II

Convivial Reconstruction

The symptoms of accelerated crisis are widely recognized. Multiple attempts have been made to explain them. I believe that this crisis is rooted in a major twofold experiment which has failed, and I claim that the resolution of the crisis begins with a recognition of the failure. For a hundred years we have tried to make machines work for men and to school men for life in their service. Now it turns out that machines do not "work" and that people cannot be schooled for a life at the service of machines. The hypothesis on which the experiment was built must now be discarded. The hypothesis was that machines can replace slaves. The evidence shows that, used for this purpose, machines enslave men. Neither a dictatorial proletariat nor a leisure mass can escape the dominion of constantly expanding industrial tools.

The crisis can be solved only if we learn to invert the present deep structure of tools; if we give people tools that guarantee their right to work with high, independent efficiency, thus simultaneously eliminating the need for either slaves or masters and enhancing each person's range of freedom. People need new tools to work with rather than tools that "work" for them. They need technology to make the most of the energy and imagination each has, rather than more well-programmed energy slaves.

I believe that society must be reconstructed to enlarge the contribution of autonomous individuals and primary groups to the total effectiveness of a new system of production designed to satisfy the human needs which it also determines. In fact, the institutions of industrial society do just the opposite. As the

power of machines increases, the role of persons more and more decreases to that of mere consumers.

Individuals need tools to move and to dwell. They need remedies for their diseases and means to communicate with one another. People cannot make all these things for themselves. They depend on being supplied with objects and services which vary from culture to culture. Some people depend on the supply of food and others on the supply of ball bearings.

People need not only to obtain things, they need above all the freedom to make things among which they can live, to give shape to them according to their own tastes, and to put them to use in caring for and about others. Prisoners in rich countries often have access to more things and services than members of their families, but they have no say in how things are to be made and cannot decide what to do with them. Their punishment consists in being deprived of what I shall call "conviviality." They are degraded to the status of mere consumers.

I choose the term "conviviality" to designate the opposite of industrial productivity. I intend it to mean autonomous and creative intercourse among persons, and the intercourse of persons with their environment; and this in contrast with the conditioned response of persons to the demands made upon them by others, and by a man-made environment. I consider conviviality to be individual freedom realized in personal interdependence and, as such, an intrinsic ethical value. I believe that, in any society, as conviviality is reduced below a certain level, no amount of industrial productivity can effectively satisfy the needs it creates among society's members.

Present institutional purposes, which hallow industrial productivity at the expense of convivial effectiveness, are a major factor in the amorphousness and meaninglessness that plague contemporary society. The increasing demand for products has come to define society's process. I will suggest how this present trend can be reversed and how modern science and technology can be used to endow human activity with unprecedented effectiveness. This reversal would permit the evolution of a life style and of a political system which give priority to the protection, the maximum use, and the enjoyment of the one resource that is almost

equally distributed among all people: personal energy under personal control. I will argue that we can no longer live and work effectively without public controls over tools and institutions that curtail or negate any person's right to the creative use of his or her energy. For this purpose we need procedures to ensure that controls over the tools of society are established and governed by political process rather than by decisions by experts.

The transition to socialism cannot be effected without an inversion of our present institutions and the substitution of convivial for industrial tools. At the same time, the retooling of society will remain a pious dream unless the ideals of socialist justice prevail. I believe that the present crisis of our major institutions ought to be welcomed as a crisis of revolutionary liberation because our present institutions abridge basic human freedom for the sake of providing people with more institutional outputs. This world-wide crisis of world-wide institutions can lead to a new consciousness about the nature of tools and to majority action for their control. If tools are not controlled politically, they will be managed in a belated technocratic response to disaster. Freedom and dignity will continue to dissolve into an unprecedented enslavement of man to his tools.

As an alternative to technocratic disaster, I propose the vision of a convivial society. A convivial society would be the result of social arrangements that guarantee for each member the most ample and free access to the tools of the community and limit this freedom only in favor of another member's equal freedom.

At present people tend to relinquish the task of envisaging the future to a professional élite. They transfer power to politicians who promise to build up the machinery to deliver this future. They accept a growing range of power levels in society when inequality is needed to maintain high outputs. Political institutions themselves become draft mechanisms to press people into complicity with output goals. What is right comes to be subordinated to what is good for institutions. Justice is debased to mean the equal distribution of institutional wares.

The individual's autonomy is intolerably reduced by a society that defines the maximum satisfaction of the maximum number as the largest consumption of industrial goods. Alternate political

arrangements would have the purpose of permitting all people to define the images of their own future. New politics would aim principally to exclude the design of artifacts and rules that are obstacles to the exercise of this personal freedom. Such politics would limit the scope of tools as demanded by the protection of three values: survival, justice, and self-defined work. I take these values to be fundamental to any convivial society, however different one such society might be from another in practice, institutions, or rationale.

Each of these three values imposes its own limits on tools. The *conditions for survival* are necessary but not sufficient to ensure justice; people can survive in prison. The *conditions for the just distribution* of industrial outputs are necessary, but not sufficient to promote convivial production. People can be equally enslaved by their tools. The *conditions for convivial work* are structural arrangements that make possible the just distribution of unprecedented power. A postindustrial society must and can be so constructed that no one person's ability to express him- or herself in work will require as a condition the enforced labor or the enforced learning or the enforced consumption of another.

In an age of scientific technology, the convivial structure of tools is a necessity for survival in full justice which is both distributive and participatory. This is so because science has opened new energy sources. Competition for inputs must lead to destruction, while their central control in the hands of a Leviathan would sacrifice equal control over inputs to the semblance of an equal distribution of outputs. Rationally designed convivial tools have become the basis for participatory justice.

But this does not mean that the transition from our present to a convivial mode of production can be accomplished without serious threats to the survival of many people. At present the relationship between people and their tools is suicidally distorted. The survival of Pakistanis depends on Canadian grain, and the survival of New Yorkers on world-wide exploitation of natural resources. The birth pangs of a convivial world society will inevitably be violently painful for hungry Indians and for helpless New Yorkers. I will later argue that the transition from the present mode of production, which is overwhelmingly industrial, toward con-

viviality may start suddenly. But for the sake of the survival of many people it will be desirable that the transition does not happen all at once. I argue that survival in justice is possible only at the cost of those sacrifices implicit in the adoption of a convivial mode of production and the universal renunciation of unlimited progeny, affluence, and power on the part of both individuals and groups. This price cannot be extorted by some despotic Leviathan, nor elicited by social engineering. People will rediscover the value of joyful sobriety and liberating austerity only if they relearn to depend on each other rather than on energy slaves. The price for a convivial society will be paid only as the result of a political process which reflects and promotes the society-wide inversion of present industrial consciousness. This political process will find its concrete expression not in some taboo, but in a series of temporary agreements on one or the other concrete limitation of means, constantly adjusted under the pressure of conflicting insights and interests.

In this volume I want to offer a methodology by which to recognize means which have turned into ends. My subject is tools and not intentions. The choice of this subject makes it impossible to undertake several related, relevant, and tempting tasks because:

1. It would not serve my purpose to describe in detail any fictional community of the future. I want to provide guidelines for action, not for fantasy. A modern society, bounded for convivial living, could generate a new flowering of surprises far beyond anyone's imagination and hope. I am not proposing a Utopia, but a procedure that provides each community with the choice of its unique social arrangements.

