet US safety standards according to its own safety inspector, but a UN expert on international corporate behavior told the *New York Times*, "A whole list of factors is not in place to insure adequate industrial safety" throughout the Third World. "Carbide is not very different from any other chemical company in this regard." According to the *Times*, "In a Union Carbide battery plant in Jakarta, Indonesia, more than half the workers had kidney damage from mercury exposure. In an asbestos cement factory owned by the Manville Corporation 200 miles west of Bhopal, workers in 1981 were routinely covered with

asbestos dust, a practice that would never be tolerated here." (12/9/84)

Some 22,500 people are killed every year by exposure to insecticides — a much higher percentage of them in the Third World than use of such chemicals would suggest. Many experts decried the lack of an "industrial culture" in the "underdeveloped" countries as a major cause of accidents and contamination. But where an "industrial culture" thrives, is the situation really much better?

Industrial Culture and Industrial Plague

In the advanced industrial nations an "industrial culture" (and little other) exists. Have such disasters been avoided as the claims of these experts would lead us to believe?

Another event of such mammoth proportions as those of Bhopal would suggest otherwise — in that case, industrial pollution killed some 4,000 people in a large population center. That was London, in 1952, when several days of "normal" pollution accumulated in stagnant air to kill and permanently injure thousands of Britons.

Then there are the disasters closer to home or to memory, for example, the Love Canal (still leaking into the Great Lakes water system), or the massive dioxin contaminations at Seveso, Italy and Times Creek, Missouri, where thousands of residents had to be permanently evacuated. And there is the Berlin and Farro dump at Swartz Creek, Michigan, where C-56 (a pesticide by-product of Love Canal fame), hydrochloric acid and cyanide from Flint auto plants had accumulated. "They think we're not scientists and not even educated", said one enraged resident, "but anyone who's been in high school knows that cyanide and hydrochloric acid is what they mixed to kill the people in the concentration camps".

A powerful image: industrial civilization as one vast, stinking extermination camp. We all live in Bhopal, some closer to the gas chambers and to the mass graves, but all of us close enough to be victims. And Union Carbide is obviously not a fluke — the poisons are vented in the air and water, dumped in rivers, ponds and streams, fed to animals going to market, sprayed on lawns and roadways, sprayed on food crops, every day, everywhere. The result may not be as dramatic as Bhopal (which then almost comes to serve as a *diversion*, a deterrence machine to take our minds off the pervasive reality which Bhopal truly represents), but it is as deadly. When ABC News asked University of Chicago professor of public

health and author of *The Politics of Cancer*, Jason Epstein, if he thought a Bhopal-style disaster could occur in the US, he replied: "I think what we're seeing in America is far more slow — not such large accidental occurrences, but a slow, gradual leakage with the result that you have excess cancers or reproductive abnormalities."

In fact, birth defects have doubled in the last 25 years. And cancer is on the rise. In an interview with the *Guardian*, Hunter College professor David Kotelchuck described the "Cancer Atlas" maps published in 1975 by the Department of Health, Education and Welfare. "Show me a red spot on these maps and I'll show you an industrial center of the US", he said. "There aren't any place names on the maps but you can easily pick out concentrations of industry. See, it's not Pennsylvania that's red it's just Philadelphia, Erie and Pittsburgh. Look at West Virginia here, there's only two red spots, the Kanawha Valley, where there are nine chemical plants including Union Carbide's, and this industrialized stretch of the Ohio River. It's the same story wherever you look."

There are 50,000 toxic waste dumps in the United States. The EPA admits that *ninety per cent* of the 90 billion pounds of toxic waste produced annually by US industry (70 per cent of it by chemical companies) is disposed of "improperly" (although we wonder what they would consider "proper" disposal). These deadly products of industrial civilization — arsenic, mercury, dioxin, cyanide, and many others — are simply dumped, "legally" and "illegally", wherever convenient to industry. Some 66,000 different compounds are used in industry. Nearly a billion tons of pesticides and herbicides comprising 225 different chemicals were produced in the US last year, and an additional 79 million pounds were imported. Some two per cent of chemical compounds have been tested for side effects. There are 15,000 chemical plants in the United States, daily manufacturing mass death.

All of the dumped chemicals are leaching into our water. Some three to four thousand wells, depending on which government agency you ask, are contaminated or closed in the US. In Michigan alone, 24 municipal water systems have been contaminated, and a thousand sites have suffered major contamination. According to the Detroit *Free Press*, "The final toll could be as many as 10,000 sites" in Michigan's "water wonderland" alone (April 15, 1984).

And the coverups go unabated here as in the Third World. One example is that of dioxin; during the proceedings around the Agent Orange investigations, it came out that Dow Chemical had lied all

along about the effects of dioxin. Despite research findings that dioxin is "exceptionally toxic" with "a tremendous potential for producing chlor-acne and systemic injury", Dow's top toxicologist, V. K. Rowe, wrote in 1965, "We are not in any way attempting to hide our problems under a heap of sand. But we certainly do not want to have any situations arise which will cause the regulatory agencies to become restrictive."

Now Vietnam suffers a liver cancer epidemic and a host of cancers and health problems caused by the massive use of Agent Orange there during the genocidal war waged by the US. The sufferings of the US veterans are only a drop in the bucket. And dioxin is appearing everywhere in our environment as well, in the form of recently discovered "dioxin rain".

Going to the Village

When the Indian authorities and Union Carbide began to process the remaining gases in the Bhopal plant, thousands of residents fled, despite the reassurances of the authorities. The *New York Times* quoted one old man who said, "They are not believing the scientists or the state government or anybody. They only want to save their lives."

The same reporter wrote that one man had gone to the train station with his goats, "hoping that he could take them with him — anywhere, as long as it was away from Bhopal" (Dec. 14, 1984). The same old man quoted above told the reporter, "All the public has gone to the village." The reporter explained that "going to the village" is what Indians do when trouble comes.

A wise and age-old strategy for survival by which little communities always renewed themselves when bronze, iron and golden empires with clay feet fell to their ruin. But subsistence has been and is everywhere being destroyed, and with it, culture. What are we to do when there is no village to go to? When we all live in Bhopal, and Bhopal is everywhere? The comments of two women, one a refugee from Times Creek, Missouri, and another from Bhopal, come to mind. The first woman said of her former home, "This was a nice place once. Now we have to bury it." The other woman said, "Life cannot come back. Can the government pay for the lives? Can you bring those people back?"

