III

The Multiple Balance

The human equilibrium is open. It is capable of shifting within flexible but finite parameters. People can change, but only within bounds. In contrast, the present industrial system is dynamically unstable. It is organized for indefinite expansion and the concurrent unlimited creation of new needs, which in an industrial environment soon become basic necessities.

Once the industrial mode of production has become dominant in a society, it may still admit shifts from one type of output to another, but it does not admit limits to the further institutionalization of values. Such growth makes the incongruous demand that man seek his satisfaction by submitting to the logic of his tools.

The demands made by tools on people become increasingly costly. This rising cost of fitting man to the service of his tools is reflected in the ongoing shift from goods to services in over-all production. Increasing manipulation of man becomes necessary to overcome the resistance of his vital equilibrium to the dynamic of growing industries; it takes the form of educational, medical, and administrative therapies. Education turns out competitive consumers; medicine keeps them alive in the engineered environment they have come to require; bureaucracy reflects the necessity of exercising social control over people to do meaningless work. The parallel increase in the cost of the defense of new levels of privilege through: military, police, and insurance measures reflects the fact that in a consumer society there are in-

evitably two kinds of slaves: the prisoners of addiction and the prisoners of envy.

Political debate must now be focused on the various ways in which unlimited production threatens human life. This political debate will be misled by those who insist on prescribing palliatives which only disguise the deep reasons why the systems of health, transport, education, housing, and even politics and law are not working. The environmental crisis, for example, is rendered superficial if it is not pointed out that antipollution devices can only be effective if the total output of production decreases. Otherwise they tend to shift garbage out of sight, push it into the future, or dump it onto the poor. The total removal of the pollution created locally by a large-scale industry requires equipment, material, and energy that can create several times the damage elsewhere. Making antipollution devices compulsory only increases the unit cost of the product. This may conserve some fresh air for all, because fewer people can afford to drive cars or sleep in air-conditioned homes or fly to a fishing ground on the weekend, but it replaces damage to the physical environment with further social disintegration. To shift from coal to atomic power replaces smog now with higher radiation levels tomorrow. To relocate refineries overseas, where pollution controls are less stringent, preserves Americans—not Venezuelans—from unpleasant odors at the cost of higher levels of world-wide poisoning.

The overgrowth of tools threatens persons in ways which are profoundly new, though they are also analogous to traditional forms of nuisance and tort. These threats are of a new kind, because their perpetrators and victims are the same people: both operators and clients of inexorably destructive tools. Though some people may cash in on the game at first, ultimately all lose everything they have.

I will identify six ways in which all people of the world are threatened by industrial development after passage through the second watershed: (1) Overgrowth threatens the right to the fundamental physical structure of the environment with which man has evolved. (2) Industrialization threatens the right to convivial work. (3) The overprogramming of man for the new environment deadens his creative imagination. (4) New levels of

productivity threaten the right to participatory politics. (5) Enforced obsolescence threatens the right to tradition: the recourse to precedent in language, myth, morals, and judgment. I will describe these five threats as distinct though interrelated categories all having in common a destructive inversion of means into ends. (6) Pervasive frustration by means of compulsory though engineered satisfaction constitutes a sixth and more subtle threat.

I am typifying the hazards created by the overgrowth of tools in six categories chosen so the damages can be recognized in traditional terms. That impersonal tools placed at the service of the injured party should inevitably inflict the injury is new, but the damage which threatens each person is not. These six categories can serve in the recovery of procedural principles by which people can expose and redress the present imbalance in the functioning of tools. These underlying principles of moral, political, and juridical procedure I assume to be three: recognition of the legitimacy of personal conflict, the dialectic authority of history over present procedures, and the recourse to laymen or peers for binding policy decisions. The radical functional inversion of our major institutions constitutes a revolution much more profound than the shifts in ownership or power usually proposed. It can be neither envisaged nor enacted unless a basic structure of procedure is recovered and clearly agreed upon. This structure can even now be discussed in concrete terms. I will therefore refer to formal juristic concepts in illustrating my argument.