2. I do not want to contribute to an engineering manual for the design of convivial institutions or tools, nor do I want to engage in a sales campaign for what would be obviously a better technology. My purpose is to lay down criteria by which the manipulation of people for the sake of their tools can be immediately recognized, and thus to exclude those artifacts and institutions which inevitably extinguish a convivial life style. Paradoxically, a society of simple tools that allows men to achieve purposes with energy fully under their own control is now difficult to imagine. Our imaginations have been industrially de-

formed to conceive only what can be molded into an engineered system of social habits that fit the logic of large-scale production. We have almost lost the ability to frame in fancy a world in which sound and shared reasoning sets limits to everybody's power to interfere with anybody's equal power to shape the world.

The present world is divided into those who do not have enough and those who have more than enough, those who are pushed off the road by cars and those who drive them. The have-nots are miserable and the rich anxious to get more. A society whose members know what is enough might be poor, but its members would be equally free. Men with industrially distorted minds cannot grasp the rich texture of personal accomplishments within the range of modern though limited tools. There is no room in their imaginations for the qualitative change that the acceptance of a stable-state industry would mean; a society in which members are free from most of the multiple restraints of schedules and therapies now imposed for the sake of growing tools. Much less do most of our contemporaries experience the sober joy of life in this voluntary though relative poverty which lies within our grasp.

3. I will focus on the structure of tools, not on the character structure of their users. The use of industrial tools stamps in an identical way the landscape of cities each having its own history and culture. Highways, hospital wards, classrooms, office buildings, apartments, and stores look everywhere the same. Identical tools also promote the development of the same character types. Policemen in patrol cars or accountants at computers look and act alike all over the world, while their poor cousins using nightstick or pen are different from region to region. The progressive homogenization of personalities and personal relationships cannot be stemmed without a retooling of society. Research on the social character traits that make retooling difficult or doubtful is complementary to what I propose. But I am not postulating the creation of a new man as a condition for a new society, nor am I pretending to know how either social character or cultures will change. A pluralism of limited tools and of convivial commonweals would of necessity encourage a diversity of life styles.

4. It would distract from the core of my argument if I were to deal with political strategies or tactics. With the possible exception of China under Mao, no present government could restructure society along convivial lines. The managers of our major tools—nations, corporations, parties, structured movements, professions—hold power. This power is vested in the maintenance of the growth-oriented structures which they manipulate. These managers have the power to make major decisions; they can generate new demands for the output of their tools and enforce the creation of new social labels to fit them. They can even go so far as to limit the output of tools in the interest of maximizing benefits. But they have no power to reverse the basic structure of the institutional arrangements which they manage.

The major institutions now optimize the output of large tools for lifeless people. Their inversion implies institutions that would foster the use of individually accessible tools to support the meaningful and responsible deeds of fully awake people. Turning basic institutions upside down and inside out is what the adoption of a convivial mode of production would require. Such an inversion of society is beyond the managers of present institutions.

Today's managers form a new class of men, selected for their character, competence, and interest—which enable them to both expand the productive society and promote the further operant conditioning of their clients. They hold and manage power no matter who lives in the illusion that he owns the tools. This class of power-holders must be eliminated, but this cannot be done by mass slaughter or replacement. The new élite would only claim more legitimacy in the manipulation of the inherited structured power. Management can be done away with only by eliminating the machinery that makes it necessary and, therefore, the demands for output that give it sway. In a convivial society there is little need for replacing the chairman of the board.

In a society in which power—both political and physical—is bounded and spread by political decision there is place not only for a new flowering of products and characters, but also for a variety in forms of governance. Certainly, new tools would provide new options. Convivial tools rule out certain levels of power,

compulsion, and programming, which are precisely those features that now tend to make all governments look more or less alike. But the adoption of a convivial mode of production does not of itself mean that one specific form of government would be more fitting than another, nor does it rule out a world federation, or agreements between nation-states, or communes, or many of the most traditional forms of governance. I restrict myself to the description of basic structural criteria within which the retooling of society can be achieved.

5. A methodology by which to recognize when corporate tools become destructive of society itself requires the recognition of the value of distributory and participatory justice. I believe that my succinct statement will be sufficient to identify necessary restraints on tools, but it will also preclude that in this essay I reach any conclusion about a desirable degree of subordination of means to ends.

6. The economics applicable to a postindustrial and convivial society can neither be ignored nor taken for granted. In a society that accepts politically defined limits on all types of industrial growth, many accepted terms will have to be redefined, but it is certain that in such a society inequality will not be excluded. In fact, each individual's power to make effective changes would be greater than in preindustrial or in industrial times. Though they would be bounded, common tools would be incomparably more efficient than primitive, and more widely distributed than industrial, devices. Their products would accrue more to some than to others. The task of keeping net transfer of power within bounds requires the use of traditional as well as new economic devices. It will be argued that the limitation of tools cannot be effected before a corresponding new economic theory has been elaborated and has become operational. This is correct. I do propose that we use a dimensional analysis to obtain information about the major variables which can upset the balance of life, and that we rely on political process to identify the significant dimensions which man can control. I therefore propose an approach to the relationship between man's ends and his means in which the key units of economics come to signify a dimensionless set of factors. Economics useful for the inversion of our present in-

stitutional structure starts out from politically defined limiting criteria. It is on these negative design criteria for technological devices that I want to focus attention.

A methodology, by which to recognize the public perversion of tools into purposes, encounters resistance on the part of people who are used to measuring what is good in terms of dollars. Plato knew that the bad statesman is he who believes that the art of measurement is universal, and who jumbles together what is greater or smaller and what is more fit to the purpose. Our present attitudes toward production have been formed over the centuries. Increasingly, institutions have not only shaped our demands but also in the most literal sense our logic, or sense of proportion. Having come to demand what institutions can produce, we soon believe that we cannot do without it.

The invention of education is an example of what I mean. We often forget that education acquired its present sense only recently. It was unknown before the Reformation, except as that part of early upbringing which is common to piglets, ducks, and men. It was clearly distinguished from the instruction needed by the young, and from the study in which some engaged later on in life and for which a teacher was needed. Voltaire still called it a presumptuous neologism, used only by pretentious schoolmasters.

The endeavor to put all men through successive stages of enlightenment is rooted deeply in alchemy, the Great Art of the waning Middle Ages. John Amos Comenius, a Moravian bishop of the seventeenth century, a self-styled pansophist and pedagogue, is rightly considered one of the founders of the modern school. He was among the first to propose seven or twelve grades of compulsory learning. In his *Magna Didactica* he described schools as devices to "teach everybody everything" and outlined a blueprint for the assembly-line production of knowledge, which according to his method would make education cheaper and better and make growth into full humanity possible for all. But Comenius was not only an early theoretician of mass production, he was an alchemist who adapted the technical language of his craft to describe the art of rearing children. The alchemist sought to refine base elements by graduating their spirits through twelve

stages of successive enlightenment, so that for their own and all the world's benefit they might be transformed into gold. Of course, alchemists failed no matter how often they tried, but each time their "science" yielded new reasons for their failure, and they tried again.