The corporate vampires are guilty of greed, plunder, murder, slavery, extermination and devastation. And we should avoid any pang of sentimentalism when the time comes for them to pay for

their crimes against humanity and the natural world. But we will have to go beyond them, to ourselves: subsistence, and with it culture, has been destroyed. We have to find our way back to the village, out of industrial civilization, out of this exterminist system.

The Union Carbides, the Warren Andersons, the "optimistic experts" and the lying propagandists all must go, but with them must go the pesticides, the herbicides, the chemical factories and the chemical way of life which is nothing but death.

Because this is Bhopal, and it is all we've got. This "once nice place" can't be simply buried for us to move on to another pristine beginning. The empire is collapsing. We must find our way back to the village, or as the North American natives said, "back to the blanket", and we must do this not by trying to save an industrial civilization which is doomed, but in that renewal of life which must take place in its ruin. By throwing off this Modern Way of Life, we won't be "giving things up" or sacrificing, but throwing off a terrible burden. Let us do so soon before we are crushed by it.

The High Cost of High Tech: The Dark Side of the Chip

LENNY SIEGEL & JOHN MARKOFF

The belt of industrial communities at the southern edge of the San Francisco Bay universally symbolizes the promise of the microelectronics era. It was first called Silicon Valley in the early 1970s, when manufacturers of silicon chips became the Santa Clara Valley's major employers. The Valley is home to the greatest concentration of high-tech professionals and enterprises in the world. It is a land where the information-rich, particularly those trained in science and technology, can make both their mark and their millions.

Though Silicon Valley is in many ways unique, planners, officials, and commercial interests throughout the country see the area as a model for industrial growth in the information age. While few other areas can hope to rival the Valley, many have already attracted their share of high-tech facilities. As high tech grows, they will learn the harsh truth behind the legends of Silicon Valley.

Many of the Valley's problems are directly caused by high tech. Others are found elsewhere, but they are significant merely because the residents of would-be Silicon Valleys have been told that the electronics industry has no serious problems. If they study the lessons of the Valley, they can avoid many of the pitfalls of high-tech growth.

"Maria", a 26-year-old political refugee from Argentina, found work in Silicon Valley, but she did not strike gold. She quit her $4.10 an hour production job at Memorex to have her first baby. For two years, she illegally stuffed and soldered thousands of printed circuit (PC) boards in her home. Her employer, a middle-aged woman she calls "Lady", sub-contracted assembly work from big firms — so Maria was told — like Apple and Memorex.

Maria gladly accepted the low piece-rate work because child care would have eaten up most of her after-tax earnings at a full-time job. She quit, however, when Lady asked her to wash her assembled boards by dipping them into a panful of solvent, heated on her kitchen stove. Maria, unlike most Silicon Valley cottage workers, had studied chemistry before immigrating into the US and she knew that the hydrocarbon fumes could make her young son, crawling around on the kitchen floor, seriously ill.

Lady contracts with about a hundred minority women, primarily immigrants and refugees from Latin America, Korea, and Indochina. Although semiconductor chips are fabricated with precise machinery in super-clean rooms, they can be attached by hand, anywhere, to the printed circuit boards that form the heart of most computer equipment.

Silicon Valley's workforce is sharply stratified. In the electronics industry, pay, status, and responsibility are primarily a function of education. The professionals who make the Valley unique sit at the top of the occupational ladder; they are paid well, and the ambitious among them can make millions. Most are white men, but Japanese-Americans and ethnic Chinese are over-represented as well.

The world of Silicon Valley's managers and professionals is centered in northern Santa Clara County, near Stanford University and the historical center of the Valley's high-tech industry. Unlike the white-collar workers who commute to America's established downtown areas, Silicon Valley's affluent have chosen to live near their place of work. Other new, high-tech centers appear to be developing along a remarkably similar pattern.

Since Stanford University established its Industrial Park in 1951, high-tech companies have clustered near the university. The Industrial Park, on Stanford-owned land just a mile from the academic campus, established standards for industrial development in Silicon Valley, and it is still considered a model throughout North America. For three decades, its low-slung buildings, innovative architecture, and expanses of green landscape perpetuated the belief that high tech was a clean industry and a good neighbor. The suburbs around Stanford have long been known for their attractive living environment and good schools; and commuting, even before the 1973 rise in oil prices, was uncomfortable, costly, and time-consuming. So professional workers generally bought homes or rented as close to work as possible.

As the Valley boomed, its industrial core spread, but until the 1980s this core was for the most part confined to the northern, suburban portion. Like their predecessors, the engineers, scientists, and managers who came to the Valley from all over the world settled near their jobs. This influx of high-income families drove up the cost of housing. By the 1970s, rents and prices in the Valley were among the highest in the nation.

By and large, the unemployed, the service workers, and the Valley's low-paid production workers — who have always earned a fraction of the professionals' salaries — were driven from the centers of employment. San Jose, the county's traditional urban center and home to half its residents, became a bedroom community for the production workforce.

Palo Alto, which receives property and sales tax revenues from the Stanford Industrial Park, easily provides municipal services to its relatively affluent citizens. San Jose, on the other hand, has a much smaller tax base from which it must serve the county's poorer residents. Production workers from San Jose spend their days in the north county, generating wealth for electronics companies to pay into suburban treasuries. They then return to homes protected by San Jose's underfunded police and fire departments and streets poorly maintained by its public works department.

Nowhere are the two worlds of Silicon Valley further apart than in education. Palo Alto's public school system is considered among the best in the nation. In fact, that is a major reason why high-tech professionals move to the area. In 1983, however, the San Jose Unified School District, the largest of several districts in the city, became the first American school system since 1943 to declare bankruptcy.

A few years back, several women on the morning shift at Verbatim, a Silicon Valley manufacturer of memory disks for computers, complained of dizziness, shortness of breath, and weakness. Some even reported seeing a haze in the factory air. More than 100 people were quickly evacuated from the building, and the company sent 35 of them to a nearby industrial clinic.