1. *Biological Degradation*

The precarious balance between man and the biosphere has been recognized and has suddenly begun to worry many people. The degradation of the environment is dramatic and highly visible. For years car traffic in Mexico City increased steadily under a sparkling sky. Then, within a couple of years, smog descended and soon became worse than in Los Angeles. This phenomenon can be easily discussed and appreciated by people who have never studied science. Poisons of unknown potency are discharged into the biotic system of the earth. There is no way to retrieve some of them, nor any means to predict how some of them may suddenly combine their action so that the whole earth, like Lake

Erie or Baikal, will die. Man has evolved to fit into one niche in the universe. The earth is his home. This home is now threatened by the impact of man.

Overpopulation, excessive affluence, and faulty technology are usually identified as the three trends which combine and threaten to break the environmental balance. Paul Ehrlich points out that to face honestly the need for population control and stabilized consumption may "expose one to the painful criticism of being both anti-people and anti-poor," but he also emphasizes that "these unpopular measures offer mankind's only hope for averting unprecedented misery." Ehrlich wants to implement birth control with industrial efficiency. Barry Commoner insists that faulty technology, the third element in the equation, accounts for most of the recent deterioration in the quality of the environment. He exposes himself to the criticism of being an antitechnological demagogue. Commoner wants to retool industry rather than invert the basic structure of our tools.

Fascination with the environmental crisis has forced the debate about survival to focus on only one balance threatened by tools. A one-dimensional dispute is futile. Three trends have indeed been identified, each of them tending to upset the balance between man and the physical environment. Overpopulation makes more people dependent on limited resources. Affluence compels each person to use more energy. Faulty technology degrades energy in an inefficient way.

If these three trends are considered to be the only significant threats, and the physical environment is considered as the only fundamental milieu that is threatened, only two central issues must be discussed: (1) To decide which factor or trend has degraded the environment most, and which factor will impose the greatest burden on the environment during the next few years. (2) To decide which factor merits most attention because we can in some way reduce or invert it. One party claims it is easier to do away with people, the other that it is more feasible to reduce entropy-producing production.

Honesty requires that we each recognize the need to limit procreation, consumption, and waste, but equally we must radically reduce our expectations that machines will do our work for

us or that therapists can make us learned or healthy. The only solution to the environmental crisis is the shared insight of people that they would be happier if they could *work* together and *care* for each other. Such an inversion of the current world view requires intellectual courage for it exposes us to the unenlightened yet painful criticism of being not only antipeople and against economic progress, but equally against liberal education and scientific and technological advance. We must face the fact that the imbalance between man and the environment is just one of several mutually reinforcing stresses, each distorting the balance of life in a different dimension. In this view, overpopulation is the result of a distortion in the balance of learning, dependence on affluence is the result of a radical monopoly of institutional over personal values, and faulty technology is inexorably consequent upon a transformation of means into ends.

The one-dimensional debate among proponents of various panaceas for the ecological imbalance will only inspire the false expectation that somehow human action can be engineered to fit into the requirements of the world conceived as a technological totality. Bureaucratically guaranteed survival under such circumstances means the expansion of industrial economics to the point where a centrally planned system of production and reproduction is identified with the guided evolution of the Earth. If such an industrially minded solution becomes generally accepted as the only way of preserving a viable environment, the preservation of the physical milieu can become the rationale for a bureaucratic Leviathan at the levers which regulate levels of human reproduction, expectation, production, and consumption. Such a technological response to growing population, pollution, and affluence can be founded only on a further development of the presently prevailing institutionalization of values. The belief in the possibility of this development is founded on an erroneous supposition, namely, that "The historical achievement of science and technology has rendered possible the *translation of values into technical tasks*—the materialization of values. Consequently, what is at stake is the redefinition of values in *technical terms,* as elements in technological process. The new ends, as technical ends,

would then operate in the project and in the construction of the machinery, and not only in its utilization." *

The re-establishment of an ecological balance depends on the ability of society to counteract the progressive materialization of values. Otherwise man will find himself totally enclosed within his artificial creation, with no exit. Enveloped in a physical, social, and psychological milieu of his own making, he will be a prisoner in the shell of technology, unable to find again the ancient milieu to which he was adapted for hundreds of thousands of years. The ecological balance cannot be re-established unless we recognize again that only persons have ends and that only persons can work toward them. Machines only operate ruthlessly to reduce people to the role of impotent allies in their destructive progress.