The industrial mode of production was first fully rationalized in the manufacture of a new invisible commodity, called "education." Pedagogy opened a new chapter in the history of the *Ars Magna*. Education became the search for an alchemic process that would bring forth a new type of man who would fit into an environment created by scientific magic. But no matter how much each generation spent on its schools, it always turned out that the majority of people were certified as unfit for higher grades of enlightenment and had to be discarded as unprepared for the good life in a man-made world.

Not only has the redefinition of learning as schooling made schools seem necessary, it has also compounded the poverty of the unschooled with discrimination against the uneducated. People who have climbed up the ladder of schooling know where they dropped out and how uneducated they are. Once they accept the authority of an agency to define and measure their level of knowledge, they easily go on to accept the authority of other agencies to define for them their level of appropriate health or mobility. It is difficult for them to identify the structural corruption of our major institutions. Just as they come to believe in the value of the "knowledge stock" they acquired in school, so they come to believe that higher speeds save time and that income levels define well-being or, as an alternative, that the production of more services rather than more goods increases the quality of life.

The commodity called "education" and the institution called "school" make each other necessary. The circle can be broken only by a widely shared insight that the institution has come to define the purpose. Values abstractly stated are reduced to mechanical processes that enslave men. This serfdom can be broken only by the joyful self-recognition of the fool who assumes personal responsibility for his folly.

The institutional definition of values has made it difficult to

focus our attention on the deep structure of social means. It is hard to imagine that the division of sciences, of labor, and of professions has gone too far. It is difficult to conceive of higher social effectiveness with lower industrial efficiency. To recognize the nature of desirable limits to specialization and output, we must focus our attention on the industrially determined shape of our expectations. Only then can we recognize that the emergence of a convivial and pluralist mode of production will follow the limitation of industrial institutions.

In the past, convivial life for some inevitably demanded the servitude of others. Labor efficiency was low before the steel ax, the pump, the bicycle, and the nylon fishing line. Between the High Middle Ages and the Enlightenment, the alchemic dream misled many otherwise authentic Western humanists. The illusion prevailed that the machine was a laboratory-made homunculus, and that it could do our labor instead of slaves. It is now time to correct this mistake and shake off the illusion that men are born to be slaveholders and that the only thing wrong in the past was that not all men could be equally so. By reducing our expectations of machines, however, we must guard against falling into the equally damaging rejection of all machines as if they were works of the devil.

A convivial society should be designed to allow all its members the most autonomous action by means of tools least controlled by others. People feel joy, as opposed to mere pleasure, to the extent that their activities are creative; while the growth of tools beyond a certain point increases regimentation, dependence, exploitation, and impotence. I use the term "tool" broadly enough to include not only simple hardware such as drills, pots, syringes, brooms, building elements, or motors, and not just large machines like cars or power stations; I also include among tools productive institutions such as factories that produce tangible commodities like corn flakes or electric current, and productive systems for intangible commodities such as those which produce "education," "health," "knowledge," or "decisions." I use this term because it allows me to subsume into one category all rationally designed devices, be they artifacts or rules, codes or operators, and

to distinguish all these planned and engineered instrumentalities from other things such as basic food or implements, which in a given culture are not deemed to be subject to rationalization. School curricula or marriage laws are no less purposely shaped social devices than road networks.

Tools are intrinsic to social relationships. An individual relates himself in action to his society through the use of tools that he actively masters, or by which he is passively acted upon. To the degree that he masters his tools, he can invest the world with his meaning; to the degree that he is mastered by his tools, the shape of the tool determines his own self-image. Convivial tools are those which give each person who uses them the greatest opportunity to enrich the environment with the fruits of his or her vision. Industrial tools deny this possibility to those who use them and they allow their designers to determine the meaning and expectations of others. Most tools today cannot be used in a convivial fashion.

Hand tools are those which adapt man's metabolic energy to a specific task. They can be multipurpose, like some primitive hammers or good modern pocket knives, or again they can be highly specific in design such as spindles, looms, or pedal-driven sewing machines, and dentists' drills. They can also be complex such as a transportation system built to get the most in mobility out of human energy—for instance, a bicycle system composed of a series of man-powered vehicles, such as pushcarts and three-wheel rickshas, with a corresponding road system equipped with repair stations and perhaps even covered roadways. Hand tools are mere transducers of the energy generated by man's extremities and fed by the intake of air and of nourishment.

Power tools are moved, at least partially, by energy converted outside the human body. Some of them act as amplifiers of human energy: the oxen pull the plow, but man works with the oxen—the result is obtained by pooling the powers of beast and man. Power saws and motor pulleys are used in the same fashion. On the other hand, the energy used to steer a jet plane has ceased to be a significant fraction of its power output. The pilot is reduced to a mere operator guided by data which a computer digests for

him. The machine needs him for lack of a better computer; or he is in the cockpit because the social control of unions over airplanes imposes his presence.

Tools foster conviviality to the extent to which they can be easily used, by anybody, as often or as seldom as desired, for the accomplishment of a purpose chosen by the user. The use of such tools by one person does not restrain another from using them equally. They do not require previous certification of the user. Their existence does not impose any obligation to use them. They allow the user to express his meaning in action.

Some institutions are structurally convivial tools. The telephone is an example. Anybody can dial the person of his choice if he can afford a coin. If untiring computers keep the lines occupied and thereby restrict the number of personal conversations, this is a misuse by the company of a license given so that persons can speak. The telephone lets anybody say what he wants to the person of his choice; he can conduct business, express love, or pick a quarrel. It is impossible for bureaucrats to define what people say to each other on the phone, even though they can interfere with—or protect—the privacy of their exchange.

Most hand tools lend themselves to convivial use unless they are artificially restricted through some institutional arrangements. They can be restricted by becoming the monopoly of one profession, as happens with dentist drills through the requirement of a license and with libraries or laboratories by placing them within schools. Also, tools can be purposely limited when simple pliers and screwdrivers are insufficient to repair modern cars. This institutional monopoly or manipulation usually constitutes an abuse and changes the nature of the tool as little as the nature of the knife is changed by its abuse for murder.

In principle the distinction between convivial and manipulatory tools is independent of the level of technology of the tool. What has been said of the telephone could be repeated point by point for the mails or for a typical Mexican market. Each is an institutional arrangement that maximizes liberty, even though in a broader context it can be abused for purposes of manipulation and control. The telephone is the result of advanced engineering;

the mails require in principle little technology and considerable organization and scheduling; the Mexican market runs with minimum planning along customary patterns.

Any institution that moves toward its second watershed tends to become highly manipulative. For instance, it costs more to make teaching possible than to teach. The cost of roles exceeds the cost of production. Increasingly, components intended for the accomplishment of institutional purposes are redesigned so that they cannot be used independently. People without cars have no access to planes, and people without plane tickets have no access to convention hotels. Alternate tools which are fit to accomplish the same purposes with fewer claims are pushed off the market. For instance, civilized correspondence becomes a lost art. During the last several years this barring of alternatives has usually coincided with the increased power of the tool and the development of more complex tool systems.