Hours later, inspectors from the California Occupational Safety and Health Administration could not find fumes intense enough to explain the complaints, and they termed the episode "mass psychogenic illness", also known as assembly-line hysteria. In the stressful world of high-volume electronics assembly, mass hysteria is not unknown. But chances are high that the Verbatim workers'

bodies had detected the presence of toxic chemicals at a level below the threshhold recognized by health officials.

High-tech industry's environmentally controlled "clean rooms", in which electronics workers must wear surgical gowns and gloves, are not designed to protect the workers; they are built to protect microelectronic products against particulate contamination. Despite the protective clothing, equipment, and vents found at a typical semiconductor plant, in the pressure to meet production quotas many Silicon Valley workers are frequently exposed to hazardous liquids and fumes.

The hazardous materials used in semi-conductor production include acids, cyanide compounds, organic solvents, and silicon tetrachloride, which turns into hydrochloric acid when its fumes are inhaled into the lungs. Arsine gas, a lethal form of arsenic, can cause serious damage to the liver, heart, and blood cells, even when inhaled in small quantities. It has been used extensively for years in the production of silicon chips. Now, as the Pentagon is promoting the development and production of chips based upon gallium arsenide instead of silicon, the likelihood of workers being exposed to arsenic is growing.

It is possible that communities and regions which study the lessons of Silicon Valley can substantially reduce the risk high-tech production poses to the environment and public health. Unfortunately, high tech's environmental record has not leaked out to the rest of the country. Officials who promote high tech as a solution to local or regional economic ills paint a picture of the industry as shiny as the surface of a silicon wafer. They call high tech a "sunrise industry", clean and light in contrast to "smokestack" industries like steel and auto production, known for their drab, monstrous factories and ever present plumes of vapor and smoke.

It isn't hard to see where high tech got its reputation. Electronic products — chips, computers, switchboards, and so on — don't breathe exhaust or drip oil. The factories are rambling, well-landscaped buildings, resembling modern college libraries; no smokestacks protrude above their facades. Many production steps take place in so-called clean rooms, where the air is fanatically filtered and production workers wear surgical gowns. But the industry's vast investment in cleanliness is designed principally to protect microelectronic components from the dust particles that could prevent them from functioning properly. It does not protect high-tech's workers nor the residents who live in the communities

that surround the plants, from the toxic chemicals and metals essential to high-tech manufacturing.

One of the greatest ironies of micro-electronics technology is that the transformation of America into an information society relies, at its core, upon a technology from the industrial era: chemical processing. The manufacture of chips, printed circuit boards, magnetic media, and other high-tech products uses some of the most dangerous materials known to humanity. And the accidental release of those toxins into the air, the ground, and bodies of water poses a significant threat to public health.

High-tech pollution is a fact of life wherever the industry has operated for any length of time, from Malaysia to Massachusetts. Yet nowhere has the growing threat that electronics production poses to public health been clearer than in Silicon Valley, where the concentration of high-tech production has greatly magnified the industry's environmental problems.

The hazards of high tech have become increasingly clear during the past few years, but it may be decades before the full impact on public health is known. The electronics industry uses thousands of different toxic materials, yet the volume is small compared to chemical-intensive industries such as petroleum and pesticide production. Still, a Bhopal-like incident, in which hundreds of people are killed immediately from a single leak, is a serious possibility.

Even without such a catastrophic accident, however, the long-term toll from high-tech pollution may be enormous. High-tech toxics have been slowly entering the environment of Silicon Valley for decades. Though widely used chemicals such as hydrocarbon solvents are known to cause ailments ranging from headaches and birth defects to cancer, it is difficult to demonstrate that any particular person is a victim of a particular leak or spill. But there is no doubt that industrial chemicals are affecting the health of growing numbers of people.

San Jose attorney Amanda Hawes is one of a handful of Silicon Valley activists who warned for years that high tech was indeed a hazardous industry. She has built up her reputation by representing electronics workers injured by chemicals on the job. Today she also represents residents of the Los Paseos neighborhood in southern San Jose. A new, comfortable, working-class suburb typical of Silicon Valley, Los Paseos is distinguished by the presence of a chip manufacturing factory built by Fairchild Semiconductor in 1975.

Hawes carries with her a large zoning map of the area surrounding the Fairchild plant. On every block in the surrounding neighborhood there are several colored pins and flags. Each triangular red flag represents a child born with heart anomalies; each blue pin marks a miscarriage; each yellow flag signals a cancer case. Black flags, superimposed on the other markers, note recent deaths. Hawes also carries with her a supply of pins, and she must frequently add one to the display. She charges that Fairchild is responsible for the area's high incidence of disease.

Most of Hawes's clients believed that electronics was a pollution-free industry until January 1982. At that time, officials disclosed that six weeks earlier they had shut down a drinking water well operated by the Great Oaks Water Co., just 2,000 feet from an underground storage tank, including suspected carcinogens trichloroethane and dichloroethylene, had entered the water supply. When residents learned of the leak, they quickly concluded that the company was to blame for the area's alarmingly high incidence of birth defects and miscarriages.

Since then, Fairchild spent at least $15 million to reduce the concentration of solvents in the aquifer, but the water will never be as clean as it was before Fairchild set up shop there. Now the factory stands empty, a monument to the dying myth of high tech as a clean, light industry.

The Fairchild leak exploded onto the local front pages and six o'clock news, breaking through a long-standing barrier of silence on high-tech pollution. The Bay Area press, public officials, and electronics corporations themselves have all been forced to investigate environmental hazards that nobody wanted to believe existed.

Today, scarcely a week passes without the revelation of a new leaking storage tank, poisoned well, or pollution law violation. As soon as the extent of the Fairchild leak was known, other companies started to test the ground water around their underground chemical tanks, and the Bay Area's Regional Water Quality Control Board ordered a comprehensive testing program. Most of the Valley's large production sites were checked — and most came up dirty. Even firms with a reputation for environmental concern, like Hewlett-Packard, had been leaking dangerous toxics used in their manufacturing processes.

Leaks were found at scores of industrial locations within Santa Clara County, but many small facilities have still not been tested.