2. *Radical Monopoly*

When overefficient tools are applied to facilitate man's relations with the physical environment, they can destroy the balance between man and nature. Overefficient tools corrupt the environment. But tools can also be made overefficient in quite a different way. They can upset the relationship between what people need to do by themselves and what they need to obtain ready-made. In this second dimension overefficient production results in radical monopoly.

By radical monopoly I mean a kind of dominance by one product that goes far beyond what the concept of monopoly usually implies. Generally we mean by "monopoly" the exclusive control by one corporation over the means of producing (or selling) a commodity or service. Coca-Cola can create a monopoly over the soft-drink market in Nicaragua by being the only maker of soft drinks which advertises with modern means. Nestlé might impose its brand of cocoa by controlling the raw material, some car maker by restricting imports of other makes, a television channel by licensing. Monopolies of this kind have been recognized for a century as dangerous by-products of industrial expansion, and legal devices have been developed in a largely futile attempt to control them. Monopolies of this kind restrict the

* Herbert Marcuse, *One-Dimensional Man,* Boston, 1970.

choices open to the consumer. They might even compel him to buy one product on the market, but they seldom simultaneously abridge his liberties in other domains. A thirsty man might desire a cold, gaseous, and sweet drink and find himself restricted to the choice of just one brand. He still remains free to quench his thirst with beer or water. Only if and when his thirst is translated without meaningful alternatives into the need for a Coke would the monopoly become radical. By "radical monopoly" I mean the dominance of one type of product rather than the dominance of one brand. I speak about radical monopoly when one industrial production process exercises an exclusive control over the satisfaction of a pressing need, and excludes nonindustrial activities from competition.

Cars can thus monopolize traffic. They can shape a city into their image—practically ruling out locomotion on foot or by bicycle in Los Angeles. They can eliminate river traffic in Thailand. That motor traffic curtails the right to walk, not that more people drive Chevies than Fords, constitutes radical monopoly. What cars do to people by virtue of this radical monopoly is quite distinct from and independent of what they do by burning gasoline that could be transformed into food in a crowded world. It is also distinct from automotive manslaughter. Of course cars burn gasoline that could be used to make food. Of course they are dangerous and costly. But the radical monopoly cars establish is destructive in a special way. Cars create distance. Speedy vehicles of all kinds render space scarce. They drive wedges of highways into populated areas, and then extort tolls on the bridge over the remoteness between people that was manufactured for their sake. This monopoly over land turns space into car fodder. It destroys the environment for feet and bicycles. Even if planes and buses could run as nonpolluting, nondepleting public services, their inhuman velocities would degrade man's innate mobility and force him to spend more time for the sake of travel.

Schools tried to extend a radical monopoly on learning by redefining it as education. As long as people accepted the teacher's definition of reality, those who learned outside school were officially stamped "uneducated." Modern medicine deprives the ailing of care not prescribed by doctors. Radical monopoly exists

where a major tool rules out natural competence. Radical monopoly imposes compulsory consumption and thereby restricts personal autonomy. It constitutes a special kind of social control because it is enforced by means of the imposed consumption of a standard product that only large institutions can provide.

The control of undertakers over burial shows how radical monopoly functions and how it differs from other forms of culturally defined behavior. A generation ago, in Mexico, only the opening of the grave and the blessing of the dead body were performed by professionals: the gravedigger and the priest. A death in the family created various demands, all of which could be taken care of within the family. The wake, the funeral, and the dinner served to compose quarrels, to vent grief, and to remind each participant of the fatality of death and the value of life. Most of these were of a ritual nature and carefully prescribed—different from region to region. Recently, funeral homes were established in the major cities. At first undertakers had difficulty finding clients because even in large cities people still knew how to bury their dead. During the sixties the funeral homes obtained control over new cemeteries and began offering package deals, including the casket, church service, and embalming. Now legislation is being passed to make the mortician's ministrations compulsory. Once he gets hold of the body, the funeral director will have established a radical monopoly over burial, as medicine is at the point of establishing one over dying.