It is possible that not every means of desirable production in a postindustrial society would fit the criteria of conviviality. It is probable that even in an overwhelmingly convivial world some communities would choose greater affluence at the cost of some restrictions on creativity. It is almost certain that in a period of transition from the present to the future mode of production in certain countries electricity would not commonly be produced in the backyard. It is also true that trains must run on tracks and stop on schedule at a limited number of points. Oceangoing vessels are built for one purpose; if they were sailing clippers, they might be even more specialized for one route than are present tankers. Telephone systems are highly determined for the transmission of messages of a certain band width and must be centrally administered even if they are limited to the service of only one area. It is a mistake to believe that all large tools and all centralized production would have to be excluded from a convivial society. It would equally be a mistake to demand that for the sake of conviviality the distribution of industrial goods and services be reduced to the minimum consistent with survival in order to protect the maximum equal right to self-determined participation. Different balances between distributive justice and partici-

patory justice can prevail in societies equally striving for post-industrial conviviality, depending on the history, political ideals, and physical resources of a community.

What is fundamental to a convivial society is not the total absence of manipulative institutions and addictive goods and services, but the balance between those tools which create the specific demands they are specialized to satisfy and those complementary, enabling tools which foster self-realization. The first set of tools produces according to abstract plans for men in general; the other set enhances the ability of people to pursue their own goals in their unique way.

The criteria by which anticonvivial or manipulative tools are recognized cannot be used to exclude every tool that meets them. These criteria, however, can be applied as guidelines for structuring the totality of tools by which a society desires to define the style and level of its conviviality. A convivial society does not exclude all schools. It does exclude a school system which has been perverted into a compulsory tool, denying privileges to the drop-out. A convivial society does not exclude some high-speed intercity transport, as long as its layout does not in fact impose equally high speeds on all other routes. Not even television must be ruled out—although it permits very few programmers and speakers to define what their viewers may see—as long as the over-all structure of society does not favor the degradation of everyone into a compulsory voyeur. The criteria of conviviality are to be considered as guidelines to the continuous process by which a society's members defend their liberty, and not as a set of prescriptions which can be mechanically applied.

At present the reverse guideline prevails, even in societies where the producer is told that he is in the saddle. The socialist planner competes with the free-market advocate in claiming that a society run on his principles is more productive. In 1931 Stalin translated "control over the means of production" to mean the increase of productivity by new methods used to control the producer. In the midst of the U.S. Depression he launched Russia on an industrial race. Since then a socialist policy has been considered one which serves the industrially organized productivity

of a socialist country. Stalin's reinterpretation of Marxism has since then served as a form of blackmail against socialists and the left. It remains to be seen if after Mao's death China will also trade productive conviviality for institutional productivity. The Stalinist interpretation of socialism has made it possible for socialists and capitalists alike to agree on how to measure the level of development a society has achieved. Societies in which most people depend for most of their goods and services on the personal whim, kindness, or skill of another are called "underdeveloped," while those in which living has been transformed into a process of ordering from an all-encompassing store catalogue are called "advanced." Stalinism makes it possible to interpret as revolutionary whatever increases the amount of schooling, expands the road systems, or increases the productivity of extraction and manufacture. To be revolutionary has come to mean either to champion the nation that lags in production and to make its members keenly aware of the lag, or to inflame the frantic and frustrated attempts of underconsuming minorities in rich countries to catch up.

Every aspect of industrial societies has become part of a larval system for escalating production and increasing the demand necessary to justify the total social cost. For this reason, criticism of bad management, official dishonesty, insufficient research, or technological lag distracts public attention from the one issue that counts: careful analysis of the basic structure of tools as means. It is equally distracting to suggest that the present frustration is primarily due to the private ownership of the means of production, and that the public ownership of these same factories under the tutelage of a planning board could protect the interest of the majority and lead society to an equally shared abundance. As long as Ford Motor Company can be condemned simply because it makes Ford rich, the illusion is bolstered that the same factory could make the public rich. As long as people believe that the public can profit from cars, they will not condemn Ford for making cars. The issue at hand is not the juridical ownership of tools, but rather the discovery of the characteristic of some tools which make it impossible for anybody to "own" them. The concept of ownership cannot be applied to a tool that cannot be controlled.

The issue at hand, therefore, is what tools can be controlled in the public interest. Only secondarily does the question arise whether private control of a potentially useful tool is in the public interest.

Certain tools are destructive no matter who owns them, whether it be the Mafia, stockholders, a foreign company, the state, or even a workers' commune. Networks of multilane highways, long-range, wide-band-width transmitters, strip mines, or compulsory school systems are such tools. Destructive tools must inevitably increase regimentation, dependence, exploitation, or impotence, and rob not only the rich but also the poor of conviviality, which is the primary treasure in many so-called "underdeveloped" areas.

It has become difficult for contemporary man to imagine development and modernization in terms of lower rather than higher energy use. High technology has been mistakenly identified with powerful intervention in physical, psychological, and social processes. The illusion that a high culture is one that uses the highest possible quantities of energy must be overcome if we are to get tools into focus. In classical societies power sources were very equally distributed. Each man was born with the potential to use most of the power he would need in a lifetime if his organism was properly maintained. Control over larger amounts of physical energy was the result of psychic manipulation or of political domination.

Men did not need power tools to build the Mexican pyramids of Teotihuacán or the Philippine rice terraces of Ibagué. Their muscles provided the force to raise St. Peter's and to dig the channels of Angkor Vat. Runners carried the messages between Caesar's generals and between village chiefs and Inca planners. Hands and feet moved the spindle and the loom, the pottery wheel and the saw. Human metabolism provided the energy that powered classical agriculture, manufacture, and war. Individual skills were the controls that shaped animal energy into socially defined work. The energy that rulers could control was the sum of the performance their subjects voluntarily or involuntarily conceded.

I do not claim that human metabolism provided all useful

power, but I do claim that in most cultures it was the main source of power. Men knew how to harness some of the forces of the environment. They steered barges down the Nile; they gentled beasts to draw the plow; they caught the wind in their sails; they became experts in the construction of simple machines which combined the power of men and of rain and of gravity. They also tamed fire in the forge and the kitchen, but the total output of these sources remained secondary. Even Mongols who lived on their mounts provided more energy with their muscles than with their horsepower. All the energy tapped from the environment to build Athens and Florence did not contribute as much controlled power to these classical societies as did their men. Only when man lit fires to turn cities into ruins or jungles into swiddens did he release—but certainly not control—energies that overwhelmed the power of the people who used them.

The amount of physical power available to old societies can be estimated. It can be expressed in multiples of the average man's working time and metabolic energy. He can burn 2,500 calories a day, four-fifths of them just to stay alive. They go into making his heart beat and his brain pulse. The remainder can be externalized, but this does not mean that all of it can be transformed into work. A large portion of the lifetime capacity of a man to act on his physical and social environment is burnt running around while he grows up. More is spent for chores that lie beyond his personal choice—but also beyond other men's reach. He consumes energy in getting up, in preparing food, in seeking protection from the cold, or in avoiding the slavedriver's whip. If man is deprived of the use of this power, he becomes useless for work. Society can give shape to these personal activities, but it cannot appropriate the energy used on them for other tasks. Custom, language, and law can determine the form of the slave's pottery, but the master cannot take the last pots or the roof away from his slaves, not if he wants them to go on slaving for him. A small energy parcel from each man was the major source of physical power with which temples were built, mountains were moved, cloth was woven, wars were waged, and kings were carried around or amused.