Nineteen high-tech sites have been placed on the Environmental Protection Agency's "Superfund" list. Nine public and more than sixty private wells have been shut down; many others contain legally allowed levels of contamination. Luckily, Silicon Valley residents have thus far been spared an outright environmental disaster. The Valley's largest source of drinking water is protected by a 200-foot layer of clay, which separates polluted ground water from deep aquifers.

Though Fairchild and nearby IBM began the task of clean-up soon after pollution from their facilities was discovered, many Valley electronics firms have not done much more than sink test wells to determine the extent of their leaks. Pools of hazardous chemicals drift around underground, poisoning shallow private wells and possibly finding a route — for example, via an abandoned agricultural well — to the public water supply. Unless the toxic chemicals are removed or neutralized before they percolate through the clay, the primary water supply of several hundred thousand people will be permanently poisoned. Silicon Valley is sitting on a toxic time bomb. No one knows when it is set to go off; certainly, not enough is being done to defuse it.

French and German suicides comes from a 1979 report of San Francisco's Pacific News Service by Eve Pell, "Teenage Suicides Sweep Advanced Nations of the West."

9 Dr. Edward F. Foulks, a medical anthropologist at the University of Pennsylvania, has argued that madness may be a way by which the human species protects itself in such times of crisis, and hence that psychosis may be a form of cultural avant-garde (see the report on his work in the *New York Times*, 9 December 1975, p. 22, and the *National Observer*, 6 march 1976, p. 1). Much of the work of R. D. Laing points in this direction, and it has been a theme in a number of Doris Lessing's novels. See also Andrew Weil, *The National Mind* (Boston: Houghton Mifflin, 1972).

10 Robert Heilbroner, *Business Civilization in Decline* (New York: Norton, 1976), pp. 120-124.

4. What is the future of human culture with respect to technology? Is there a solution to the reality of being diminished by high tech?

Life is becoming more and more technicized, mediated by machines, modeled on mechanical processes. Heidegger said in the 1960s that philosophy has come to an end in the present epoch, replaced by cybernetics.

Yet the awareness of this unbearable condition grows apace with the barrenness that technology creates around us.

Realistic efforts at a solution will be drastic, far-reaching ones as reflected by a pessimism among most critics of high tech. The problem is profound, and pessimism may be a necessary part of the first step in sizing up our oppression.

There seem to be indications that a whole critique of modern life is involved here. As things get worse, more empty, that encompassing critique will make more and more sense.

Almost fifty years ago, Georges Bataille wrote of the nature and result of modern science in a way that also applies to technology:

"Science is a function that developed only after occupying the place of the destiny it was to have *served* . . . It is a paradox that a function

could only be fulfilled on condition that it become an end in itself. The totality of sciences that man has at his disposal is due to this sort of fraud. But if it is true that the human domain has increased because of it, it has been at the cost of a crippled existence."

Perhaps we are now, finally, able to see this crippling more clearly, and can comprehend that a subjugation of outer nature, now so evident — and ghastly — was truly purchased at the cost of suppression of inner nature. The instrumental or utilitarian character of science and technology is a false notion; domination itself is found there.

If this indictment is vast, so are the measures we must take to remove its application from a world we would like to save and savour. Since the word is getting out — as evidenced by the four samples below — the real work may be our will to renewal and our desire for wholeness.

T. Fulano's poetic contribution verges on despair in its metaphor of our technicized culture as a 747 crashing to earth. Indian activist Russell Means' manifesto attracted much attention as an angry denunciation of "European" culture as a whole. Sally Gearhart goes so far as to recommend the non-reproduction of the human species as a last alternative to high tech's destructiveness, while Morris Berman suggests some of the mammoth changes in the social order that would be necessary for human culture to survive.

Civilization is like a jetliner

T. FULANO

Civilization is like a jetliner, noisy, burning up enormous amounts of fuel. Every imaginable and unimaginable crime and pollution had to be committed in order to make it go. Whole species were rendered extinct, whole populations dispersed. Its shadow on the waters resembles an oil slick. Birds are sucked into its jets and vaporized. Every part, as Gus Grissom once nervously remarked about space capsules before he was burned up in one, has been made by the lowest bidder.

Civilization is like a 747, the filtered air, the muzak oozing over the earphones, a phony sense of security, the chemical food, the plastic trays, all the passengers sitting passively in the orderly row of padded seats staring at Death on the movie screen. Civilization is like a jetliner, an idiot savant in the cockpit, manipulating computerized controls built by sullen wage workers, and dependent for his directions on sleepy technicians high on amphetamines with their minds wandering to sports and sex.

Civilization is like a 747, filled beyond capacity with coerced volunteers — some in love with the velocity , most wavering at the abyss of terror and nausea, yet still seduced by advertising and propaganda. It is like a DC-10, so incredibly enclosed that you want to break through the tin can walls and escape, make your own way through the clouds, and leave this rattling, screaming fiend approaching its breaking point. The smallest error or technical failure leads to catastrophe, scattering your sad entrails like belated omens all over the runway, knocks you out of your shoes, breaks all your bones like egg shells.

(Of course civilization is like many other things besides jets — always *things* — a chemical drainage ditch, a woodland knocked down to lengthen an airstrip or to build a slick new shopping mall where people can buy salad bowls made out of exotic tropical trees which will be extinct next week, or perhaps a graveyard for cars, or a

suspension bridge which collapses because a single metal pin has shaken loose. Civilization is a hydra. There is a multitude of styles, colors, and sizes of Death to choose from.)

Civilization is like a Boeing jumbo jet because it transports people who have never experienced their humanity where they were, to places where they shouldn't go. In fact it mainly transports {businessmen} in suits with briefcases filled with charts, contracts, more mischief — {businessmen} who are identical everywhere and hence have no reason at all to be ferried about. And it goes faster and faster, turning more and more places into airports, the (un)natural habitat of {businessmen}

It is an utter mystery how it gets off the ground. It rolls down the runway, the blinking lights along the ground like electronic scar tissue on the flesh of the earth, picks up speed and somehow grunts, raping the air, working its way up along the shimmering waves of heat and the trash blowing about like refugees fleeing the bombing of a city. Yes, it is exciting, a mystery, when life has been evacuated and the very stones have been murdered.