The current debate over health-care delivery in the United States clearly illustrates the entrenchment of a radical monopoly. Each political party in the debate makes sick-care a burning public issue and thereby relegates health care to an area about which politics has nothing important to say. Each party promises more funds to doctors, hospitals, and drugstores. Such promises are not in the interest of the majority. They only serve to increase the power of a minority of professionals to prescribe the tools men are to use in maintaining health, healing sickness, and repressing death. More funds will strengthen the hold of the health industry over public resources and heighten its prestige and arbitrary power. Such power in the hands of a minority will produce only an increase in suffering and a decrease in personal self-reli-

ance. More money will be invested in tools that only postpone unavoidable death and in services that abridge even further the civil rights of those who want to heal each other. More money spent under the control of the health profession means that more people are operationally conditioned into playing the role of the sick, a role they are not allowed to interpret for themselves. Once they accept this role, their most trivial needs can be satisfied only through commodities that are scarce by professional definition.

People have a native capacity for healing, consoling, moving, learning, building their houses, and burying their dead. Each of these capacities meets a need. The means for the satisfaction of these needs are abundant so long as they depend primarily on what people can do for themselves, with only marginal dependence on commodities. These activities have use-value without having been given exchange-value. Their exercise at the service of man is not considered labor.

These basic satisfactions become scarce when the social environment is transformed in such a manner that basic needs can no longer be met by abundant competence. The establishment of radical monopoly happens when people give up their native ability to do what they can do for themselves and for each other, in exchange for something "better" that can be done for them only by a major tool. Radical monopoly reflects the industrial institutionalization of values. It substitutes the standard package for the personal response. It introduces new classes of scarcity and a new device to classify people according to the level of their consumption. This redefinition raises the unit cost of valuable service, differentially rations privilege, restricts access to resources, and makes people dependent. Above all, by depriving people of the ability to satisfy personal needs in a personal manner, radical monopoly creates radical scarcity of personal—as opposed to institutional—service.

Against this radical monopoly people need protection. They need this protection whether consumption is imposed by the private interests of undertakers, by the government for the sake of hygiene, or by the self-destructive collusion between the mortician and the survivors, who want to do the best thing for their

dear departed. They need this protection even if the majority is now sold on the professional's services. Unless the need for protection from radical monopoly is recognized, its multiple implementation can break the tolerance of man for enforced inactivity and passivity.

It is not always easy to determine what constitutes compulsory consumption. The monopoly held by schools is not established primarily by a law that threatens punishment to parent or child for truancy. Such laws exist, but school is established by other tactics: by discrimination against the unschooled, by centralizing learning tools under the control of teachers, by restricting public funds earmarked for baby-sitting to salaries for graduates from normal schools. Protection against laws that impose education, vaccination, or life prolongation is important, but it is not sufficient. Procedures must be used that permit any party who feels threatened by compulsory consumption to claim protection, whatever form the imposition takes. Like intolerable pollution, intolerable monopoly cannot be defined in advance. The threat can be anticipated, but the definition of its precise nature can result only from people's participation in deciding what may not be produced.

Protection against this general monopoly is as difficult as protection against pollution. People will face a danger that threatens their own self-interest but not one that threatens society as a whole. Many more people are against cars than are against driving them. They are against cars because they pollute and because they monopolize traffic. They drive cars because they consider the pollution created by one car insignificant, and because they do not feel personally deprived of freedom when they drive. It is also difficult to be protected against monopoly when a society is already littered with roads, schools, or hospitals, when independent action has been paralyzed for so long that the ability for it seems to have atrophied, and when simple alternatives seem beyond the reach of the imagination. Monopoly is hard to get rid of when it has frozen not only the shape of the physical world but also the range of behavior and of imagination. Radical monopoly is generally discovered only when it is too late.