Power was limited. It was proportional to the population. Its

major source was the muscles of individual men. Its efficient use depended on the stage of development which hand tools had reached and the distribution of necessary tools throughout the population. Tools all matched the impedance of manpower to the task. Except by redirecting the forces of gravity and wind they did not and could not act as amplifiers of this power. To control more power than others in his society, a man had to lord it over his fellows. If a ruler could draw power from sources other than men, his control over this power still depended on his control over men. Each pair of oxen required a man to lead them. Even the forge needed a boy to blow into the fire. Political control coincided with the control over physical power, and the control of power depended entirely on authority.

Equal power and equal direct control of power were both features of preindustrial societies, but this did not guarantee an equal autonomy in the exercise of this control. On a very primitive level the physical predominance of one person made him into the lord of others. A slight advantage in organization or weaponry made one people the master of another. The appropriation of resources and tools created the basis of class societies and fostered the rituals and myths that shaped men to fit into the class to which they were assigned.

In a preindustrial society political control could extend only over the excess power that people could produce. As soon as a population became efficient enough to produce more power than was required to maintain it, people could be deprived of control over this energy. They could be compelled to cede their power to the decisions of others. They could be either taxed or enslaved. Part of what they produced on their own could be taken from them, or they could be put to work for the king or the village. Ideology, economic structure, and life style tended to favor this concentration of excess energy under the control of a few.

The degree to which this concentration of control polarized social benefits varied from one culture to another. At best it improved the range within which most members of society could employ their remaining energies. High peasant cultures offer good examples. While all shared in the tasks of defending their land from enemies or floods, each was also better dressed, housed, and

fed. At worst, the concentration of decisions over power led to the establishment of empires which were expanded by mercenaries and fed from plantations worked by slaves.

The total energy available to society increased rapidly toward the end of the Iron Age, that is, between the time of Agrippa and the time of Watt. Most of the radical technical mutations that came into existence before the scientific discoveries in the field of electricity in fact came about early in the Middle Ages. Because they used windpower far more effectively than any previous invention, three-masted sailing ships made world-wide transportation possible. Speedy transportation with regular deliveries was made possible by the building of canals in Europe, a millennium after the same discovery was implemented in Southeast Asia. A vastly increased application of nonhuman energy to industries like brewing, dyeing, pottery-making, brick-making, sugar-refining, salt manufacture, and transportation went parallel with the construction of vastly improved water wheels and windmills.

From the High Middle Ages to the late Renaissance, new social tools developed that ensured the protection of the worker's self-image and dignity, although he was now sometimes dwarfed by the size of machines. The guild system did indeed give the worker a new claim to the monopoly over tools specific to his trade. But the mill had not yet grown out of proportion to the miller. His monopoly over grain-processing protected the guildsman, provided him with extra holidays, and still maximized the services that he could render to his town. Guilds were neither unions nor professional associations.

Lewis Mumford in his *The Myth of the Machine: The Pentagon of Power* points out that one particular enterprise, namely mining,

> set the pattern for later modes of mechanization by its callous disregard for human factors, by its indifference to the pollution and destruction of the neighboring environment, by its concentration upon the physico-chemical process for obtaining the desired metal or fuel, and above all by its topographic and mental isolation from the organic world of the farmer and the craftsman, and the spiritual world of the Church, the University and the City. In its destruction of the environment and

its indifference to the risks to human life, mining closely resembles warfare—though likewise it often, through its confrontation of danger and death, brings into existence a tough, self-respecting personality . . . the soldier at his best. But the destructive animus of mining and its punishing routine of work, along with its environmental poverty and disorder were passed on to the new industries that used its products. These negative social results offset the mechanical gains.

This new attitude toward gainful activity is well reflected in the introduction of a new term to designate it. *Tripaliare* meant to torture on the *trepalium,* which was first mentioned in the sixth century as an instrument of impalement made out of three wooden sticks. By the twelfth century the word in both French and Spanish expressed a painful experience to which man is subjected; only in the sixteenth century did it become possible to use the verb *trabajar* interchangeably with *laborar* and *sudar* on the job. Equally significant is what happened in the English language. Things began to *work*—first medicines (1600) and then physical tools (1650), even though these were not yet tools driven by any outside power. The alchemist's dream of making a homunculus in the test tube slowly took the shape of creating robots to *work* for man, and to educate men to *work* alongside them. The ideology of an industrial organization of tools and a capitalist organization of the economy preceded by many centuries what is usually called the Industrial Revolution. On Baconian premises Europeans began, according to Mumford, to save time, shrink space, augment power, multiply goods, overthrow organic norms and displace real organisms with mechanisms that stimulated them or vastly magnified some single function they performed. All these imperatives, which have become the groundwork of science as technology in our present society, seem axiomatic and absolute only because they remain unexamined. The same change of mind appears also in a transfer from ritual regularity to mechanical regularity with an emphasis on time-keeping, space-measuring, account-keeping, thus translating concrete objects and complex events into abstract quantities. According to Mumford, it was this capitalistic devotion to repetitive order that helped undermine the unmeasurable personal balance between the workman and his tools.

New power meant a new relation to time. The lending of money against interest was considered "against nature" by the Church: money naturally was a means of exchange to buy necessities, not a capital that could *work* or bear fruits. During the seventeenth century even the Church abandoned this view—though reluctantly—to accept the fact that Christians had become capitalist merchants. Time became like money: I now can *have* a few hours before lunch; how shall I *spend* time? . . . I am *short of* time so I can't *afford* to *spend* that much time on a committee; it's not *worth* the time! . . . It would be a *waste* of time; I'd rather *save* an hour.

Scientists began to consider man as a power source. They sought to measure the maximum daily exertion that might be expected from a man and compare both his maintenance and his power to those of a horse. Man was reinvented as a source of mechanical power. Prisoners condemned to the galleys were not much use most of the time, since galleys were most of the time in port. Prisoners condemned to the treadmills produced rotary power to which any of the new machines could be hooked. Up to the early nineteenth century men in English prisons actually labored on the treadmills to make machines work.

The new attitude of man to his tools during the Industrial Revolution, which began as capitalism did in the fifteenth century, finally called for the invention of new sources of power. The steam engine was a product of the Industrial Revolution rather than the cause of it. Power plants soon became mobile, and with the railroad the Iron Age and the Industrial Revolution came to an end. Industrial ways became the status quo.

Immense new sources of power were tapped during the twentieth century, and much of this power became self-governing. Man has now been almost replaced by machines and reduced to being their operator. Fewer men are needed as gang workers in the fields: slavery has become uneconomical. But also fewer men are needed on the assembly line, as engineers have designed machines to perform the tasks that mass production and industrialization had created in the centuries before the steam engine. More power has become available, so more power is used. The

human slaveowner is replaced by the operant conditioning of men in the mega-machine.