But civilization, like the jetliner, this freak phoenix incapable of rising from its ashes, also collapses across the earth like a million bursting wasps, flames spreading across the runway in tentacles of gasoline, samsonite, and charred flesh. And always the absurd rubbish, Death's confetti, the fragments left to mock us lying along the weary trajectory of the dying bird — the doll's head, the shoes, eyeglasses, a beltbuckle.

Jetliners fall, civilizations fall, this civilization will fall. The gauges will be read wrong on some snowy day (perhaps they will fail). The wings, supposedly defrosted, will be too frozen to beat against the wind and the bird will sink like a millstone, first gratuitously skimming a bridge (because civilization is also like a bridge, from Paradise to Nowhere), a bridge laden, say, with commuters on their way to or from work, which is to say, to or from an airport, packed in their cars (wingless jetliners) like additional votive offerings to a ravenous Medusa.

Then it will dive into the icy waters of a river, the Potomac perhaps, or the River Jordon, or Lethe. And we will be inside, each one of us at our specially assigned porthole, going down for the last time, like dolls' heads encased in plexiglass.

II

COMPUTERS
and the Informed
Individual

**5. Are computers a force for increased individual autonomy
— or a route to a new totalitarianism?**

Computer and *count* derive from the same Latin words (con +
putare), to reckon. Counting is subconsciously identified with
fingers and toes and manageable numbers. The computer,
though, has been termed "an abacus on amphetamines". Its
ability to perform arithmetical chores far outstrips human
skill in speed and accuracy, just as the dishwasher gets dishes
cleaner, cars are faster than legs, and typing is easier to read
than handwriting.

Computers used to be sold as labor-saving devices; nowadays
thay are more commonly touted as indispensible tools that

give people a head start in the race of life. Kids need them to make it from kindergarten to college; executives need them so as not to waste precious seconds or make decisions based on insufficient data. Countries must have them to keep up with other countries, especially militarily.

An increasing percentage of office work is computer-based. Computerization has turned many offices into the information version of an assembly line, where a discrete unit is processed only to be replaced by the next discrete unit, with no let-up, no breather.

In this section, David Burnham focuses on the increased power modern bureaucracies have to override personal privacy via computers; Abbe Mowoshowitz sees a diminution of consciousness stemming, at least in part, from the same source. Joan Howe takes a brief, negative look at the effects of home-based computer work, while Craig Brod depicts the tedium and strain that accompany labor in the newly automated office.

6. *Some in the Artificial Intelligence field claim that soon computers will not only think but also feel and possess consciousness. What are the implications of such staggering claims?*

The much maligned poet Joyce Kilmer wrote, "I think that I shall never see / a poem as lovely as a tree." If only Kilmer were alive today to celebrate the piece of work that is man, not machine! More and more people die these days because the family has decided to pull the plug. Or perhaps they turned on once too often and overdosed. It's easy to get confused by the machine metaphors for humans. But so far, you can't make love and conceive a machine; and you can't assemble a baby.

Yet the dominant view in philosophy and psychology, as well as artificial intelligence, emphasizes the analogies between human intelligence and digital computers. Perhaps we are nearing the time when man and machine will "isomorph".

Here, we let two champions of artificial intelligence have the floor. Frankly, if you are not deeply chilled, even shocked, by the sensibility they represent, this analogy has been conceived in a most naive way. Computer expert Hubert Dreyfus concludes with a concise estimation of that part of our intellectual tradition that reduces the living subject to a mere calculating object.

* See "Questioning Technology, Questioning Patriarchy," p. 1.

7. What does one learn from interaction with a computer? How does it affect relationships with people?

Notes from a small city:

A local supermarket recently converted to a "box store" and installed laser scanners to read bar codes. Prices declined and the number of customers doubled. Personal relationships of long standing between steady customers and checkers dissolved, given the long lines and hectic conditions.

A minister who had long been active in the peace movement died, and an article in the local paper invited friends to attend his memorial service and join the choir in singing his favorite hymn, "There is a Bomb in Gilead". The dictionary program that "proofed" that particular story did not adequately replace the human proof-reader who had retired from the paper some months before.

An alternative public elementary school with an arts-based curriculum, unique in the nation, was displaced from its home in a roomy, beautiful 1924 Mission-style school. The University moved in its new Center for Advanced Technology in Education.

Gregg Easterbrook provides commentary on the unreal emotional compensations that computers afford; Craig Brod emphasizes the effect this has on children, in the direction of erosion of human interaction. Educator Sardello fears that computer-oriented public education will produce a completely barren, dying culture. James Gorman's consumer comparison of the Cairn Terrier and the Macintosh is easily the funniest entry in the book you are holding.

{Man}*Bytes Dog

JAMES GORMAN

Many people have asked me about the Cairn Terrier. How about memory, they want to know. Is it IBM-compatible? Why didn't I get the IBM itself, or a Kaypro, Compaq, or Macintosh? I think the best way to answer these questions is to look at the Macintosh and the Cairn head on. I almost did buy the Macintosh. It has terrific graphics, good word-processing capabilities, and the mouse. But in the end I decided on the Cairn, and I think I made the right decision.

Let's start out with the basics:

MACINTOSH:
  Weight (without printer): 20lbs
  Memory (RAM): 128 K
  Price (with printer): $3,090

CAIRN TERRIER:
  Weight (without printer): 14lbs
  Memory (RAM): Some
  Price (without printer): $250

Just on the basis of price and weight, the choice is obvious. Another plus is that the Cairn Terrier comes in one unit. No printer is necessary, or useful. And — this was a big attraction to me — there is no user's manual.

Here are some of the other qualities I found put the Cairn way out ahead of the Macintosh:

PORTABILITY: To give you a better idea of size, Toto in "The Wizard of Oz" was a Cairn Terrier. So you can see that if the young Judy Garland wss able to carry Toto around in that little picnic basket, you will have no trouble at all moving your Cairn from place to place. For short trips it will move under its own power. The Macintosh will not.

RELIABILITY: In five to ten years, I am sure, the Macintosh will be superseded by a new model, like the Delicious or the Granny

*See "Questioning Technology, Questioning Patriarchy," p.1.

Smith. The Cairn Terrier, on the other hand, has held its share of the market with only minor modifications for hundreds of years. In the short term, Cairns seldom need servicing, apart from shots and the odd worming, and most function without interruption during electrical storms.