Commercial monopoly is broken at the cost of the few who

profit from it. Usually, these few manage to evade controls. The cost of radical monopoly is already borne by the public and will be broken only if the public realizes that it would be better off paying the costs of ending the monopoly than by continuing to pay for its maintenance. But the price will not be paid unless the public learns to value the potential of a convivial society over the illusion of progress. It will not be paid voluntarily by those who confuse conviviality with intolerable poverty.

Some of the symptoms of radical monopoly are reaching public awareness, above all the degree to which frustration grows faster than output in even the most highly developed countries and under whatever political regime. Policies aimed to ease this frustration may easily distract attention from the general nature of the monopoly at its roots, however. The more these reforms succeed in correcting superficial abuses, the better they serve to bolster the monopoly I am trying to describe.

The first palliative is consumer protection. Consumers cannot do without cars. They buy different makes. They discover that most cars are unsafe at any speed. So they organize to get safer, better, and more durable cars and to get more as well as wider and safer roads. Yet when consumers gain more confidence in cars, the victory only increases society's dependence on high-powered vehicles—public or private—and frustrates even more those who have to, or would prefer to, walk.

While the organized self-protection of the addict-consumer immediately raises the quality of the dope and the power of the peddler, it also may lead ultimately to limits on growth. Cars may finally become too expensive to purchase and medicines too expensive to test. By exacerbating the contradictions inherent in this institutionalization of values, majorities can more easily become aware of them. Discerning consumers who are discriminatory in their purchasing habits may finally discover that they can do better by doing things for themselves.

The second palliative proposed to cure growing frustration with growing output is planning. The illusion is common that planners with socialist ideals might somehow create a socialist society in which industrial workers constitute a majority. The proponents of this idea overlook the fact that anticonvivial and

manipulative tools can fit into a socialist society in only a very limited measure. Once transportation, education, or medicine is offered by a government free of cost, its use can be enforced by moral guardians. The underconsumer can be blamed for sabotage of the national effort. In a market economy, someone who wants to cure his flu by staying in bed will be penalized only through loss of income. In a society that appeals to the "people" to meet centrally determined production goals, resistance to the consumption of medicine becomes an act of public immorality. Protection against radical monopoly depends on a political consensus opposed to growth. Such a consensus is diametrically opposed to the issues now raised by political oppositions, since these converge in the demand to increase growth and to provide more and better things for more completely disabled people.

Both the balance that defines man's need for a hospitable environment and the balance that defines everyone's need for authentic activity are now close to the breaking point. And still this danger does not concern most people. It must now be explained why most people are either blind to this threat or feel helpless to correct it. I believe that the blindness is due to the decline in a third balance—the balance of learning—and that the impotence people experience is the result of yet a fourth upset in what I call the balance of power.

3. *Overprogramming*

The balance of learning is determined by the ratio of two kinds of knowledge in a society. The first is a result of the creative action of people on their environment, and the second represents the result of man's "trivialization" by his manufactured milieu. Their first kind of knowledge is derived from the primary involvement of people with each other and from their use of convivial tools; the second accrues to them as a result of purposeful and programmed training to which they are subjected. Speaking the mother tongue is learned in the first way, while some pupils learn mathematics in the second. No sane person would say that speaking or walking or nursing a child is primarily the result of education, while competence in mathematics, ballet dancing, or painting usually is.

The relation between what can be learned from ordinary living and what must be learned as a result of intentional teaching differs widely with place and time. It depends very much on rituals. All Muslims learn some Arabic as the result of prayer. This learning evolves from interaction in a context bounded by tradition. In much the same manner, peasants pick up the folklore of their region. Class and caste also generate opportunities to learn. The rich acquire "proper" table manners or accents and insist that these cannot be taught. The poor learn to fend in dignity where no education could teach the rich to survive.