We have all grown up as children of our time, and therefore it is extremely difficult to envisage a postindustrial yet human type of "work." To reduce industrial tools seems equivalent to a return to the tortured labor of the mine and the factory, or to the labor of the U.S. farm hand who has to compete with his mechanical neighbor. The worker who had to dip a heavy tire into a solution of hot sulfur each time the machine asked for it was literally hooked onto his apparatus. Agricultural labor also ceased to be what it was for a slave or a farmer. For the slave it was *labor* at the service and behest of a master; for the peasant it was his own *work* which he could organize and shape in accordance with the demands of growing plants, hungry animals, and unpredictable weather. The modern farmhand in the United States today who is deprived of power tools is under a double pressure quite different from that of the classical slave: he must measure up to performance standards set by farm hands elsewhere who use machines, and he is constantly aware that he is underprivileged, exploited, and abused because in an age of the mega-machine he feels that he is used like a component. The prospect that moving toward a convivial society might imply a society with low power tools would seem to him like a return to the exploitation of manpower by inefficient industrial machines in the early periods of steam.

I have described three types of institutional arrangements within which tools can be used. Certain tools can be used effectively within only one of these arrangements. There are tools which can be used normally for fully satisfying, imaginative, and independent *work*; others tend to be used primarily in activities best labeled as *labor*; and, finally, certain machines can only be *operated*. The same can be said about physical artifacts and about the set of rules that define formal institutional arrangements. Cars are machines that call for highways, and highways pretend to be public utilities while in fact they are discriminatory devices. Compulsory schools constitute a huge bureaucratic system; no matter how convivially a teacher tries to conduct his class, his pupils learn through him to which class they belong.

Cars *operate* on highways as teachers operate in schools. Only in a very limited sense can what the truck driver and the teacher do be called *labor*. Only exceptionally will a teacher feel that his operations within the school system do not directly interfere with his *work*.

The market characteristics of these three types of human activity help to clarify the distinction among them. Labor can be purchased or sold in the marketplace. Not work as an activity, but only the result of convivial work can be marketed. Finally, the right to operate machines and to obtain the scarce privileges that go with employment must be earned through the previous consumption of certified treatments, which take the form of a curriculum of schooling and testing along with successive jobs.

Tools for a convivial and yet efficient society could not have been designed at an earlier stage of history. We now can design the machinery for eliminating slavery without enslaving man to the machine. Science and technology are not bound to the peculiar notion, seemingly characteristic of the last 150 years of their application to production, that new knowledge of nature's laws has to be locked into increasingly more specialized and highly capitalized preparation of men to use them. The sciences, which specialized out of philosophy, have become the rationale for an increasing division of operations. The division of labor has finally led to the labor-*saving* division of tools. New technology is now used to amplify supply funnels for commodities. Public utilities are turned from facilities for persons into arenas for the owners of expensive tools. The use of science and technology constantly supports the industrial mode of production, and thereby crowds off the scene all tool shops for independent enterprise. But this is not the necessary result of new scientific discoveries or of their useful application. It is rather the result of a total prejudice in favor of the future expansion of an industrial mode of production. Research teams are organized to remedy minor inefficiencies that hold up the further growth of a specific production process. These planned discoveries are then heralded as costly breakthroughs in the interest of further public service. Research is now mostly oriented toward industrial development.

This unqualified identification of scientific advance with the

replacement of human initiative by programmed tools springs from an ideological prejudice and is not the result of scientific analysis. Science could be applied for precisely the opposite purpose. Advanced or "high" technology could become identified with labor-sparing, work-intensive decentralized productivity. Natural and social science can be used for the creation of tools, utilities, and rules available to everyone, permitting individuals and transient associations to constantly recreate their mutual relationships and their environment with unenvisaged freedom and self-expression.

New understanding of nature can now be applied to our tools either for the purpose of propelling us into a hyperindustrial age of electronic cybernetics or to help us develop a wide range of truly modern and yet convivial tools. Limited resources can be used to provide millions of viewers with the color image of one performer or to provide many people with free access to the records of their choice. In the first case, technology will be used for the further promotion of the specialized worker, be he a plumber, surgeon, or TV performer. More and more bureaucrats will study the market, consult their balance sheets, and decide for more people on more occasions about the range of products among which they may choose. There will be a further increase of useful things for useless people. But science can also be used to simplify tools and to enable the layman to shape his immediate environment to his taste. The time has come to take the syringe out of the hand of the doctor, as the pen was taken out of the hand of the scribe during the Reformation in Europe.

Most curable sickness can now be diagnosed and treated by laymen. People find it so difficult to accept this statement because the complexity of medical ritual has hidden from them the simplicity of its basic procedures. It took the example of the barefoot doctor in China to show how modern practice by simple workers in their spare time could, in three years, catapult health care in China to levels unparalleled elsewhere. In most other countries health care by laymen is considered a crime. A seventeen-year-old friend of mine was recently tried for having treated some 130 of her high-school colleagues for VD. She was acquitted on a technicality by the judge when expert counsel compared her performance

with that of the U.S. Health Service. Nowhere in the U.S.A. can her achievement be considered "standard," because she succeeded in making retests on all her patients six weeks after their first treatment. Progress *should* mean growing competence in self-care rather than growing dependence.

The possibilities of lay therapy also run up against our commitment to "better" health, and have blinded us to the distinction between curable and incurable sickness. This is a crucial distinction because as soon as a doctor treats incurable sickness, he perverts his craft from a means to an end. He becomes a charlatan set on providing scientific consolation in a ceremony in which the doctor takes on the patient's struggle against death. The patient becomes the object of his ministrations instead of a sick subject who can be helped in the process of healing or dying. Medicine ceases to be a legitimate profession when it cannot provide each man or his next of kin with the tool to make this one crucial differential diagnosis for himself.

New opportunities for the progressive expansion of lay therapy and the parallel progressive reduction of professional medicine are rejected because life in an industrial society has made us place such exaggerated value on standard products, uniformity, and certified quality. Industrialized expectations have blurred the distinction between personal vocation and standard profession. Of course, any layman can grow up to become a general healer, but this does not mean that every layman must be taught how to heal. It simply means that in a society in which people can and must take care of their neighbors and do so on their own, some people will excel at using the best available tools. In a society in which people can once again be born in their homes and die in their homes and in which there is a place for cripples and idiots in the street, and where a distinction is made between plumbing and healing, quite a few people would grow up capable of assisting others to heal, to suffer, or to die.

Just as with proper social arrangements most people would grow up as readers without having to be schooled and without having to recreate the pre-Gutenberg profession of the scribe, so a sufficient number would grow up competent with medical tools. This would make healing so plentiful that it would be difficult

to turn this competence into a monopoly or to sell it as a commodity. Deprofessionalization means a renewed distinction between the freedom of vocation and the occasional boost sick people derive from the quasi-religious authority of the certified doctor.

Of course the deprofessionalization of most ordinary medicine could sometimes substitute a quack for today's impostor, but the threat of quackery becomes less convincing as professionally caused damage grows. There just is no substitute for the self-correcting judgment of the layman in socializing the tools invented or used by the professional. Lifelong familiarity with the specific dangers of a specific remedy is the best preparation for accepting or rejecting it in time of crisis.

Take another tool—transportation—as an example. Under President Cárdenas in the early thirties, Mexico developed a modern system of transportation. Within a few years about 80 percent of the population had gained access to the advantages of the automobile. Most important, villages had been connected by dirt roads or tracks. Heavy, simple, and tough trucks traveled over them every now and then, moving at speeds far below twenty miles per hour. People were crowded together on rows of wooden benches nailed to the floor to make place for merchandise loaded in the back and on the roof. Over short distances the vehicle could not compete with people, who had been used to walking and to carrying their merchandise, but long-distance travel had become possible for all. Instead of a man driving his pig to market, man and pig could go together in a truck. Any Mexican could now reach any point in his country in a few days.