COMPATIBILITY: Cairn Terriers get along with everyone. And for communications with any other dog, of any breed, within a radius of three miles, no additional hardware is necessary. All dogs share a common operating system.

SOFTWARE: The Cairn will run three standard programs, SIT, COME and NO, and whatever else you create. It is true that, being microcanine, the Cairn is limited here, but it does load the programs instantaneously. No disk drives. No tapes.

Admittedly, these are peripheral advantages. The real comparison has to be on the basis of capabilities. What can the Macintosh and the Cairn do? Let's start on the Macintosh's turf — income-tax preparation, recipe storage, graphics, and astrophysics problems:

	Taxes	Recipes	Graphics	Astrophysics
Macintosh	yes	yes	yes	yes
Cairn	no	no	no	no

At first glance it looks bad for the Cairn. But it's important to look beneath the surface with this kind of chart. If you yourself are leaning toward the Macintosh, ask yourself these questions: Do you want to do your own income taxes? Do you want to type all your recipes into a computer? In your graph, what would you put on the *x* axis? The *y* axis? Do you have any astrophysics problems you want solved?

Then consider the Cairn's specialities: playing fetch and tug-of-war, licking your face, and chasing foxes out of rock cairns (eponymously). Note that no software is necessary. All these functions are part of the operating system:

	Fetch	Tug-of-war	Face	Foxes
Cairn	yes	yes	yes	yes
Macintosh	no	no	no	no

Another point to keep in mind is that computers, even the Macintosh, only do what you tell them to do. Cairns perform their functions all on their own. Here are some of the additional capabilities that I discovered once I got the Cairn home and housebroken:

WORD PROCESSING: Remarkably the Cairn seems to understand every word I say. He has a nice way of pricking up his ears at words like "out" or "ball". He also has highly tuned voice-recognition.

EDUCATION: The Cairn provides children with hands-on experience at an early age, contributing to social interaction, crawling ability, and language skills. At age one, my daughter could say "Sit", "Come" and "No".

CLEANING: This function was a pleasant surprise. But of course cleaning up around the cave is one of the reasons dogs were developed in the first place. Users with young (below age two) children will still find this function useful. The Cairn Terrier cleans the floor, spoons, bib and baby, and has an unerring ability to distinguish strained peas from ears, nose and fingers.

PSYCHOTHERAPY: Here the Cairn really shines. And remember, therapy is something that computers have tried. There is a program that makes the computer ask you questions when you tell it your problems. You say, "I'm afraid of foxes". The computer says, "You're afraid of foxes?"

The Cairn won't give you that kind of echo. Like Freudian analysts, Cairns are mercifully silent; unlike Freudians, they are infinitely sympathetic. I've found that the Cairn will share, in a nonjudgemental fashion, disappointments, joys and frustrations. And you don't have to know BASIC.

This last capability is related to the Cairn's strongest point, which was the final deciding factor in my decision against the Macintosh — user-friendliness. On this criterion, there is simply no comparison. The Cairn Terrier is the essence of user-friendliness. It has fur, it doesn't flicker when you look at it, and it wags its tail.

III

TECHNOLOGY
The Web of Life?

8. Contemporary society can be described in phrases like "Information Age" and "global communications network". What do the "information" and "comunications" consist of?

The acceleration of technology has been accompanied by an eclipse of meaning, as ideas have passed from understanding to knowledge to data. The buzzword "information" signifies this removal of meaning, and the "communication" comes to be mainly one-way, as we spend more and more time passively plugged in to the programming and circuitry of the new order.

It is not difficult, or unrealistic, to dream up a "Big Brother" intentionality out of all this. In fact, some promoters of the Information Age sound pretty sinister. Consider Pask and Gordon (*Micro Man*, pp. 216-217): "Pockets of a de-informationalized society may survive ... But most communities — particularly large prosperous ones — have no choice in the matter. They must opt in. The sooner this fact and its consequences become part of our consensual reality, the better for everyone."

Is this an offer we can't refuse?

Mythinformation

LANGDON WINNER

> *Mythinformation (n.): The almost religious conviction that a widespread adoption of computers and communications systems, along with broad access to electronic information, will automatically produce a better world for humanity.*

The specter of computer revolution is haunting modern society. Books, magazine articles, and news-media specials declare that this upheaval is underway, that nothing will escape unchanged. Like political revolutionists, advocates of computerization believe that a glorious transformation is sweeping the world and that they are its vanguard.

Of course, modern society has long since gotten used to "revolutions" in laundry detergents, underarm deodorants, floor waxes, and other consumer products. Exhausted in advertising slogans, the revolution image has lost much of its punch. Those who employ it to talk about computers and society, however, appear to make much more serious claims.

According to visionaries like Edward A. Feigenbaum and Pamela McCorduck (*The Fifth Generation*) or Murray Turoff and Starr Roxanne Hiltz (*The Network Nation*) industrial society, which depends on material production for its livelihood, is being supplanted by a society in which information services will enable people to satisfy their economic and social needs. As computation and communication technologies become less expensive and more convenient, all the people of the world, not just the wealthy, will use the wonderful services that information machines make available. Gradually, existing differences between rich and poor will evaporate.

Long lists of services are meant to suggest the coming utopia: interactive television, electronic funds transfer, computer-aided instruction, customized news service, electronic magazines, electronic mail, computer teleconferencing, on-line stock and weather

reports, computerized yellow pages, shopping via home computer, and so forth. In the words of James Martin, writing in *Telematic Society*: "The electronic revolution will not do away with work, but it does hold out some promises: most boring jobs can be done by machines; lengthy commuting can be avoided; the opportunities for personal creativity will be unlimited."

In this interpretation, the prospects for participatory democracy have never been brighter, offering all the democratic benefits of the ancient Greek city-state, the Israeli kibbutz, and the New England town meeting. J. C. R. Licklider, a computer scientist at MIT, writes hopefully in a 1980 article called "Computers and Government": "The political process would essentially be a giant teleconference, and a campaign would be a months-long series of communications among candidates, propagandists, commentators, political action groups, and voters. The information revolution is bringing with it a key that may open the door to a new era of involvement and participation."

Mythinformation in the High-tech Era

Taken as a whole, beliefs like these make up what I call *mythinformation*: the almost religious conviction that a widespread adoption of computers and communications systems, along with broad access to electronic information, will automatically produce a better world for humanity.