Crucial to how much anyone can learn on his own is the structure of his tools: the less they are convivial, the more they foster teaching. In limited and well-integrated tribes, knowledge is shared quite equally among most members. All people know most of what everybody knows. On a higher level of civilization, new tools are introduced; more people know more things, but not all know how to execute them equally well. Mastery of skill does not yet imply a monopoly of understanding. One can understand fully what a goldsmith does without being one oneself. Men do not have to be cooks to know how to prepare food. This combination of widely shared information and competence for using it is characteristic of a society in which convivial tools prevail. The techniques used are easily understood by observing the artisan at work, but the skills employed are complex and usually can be acquired only through lengthy and programmed apprenticeship. Total learning expands when the range of spontaneous learning widens along with access to an increasing number of taught skills and both liberty and discipline flower. This expansion of the balance of learning cannot go on forever; it is self-limiting. It can be optimized, but it cannot be forcibly extended. One reason is that man's life span is limited. Another—just as inexorable—is that the specialization of tools and the division of labor reinforce each other. When centralization and specialization grow beyond a certain point, they require highly programmed operators and clients. More of what each man must know is due to what another man has designed and has the power to force on him.

The city child is born into an environment made up of systems that have a different meaning for their designers than for their

clients. The inhabitant of the city is in touch with thousands of systems, but only peripherally with each. He knows how to operate the TV or the telephone, but their workings are hidden from him. Learning by primary experience is restricted to self-adjustment in the midst of packaged commodities. He feels less and less secure in doing his own thing. Cooking, courtesy, and sex become subject matters in which instruction is required. The balance of learning deteriorates: it is skewed in favor of "education." People know what they have been taught, but learn little from their own doing. People come to feel that they need "education."

Learning thus becomes a commodity, and, like any commodity that is marketed, it becomes scarce. The nature of this scarcity is hidden—at a high cost—by the many forms education takes. Education can be programmed preparation *for* life in the future in the form of packaged, serial instructions produced by schools, or it can be constant communication *about* ongoing life through the output of the media and through the instructions built into consumer goods. Sometimes these instructions are attached to the item and must be read. In more thoroughly designed goods, the shape, color, and provoked associations speak to the user about the way the item must be handled. Education can also become a periodic remedy for workers whose original training gets left behind by industrial innovation. When people become obsolete and need constantly to renew their educational security, when the accountant must be reprogrammed for each new generation of computers, then learning has indeed become scarce. Educator becomes the most vulnerable and confusing issue in the society.

Everywhere the direct cost of training rises faster than the total output. This has been interpreted in either of two ways. One interpretation assumes that education is a means to a social end. From this perspective the capitalization of man through knowledge inputs is a necessary requirement for higher productivity. The disproportionate growth rate of the educational sector means total production is nearing an asymptote. To avoid this, ways must be found to increase the cost-benefit ratio in education. Schools will be the first victims of a drive for ration-

alization in the production of knowledge capital. In my opinion, this is unfortunate. Although the school is destructive and quite inefficient, its traditional character protects at least some rights of the pupil. Educators freed from the restraint of schools could be much more effective and deadly conditioners.

The second interpretation starts from the opposite assumption. According to this view, education is the most valuable output of institutional growth. The transition to a stationary state in the production of goods and perhaps even of energy will usher in an explosive growth in the production of invisible commodities such as information, education, and fun. In this argument the marginal utility of education also decreases, but this is no reason to limit its production. Some economists go even further. In the name of a misnamed quality of life they want to put the breaks on the manufacturing sector when it interferes with the growth of the service sector, seemingly unaware of the stultifying effects of escalating treatments. In neither of these two views is a distinction made between learning by the use of convivial tools and learning through manipulation. Both views skew the balance of learning by increasing manipulative teaching and crushing autonomous questions. Those who treat education as a means for production and those who treat education as the supreme luxury product agree on the need for more education. They upset the balance of learning in favor of more teaching. They assume that a modern world is inevitably so alien that it has passed beyond the reach of people and can be known only by mystagogues and disciples.