Since 1945 the money spent on roads has increased every year. It has been used to build highways between a few major centers. Fragile cars now move at high speeds over smooth roads. Large, specialized trucks connect factories. The old, all-purpose tramp truck has been pushed back into the mountains or swamps. In most areas either the peasant must take a bus to go to the market to buy industrially packaged commodities, or he sells his pig to the trucker in the employ of the meat merchant. He can no longer go to town with his pig. He pays taxes for the roads which serve

the owners of various specialized monopolies and does so under the illusion that the benefits will ultimately spread to him.

In exchange for an occasional ride on an upholstered seat in an air-conditioned bus, the common man has lost much of the mobility the old system gave him, without gaining any new freedom. Research done in two typical large states of Mexico—one dominated by deserts, the other by mountains and lush growth—confirms this conclusion. Less than one percent of the population in either state traveled a distance of over fifteen miles in any one hour during 1970. More appropriate pushcarts and bicycles, both motorized when needed, would have presented a technologically much more efficient solution for 99 percent of the population than the vaunted highway development. Such pushcarts could have been built and maintained by people trained on the job, and operated on roadbeds built to Inca standards, yet covered to diminish drag. The usual rationale given for the investment in standard roads and cars is that it is a condition for development and that without it a region cannot be integrated into the world market. Both claims are true, but can be considered as desirable only if monetary integration is the goal of development.

During the last few years the promoters of development have come to admit that cars, as operated now, are inefficient. This inefficiency is blamed on the fact that modern vehicles are designed for private ownership, not for the public good. In fact, modern personnel transport is inefficient not because an individual capsule rather than a cabin is the model for the largest number of vehicles, or because these vehicles are now owned by their drivers. It is inefficient because of the obsessive identification of higher speed with better transport. Just as the demand for better health at all costs is a form of mental sickness, so is the pretense of higher speed.

The railroads reflected the class societies they served simply by putting different fares on the same speed. But when a society commits itself to higher speeds, the speedometer becomes an indicator of social class. Any peasant could accompany Lázaro Cárdenas on horseback. Today only his personal staff can accompany a modern governor in his private helicopter. In capi-

talist countries how often you can cover great distances is determined by what you can pay. In socialist countries your velocity depends on the social importance the bureaucracy attaches to you. In both cases the particular speed at which you travel puts you into your class and company. Speed is one of the means by which an efficiency-oriented society is stratified.

Fostered addiction to speed is also a means of social control. Transportation in its various forms now swallows 23 percent of the U.S. gross expenditures. The United States may be rich enough to allocate one-fourth of its energy resources and human time to the enterprise of getting somewhere. Under Khufu, Egyptians might have spent that much during a few years to build the Great Pyramid and to get their ruler to the underworld. Unfortunately, however, transportation exacts an ever higher percentage of the cash spent in a given year within many a Latin-American municipality. The road degrades the subsistence farmer and artisan, integrates the village into the money economy, and swallows much of the available cash. It is true that modern transportation does incorporate a region into the world market. It also trains the inhabitants for the consumption of foreign goods and the acceptance of foreign values. For example, throughout history Thailand was known for its klongs. These canals crisscrossed the country; people, rice, and tax collectors all moved easily along them. Some villages were cut off during the dry season, but their seasonal rhythm of life turned this periodic isolation into an occasion for meditation and festivities. A society that can afford long holidays and fill them with activities is certainly not poor. During the last half-decade major klongs were filled in to build roads. Since bus drivers are paid by the number of miles they can cover in a day, and since cars are still few, the Thais for a short while will be able to circulate in their country at world-record bus speeds. They will pay with the destruction of waterways that took millennia to build. The economists argue that buses and trucks pump more money per year through the economy. They do, but at the cost of depriving most Thais of the independence which their sleek rice boats once granted each family. Of course, car owners could never have competed with rice boats unless the World Bank had financed roads for them and the Thai govern-

ment had made new laws that permitted them to profane the klongs.

The building trades are another example of an industry that modern nation-states impose on their societies, thereby modernizing the poverty of their citizens. The legal protection and financial support granted the industry reduces and cancels opportunities for the otherwise much more efficient self-builder. Quite recently Mexico launched a major program with the aim of providing all workers with proper housing. As a first step, new standards were set for the construction of dwelling units. These standards were intended to protect the little man who purchases a house from exploitation by the industry producing it. Paradoxically, these same standards deprived many more people of the traditional opportunity to house themselves. The code specifies minimum requirements that a man who builds his own house in his spare time cannot meet. Besides that, the real rent for industrially built quarters is more than the total income of 80 percent of the people. "Better housing," then, can be occupied only by those who are well-off or by those on whom the law bestows direct rent subsidies.

Once dwellings that fall below industrial standards are defined as improper, public funds are denied to the overwhelming majority of people who cannot buy housing but could "house" themselves. The tax funds meant to improve the living quarters of the poor are monopolized for the building of new towns next to the provincial and regional capitals where government employees, unionized workers, and people with good connections can live. These are all people who are employed in the modern sector of the economy, that is, people who *hold* jobs. They can be easily distinguished from other Mexicans because they have learned to speak about their *trabajo* as a noun, while the unemployed or the occasionally employed or those who live near the subsistence level do not use the noun form when they go to work.

These people, who *have* work, not only get subsidies for the building of their homes; the entire public-service sector is rearranged and developed to serve them. In Mexico City it has been estimated that 10 percent of the people use 50 percent of the household water, and on the high plain water is very scarce in-

deed. The building code has standards far below those of rich countries, but by prescribing certain ways in which houses must be built, it creates a rising scarcity of housing. The pretense of a society to provide ever better housing is the same kind of abberation we have met in the pretense of doctors to provide better health and of engineers to provide higher speeds. The setting of abstract impossible goals turns the means by which these are to be achieved into ends.

What happened in Mexico happened all over Latin America during the decade of the Alliance for Progress, including Cuba under Castro. It also happened in Massachusetts. In 1945, 32 percent of all one-family housing units in Massachusetts were still self-built: either built by their owners from foundation to roof or constructed under the full responsibility of the owner. By 1970 the proportion had gone down to 11 percent. Meanwhile, *housing* had been discovered as a major *problem*. The technological capability to produce tools and materials that favor self-building had increased in the intervening decades, but social arrangements—like unions, codes, mortgage rules, and markets—had turned against this choice.

Most people do not feel at home unless a significant proportion of the value of their houses is the result of the input of their own labor. Convivial policies would define what people who want to house themselves cannot get, and thereby make sure that all can get access to some minimum of physical space, to water, some basic building elements, some convivial tools ranging from power drills to mechanized pushcarts, and, probably, to some limited credit. Such an inversion of the present policy could give a post-industrial society modern homes almost as desirable for its members as those which were standard for the old Mayas and are still the rule in Yucatán.