It is common for the advent of a new technology to provide occasion for flights of utopian fancy. During the last two centuries the factory system, railroads, the telephone, electricity, automobiles, airplanes, radio, television, and nuclear power have all figured prominently in the belief that a new and glorious age was about to begin. But even within the great tradition of optimistic technophilia, current dreams of a "computer age" stand out as exaggerated and unrealistic. Because they have such broad appeal, and because they overshadow other ways of looking at the matter, these notions deserve closer inspection.

As is generally true of myths, the dreams contain elements of truth. What were once industrial societies are being transformed into service economies, a trend that emerges as a greater share of material production shifts to the developing countries, where labor costs are low and business tax breaks are lucrative. However, this shift does not mean that future employment possibilities will flow largely from the microelectronics and information-services indus-

tries, even though some service industries do depend on highly sophisticated computer and communications systems.

A number of studies, including those of the US Bureau of Labor Statistics, suggest that the vast majority of new jobs will be menial service positions paying relatively low wages. As robots and computer software absorb an increasing share of factory and office tasks, the "information society" will offer plenty of work for janitors, hospital orderlies, and fast-food helpers.

The computer savants correctly notice that computerization alters relationships of social power and control; however, the most obvious beneficiaries of this change are large transnational business corporations. While their "global reach" does not arise solely from the application of information technologies, such organizations are uniquely situated to exploit the new electronic possibilities for greater efficiency, productivity, command, and control. Other notable beneficiaries will be public bureaucracies, intelligence agencies, and ever-expanding military organizations.

Ordinary people are, of course, strongly affected by these organizations and by the rapid spread of new electronic systems in banking, insurance, taxation, work, home entertainment, and the like. They are counted on to be eventual eager buyers of hardware, software, and communications services.

But where is any motion toward increased democratization and social equality, or the dawn of a cultural renaissance? Current empirical studies of computers and social change — such as those described in *Computers and Politics* by James Danzig — suggest an increase in power by those who already have a great deal of power, an enhanced centralization of control by those already in control, and an augmentation of wealth by the already wealthy. If there is to be a computer revolution, it will most likely have a distinctly conservative character.

Granted, such prominent trends could be altered. A society strongly rooted in computer and telecommunications systems could incorporate participatory democracy, decentralized control, and social equality. However, such progress would involve concerted efforts to remove the many difficult obstacles blocking those ends, and the writings of computer enthusiasts seldom propose such deliberate action. Instead, they suggest that the good society will be a natural spin-off from the proliferation of computing devices. They evidently assume no need to place limits upon concentrations of power in the information age.

There is nothing new in this assumption. Computer romanticism strongly resembles a common nineteenth- and twentieth-century faith that expects to generate freedom, democracy, and justice through simple material abundance. From that point of view, there is no need for serious inquiry into the appropriate design of new institutions for the distribution of rewards and burdens. In previous versions of this conviction, the abundant (and therefore democratic) world would be found in a limitless supply of houses and consumer goods. Now "access to information" has moved to the top of the list.

Probing the Key Assumptions

The political arguments of computer romantics draw upon four key assumptions: 1) people are bereft of information; 2) information is knowledge; 3) knowledge is power; and 4) increased access to information enhances democracy and equalizes social power.

1. Is it true that people face serious shortages of information? To read the literature on the computer revolution, one would suppose this to be a problem on a par with the energy crisis of the 1970s. The persuasiveness of this notion borrows from our sense that literacy, education, knowledge, well-informed minds, and the widespread availability of tools of inquiry are of unquestionable social value.

Alas, the idea is entirely faulty. It mistakes sheer supply of information for an educated ability to gain knowledge and act effectively. Even highly developed societies contain chronic inequalities in the distribution of education and intellectual skills. The US Army must reject many of the young men and women it recruits because they cannot read military manuals.

If the solution to problems of illiteracy and poor education were a question of information supply alone, then the best policy might be to increase the number of well-stocked libraries, especially in places where libraries do not presently exist. Of course, that would do little good unless people were sufficiently well educated to use those libraries. Computer enthusiasts, however, are not known for their support of public libraries and schools; they call for *electronic information* carried by *networks*. To look to those instruments first while ignoring everything history has taught us about how to educate and stimulate a human mind is grave foolishness.

2. What is the "information" so cherished as knowledge? It is not understanding, enlightenment, critical thought, timeless wisdom, or the content of a well-educated mind. Looking closely at the writings of computer enthusiasts, "information" means enormous quantities

of data manipulated by various kinds of electronic media, used to facilitate the transactions of large, complex organizations. In this context, the sheer quantity of information presents a formidable challenge. Modern organizations continually face "overload", a flood of data that threatens to become unintelligible. Computers provide one way to confront that problem; speed conquers quantity.

The information most crucial to modern organizations is highly time-specific. Data on stock market prices, airline traffic, weather conditions, international economic indicators, military intelligence, and public opinion polls are useful for very short periods of time.

Systems that gather, organize, analyze, and use electronic data must be closely tuned to the latest developments. Information is a perishable commodity.

But is it sensible to transfer this ideology, as many evidently wish, to all parts of human life? A recent *Business Week* article on home computers concluded: "Running a household is actually like running a small business. You have to worry about inventory control — of household supplies — and budgeting for school tuition, housekeepers' salaries, and all the rest." One begins to wonder how running a home was possible before microelectronics.

3. "As everybody knows, knowledge is power," wrote Dr. Feigenbaum. This attractive idea is highly misleading. Knowledge employed in particular circumstances may well help one act effectively — a citrus farmer's knowledge of frost conditions enables {him} to fight the harmful effects of cold snaps. But there is no automatic, positive link between knowledge and power, especially power in a social or political sense. At times, knowledge brings merely an enlightened impotence or paralysis. What conditions might enable ordinary folks to translate their knowledge into renewed power? It is a question computer enthusiasts ought to explore.

4. An equally serious misconception among computer enthusiasts is the belief that democracy is largely a matter of distributing information. This assertion plays on the valid beliefs that a democratic public should be open-minded and well-informed, and that totalitarian societies are evil because they dictate what people can know and impose secrecy to restrict freedom. But democracy is not founded primarily upon the availability of information. It is distinguished from other political forms by the recognition that the people as a whole are capable of, and have the right to, self-government.