Our present tools are engineered to deliver professional energies. Such energies come in quanta. Less than a quantum cannot be delivered. Less than four years of schooling is worse than none. It only defines the former pupil as a dropout. This is equally true in medicine, transportation, and housing, as in agriculture and in the administration of justice. Mechanical transportation is worthwhile only at certain speeds. Conflict

resolution is effective only when the issue is of sufficient weight to justify the costs of court action. The planting of new grains is productive only if the acreage and capital of the farmer are beyond a certain size. Powerful tools created to achieve abstractly conceived social goals inevitably deliver their output in quanta that are beyond the reach of a majority. What is more, these tools are integrated. Access to key positions in government or industry is reserved to those who are certified consumers of high quanta of schooling. They are the individuals chosen to run the plantation of mutant rubber trees, and they need a car to rush from meeting to meeting. Productivity demands the output of packaged quanta of institutionally defined values, and productive management demands the access of an individual to all these packages at once.

Professional goal-setting produces goods for an environment produced by other professions. Life that depends on high speed and apartment houses makes hospitals inevitable. By definition all these are scarce, and get even scarcer as they approach the standards set more recently by an ever-evolving profession; thereby each unit or quantum appearing on the market frustrates more people than it satisfies.

A just society would be one in which liberty for one person is constrained only by the demands created by equal liberty for another. Such a society requires as a precondition an agreement excluding tools that by their very nature prevent such liberty. This is true for tools that are fundamentally purely social arrangements, such as the school system, as well as for tools that are physical machines. In a convivial society compulsory and open-ended schooling would have to be excluded for the sake of justice. Age-specific, compulsory competition on an unending ladder for lifelong privileges cannot increase equality but must favor those who start earlier, or who are healthier, or who are better equipped outside the classroom. Inevitably, it organizes society into many layers of failure, with each layer inhabited by dropouts schooled to believe that those who have consumed more education deserve more privilege because they are more valuable assets to society as a whole. A society constructed so that education by means of

schools is a necessity for its functioning cannot be a just society. Power tools having certain structural characteristics are inevitably manipulative and must also be eliminated for the sake of justice. In a modern society, energy inputs represent one of the major new liberties. Each man's ability to produce change depends on his ability to control low-entropy energy. On this control of energy depends his right to give his meaning to the physical environment. His ability to act toward the future he chooses depends on his control of the energy that gives shape to that future. Equal freedom in a society that uses large amounts of environmental energy means equal control over the transformation of that energy and not just an equal claim to what has been done with it.

Most of the power tools now in use favor centralization of control. Industrial plants with their highly specialized tools give neither the worker nor most engineers a choice over what use will be made of the energy they manage. This is equally true, though less evident, of the high-powered consumer tools that dominate our society. Most of them, such as cars and air conditioners, are too costly to be available on an equal basis outside a few superrich societies. Others, such as mechanical household devices, are so specialized in nature that they in no way offer more freedom than much simpler hand tools. The monopoly of industrial production deprives even privileged clients of control over what they may get. Few people get the cars that most people want, and GM designers can only build vehicles to fit the existing roads.

Nations and multinational corporations have become means for the spreading empire of international professions. Professional imperialism triumphs even where political and economic domination has been broken. Schools everywhere are governed by pedagogues who read the same books on learning theory and curriculum-planning. In a given year, schools produce more or less the same model of pupils in every nation. Nineteen-fifty graduates are as obsolete in Dakar as they are in Paris. The same iatrogenic sicknesses are produced all over the world by doctors who administer chloromycin or steroid pills. Every country tends to select those productive processes which are more capital-intensive and promise greater cost-benefit ratios, so that the same kind of technological unemployment is produced everywhere. Basic needs are defined as

those that international professions can meet. Since the local production of these wares is to the advantage of highly schooled national élites, a country's doctors, teachers, and engineers will defend it as an antidote to foreign domination. The knowledge-capitalism of professional imperialism subjugates people more imperceptibly than and as effectively as international finance or weaponry.

The principal source of injustice in our epoch is political approval for the existence of tools that by their very nature restrict to a very few the liberty to use them in an autonomous way. The pompous rituals by which each man is given a vote to choose between factions only cover up the fact that the imperialism of industrial tools is both arbitrary and growing. Statistics which prove increased outputs and high per capita consumption of professionally defined quanta only veil the enormously high invisible costs. People get better education, better health, better transportation, better entertainment, and often even better nourishment only if the experts' goals are taken as the measurement of what "better" means. The possibility of a convivial society depends therefore on a new consensus about the destructiveness of imperialism on three levels: the pernicious spread of one nation beyond its boundaries; the omnipresent influence of multinational corporations; and the mushrooming of professional monopolies over production. Politics for convivial reconstruction of society must especially face imperialism on this third level, where it takes the form of professionalism. The public ownership of resources and of the means of production, and public control over the market and over net transfers of power, must be complemented by a public determination of the tolerable basic structure of modern tools. This means that politics in a postindustrial society must be mainly concerned with the development of design criteria for tools rather than as now with the choice of production goals. These politics would mean a structural inversion of the institutions now providing and defining new man-made essentials.

To invert politics, it will not be enough to show that a convivial life style is possible, or even to demonstrate that it is more attractive than life in a society ruled by industrial productivity. We

cannot rest with the claim that this inversion would bring society closer to meeting the goals now stated as those of our major institutions. It is not even enough to show that a just or socially equal order can become a reality only through a convivial reconstruction of tools and the consequent redefinition of ownership and power. We need a way to recognize that the inversion of present political purpose is necessary for the survival of all people.

Most people have staked their self-images in the present structure and are unwilling to lose their ground. They have found security in one of the several ideologies that support further industrialization. They feel compelled to push the illusion of progress on which they are hooked. They long for and expect increased satisfaction, with less input of human energy and with more division of competence. They value handicraft and personal care as luxuries, but the ideal of a more labor-intensive, yet modern, production process seems to them quixotic and anachronistic.

It seems absurd to prepare politicians who have pledged themselves to increased outputs and better distribution of goods and services among their constituents for the day when a majority of voters will choose limits for all rather than promises of equal consumption. It appears equally hopeless to expect inverse insight from humanitarian liberals who have come to feel that feeding the starving millions is their vocation. They forget that people *eat,* and that people die when they are *fed.* These self-appointed keepers of their brothers make other people's survival depend on their own growing efficiency. By shifting from the production of guns to the production of grains they reduce their sense of guilt and increase their sense of power. They are blind to the convergence of population growth and the failure of the green revolution, which guarantees that feeding people now will escalate starvation by 1985. Their hubris distracts them from understanding that only the renunciation of industrial expansion can bring food and population into a balance in the so-called backward countries. The attempt to feed people and to control their increase are two mutually reinforcing, and very dangerous, illusions. Nor can economists foresee institutional inversion when for them all institutions must be evaluated according to the increase in

their planned output and their ability to externalize internal diseconomics in an unobtrusive way. The terms and frameworks of economics have been shaped by the ideology of an irresistible institutionalization of values that overarches otherwise opposed economic creeds.

To translate the theoretical possibility of a postindustrial convivial life style into a political program for new tools, it must soon be shown that the prevailing fundamental structure of our present tools menaces the survival of mankind. It must be shown that this menace is imminent and that the effects of compulsive efficiency do more damage than good to most people in our generation. For this purpose we must identify the range within which our present institutions have become frustrating, and we must recognize another range within which our tools become destructive of society as a whole.