There are many reasons why relatively low levels of citizen

*See "Questioning Technology, Questioning Patriarchy," p. 1.

participation prevail in some modern democracies, including the United States. Perhaps opportunities to serve in a public office or influence policy are too limited; in that case, broaden the opportunities. Or perhaps choices placed before citizens are so pallid that boredom is a valid response; then improve the quality of those choices. But it is not reasonable to assume that a universal grid of sophisticated information machines, in itself, would stimulate a renewed sense of political involvement and participation.

The role of television in modern politics suggests why this is so. Public participation in voting has steadily declined as television replaces the face-to-face politics of precincts and neighborhoods. The passive monitoring of electronic news makes citizens feel involved while releasing them from the desire to take an active part, and from any genuine political knowledge based on first-hand experience. The vitality of democratic politics depends on people's willingness to act together — to appear before each other in person, speak their minds, deliberate, and decide what they will do. This is considerably different from the model upheld as a breakthrough for democracy: logging onto one's computer, receiving the latest information, and sending back a digitized response. No computer enthusiasm is more poignant than the faith that the personal computer, as it becomes more sophisticated, cheaper, and more simple to use, will become a potent equalizer in society. Presumably, ordinary citizens equipped with microcomputers will counter the influence of large, computer-based organizations. This notion echoes the eighteenth- and nineteenth-century revolutionary belief that placing firearms in the hands of the people would overthrow entrenched authority. But the military defeat of the Paris Commune in 1871 made clear that arming the people may not be enough. Using a personal computer makes one no more powerful vis-a-vis, say, the US National Security Agency than flying a hang glider establishes a person as a match for the US Air Force.

The Long-term Consequences

If the long-term consequences of computerization are anything like the ones commonly predicted, they will require rethinking of many fundamental conditions and institutions in social and political life. Three areas of concern seem paramount. First, as people handle more of their daily activites electronically — mail, banking, shopping, entertainment, travel plans, and so on — it becomes technically feasible to monitor these activities with unprecedented ease. An age rich in electronic information may achieve wonderful

social conveniences at the cost of placing freedom — and the feeling of freedom — in a deep chill.

Second, a computerized world will renovate conditions of human sociability. Indeed, the point of many applications of microelectronics is to eliminate social layers that were previously needed. Computerized bank tellers have largely done away with local branch banks, which were places where people met and socialized. The so-called electronic cottage would operate well without the human interaction that characterizes office work.

These developments pare away the face-to-face contact that once provided buffers between individuals and organized power. Workers who might previously have recognized a common grievance and acted together to remedy it are now deprived of such contact, and thus increasingly influenced by employers, news media, advertisers, and national political leaders. Where will we find new institutions to balance and mediate such power?

Third, computers, satellites, and telecommunications may recast the basic structure of political order, as they fulfill the modern dream of conquering space and time. These systems make possible instantaneous action anywhere on the globe without limits imposed by the location of the initiator. But humans and their societies have traditionally lived, acted, and found meaning within spatial and temporal limits. Microelectronics tends to dissolve these limits, thereby threatening the integrity of social and political forms that depend on them.

Transnational corporations of enormous size can now manage their activities efficiently across the whole surface of the planet. If it seems convenient, operations can be shifted from Sunnyvale to Singapore at the flick of a switch. In recent past, corporations have had to demonstrate at least some semblance of commitment to their geographical base; their public relations often stressed the fact that they were "good neighbors". But when organizations are located everywhere and nowhere this commitment easily evaporates. Towns, cities, regions, and whole nations must swallow their pride and negotiate for favors. Political authority is gradually redefined.

By calling the changes of computerization "revolutionary", people tacitly acknowledge that these changes require reflection; they may even require strong public action to ensure desirable outcome. Yet the occasions in our society for reflection, debate and public check are rare indeed. The important decisions are left in private hands inspired by narrowly focused economic motives. While it is widely recognized that these decisions have profound cumulative

9. How — and how effectively — is the technological outcome of science regulated? Is there some research and development that should be off-limits?

In a recent series of radio interviews of nationally recognized research scientists, this question was asked of each person: "Who is responsible for the technological consequences of scientific research?" "The engineers," said one scientist. "The public", said another. "Not the scientists", stated a third savant. The others said they didn't know. Not one of them ventured to suggest that the *scientist* might have responsibility.

The technician's answer to the culpability question could be Eichmann's: "I was only following orders." As for the public: "What do we know? It's probably for the best. It's inevitable — you can't stop progress." (That's what people said about slavery, among other scourges.)

Eugene Schwartz takes the measure of the juggernaut of technology, and concludes that the prevailing antidote to high tech problems — more technology — is not the answer. Greg Davis shows the weaknesses in sanguine assumptions about regulation of technology, and discusses some grass roots combat strategies. Leonard Cole is cautiously optimistic as to prospects for successful control of science and technology, whereas T. Fulano attacks faith in science as the triumph of the inhuman and the death of the wonder of nature.

10. Is technology "neutral"?

Interest in digital watches seems to be waning. Concert-goers are no longer greeted by signs that ask them to turn of the "beep beep". In fact, the chorus of "beep beeps" that used to occur on the hour is now a sign that one is surrounded by the sort of folks that used to carry slide rules in their back pockets.

The digital watch, like a sextant, gives you your position *now*. But it does not measure or predict. A person with the clockface watch has the edge, somehow. And so, slowly but surely, the drift has been back to "telling time".

If time is alienating, high tech can increase the estrangement. But only with our assistance. The riddle is solved: guns don't kill people; people sometimes kill people; mostly, people kill people *with guns*.

The Zerzans find in the invention of the factory system a conscious tactic of social engineering, while ex-ad {man}* Mander characterizes television as fundamentally alienating and hence unreformable. Ian Reinecke demonstrates a deadening fragmentation of work that is being heightened, and not accidentally, by high tech work processes. Our shortest selection is Ellul's elucidation of an autonomous technology whose boundaries have grown beyond any reasonable definition of neutrality.

*See "Questioning Technology. Questioning Patriarchy," p. 1.

SORRY FOR THE BLANK PAGES

CHEERS, ONUR :)