The transformation of learning into education paralyzes man's poetic ability, his power to endow the world with his personal meaning. Man will wither away just as much if he is deprived of nature, of his own work, or of his deep need to learn what he wants and not what others have planned that he should learn. The overdetermination of the physical environment renders it hostile. Radical monopoly makes people prisoners of welfare. Men overwhelmed by commodities are rendered impotent and in their rage either kill or die. The corruption of the balance of learning makes people into puppets of their tools.

Poets and clowns have always risen up against the oppression of creative thought by dogma. They expose literal-mindedness

with metaphor. They demonstrate the follies of seriousness in a framework of humor. Their intimate wonder dissolves certainties, banishes fears, and undoes paralysis. The prophet can denounce creeds and expose superstitions and mobilize persons to use their lights and wits. Poetry, intuition, and theory can offer intimations of the advance of dogma against wit that may lead to a revolution in awareness. Only the separation of Church and State, of compulsory knowledge from political action, can redress the balance of learning. The law has been used, and can be used again, to this purpose. The law has protected societies against the exaggerated claims of its priests, and can protect it against the claims of educators. Compulsory school attendance or other compulsory treatment is analogous to compulsory attendance at a religious ritual. The law can disestablish it. The law can be used against the rising cost of education, and against the use of education in the reproduction of a class society.

To understand the rising cost of education, we must recognize two facts: first, that nonconvivial tools create educational side effects which at some point become intolerable and, second, that education which employs nonconvivial tools is economically unfeasible. The first recognition opens our eyes to the possibility of a society where work and leisure and politics would favor learning and that could function with less formal education; the second recognition permits us to set up educational arrangements that favor self-initiated, self-chosen learning, and that relegate programmed teaching to limited, clearly specified occasions.

Throughout the world, highly capitalized tools require highly capitalized men. Following the Second World War, economic development penetrated even "backward" areas. Spot industrialization created an intense demand for schools to program people not only to operate but also to live with their new tools. The establishment of more schools in Malaysia or Brazil teaches people the accountant's view of the value of time, the bureaucrat's view of the value of promotion, the salesman's view of the value of increased consumption, and the union leader's view of the purpose of work. People are taught all this not by the teacher but by the curriculum hidden in the structure of school. It does not matter what the teacher teaches so long as the pupil has to attend hun-

dreds of hours of age-specific assemblies to engage in a routine decreed by the curriculum and is graded according to his ability to submit to it. People learn that they acquire more value in the market if they spend more hours in class. They learn to value progressive consumption of curricula. They learn that whatever a major institution produces has value, even invisible things such as education or health. They learn to value grade advancement, passive submission, and even the standard misbehavior that teachers like to interpret as a sign of creativity. They learn disciplined competition for the favor of the bureaucrat who presides over their daily sessions, who is called their teacher as long as they are in class and their boss when they go to work. They learn to define themselves as holders of knowledge stock in the specialty in which they have made investments of their time. They learn to accept their place in society precisely in the class and career corresponding to the level at which they leave school and to the field of their academic specialization.

Industrial jobs are arranged so that the better-schooled fit into the scarcer slots. Scarce jobs are defined as more productive, so people with less schooling are barred from access to the more desirable goods produced in the new industries. Industrially produced shoes, bags, clothes, frozen foods, and soft drinks drive off the market equivalent goods that had been convivially produced. As production becomes more centralized and more capital-intensive, the screening process performed by tax-supported schools not only costs more for those who get through it, but double-charges those who do not.

Education becomes necessary not only to grade people for jobs but to upgrade them for consumption. As industrial output rises, it pushes the education system to exercise the social control necessary for its efficient use. The housing industry in Latin-American countries is a good example of the educational diseconomies produced by architects. All the major cities in such countries are surrounded by vast tracts of self-built *favelas, barriadas,* or *poblaciones.* Components for new houses and utilities could be made very cheaply and designed for self-assembly. People could build more durable, more comfortable, and more sanitary dwellings, as well as learn about new materials and systems. But in-

stead of supporting the ability of people to shape their own environment, the government deposits in these shantytowns public utilities designed for people who live in standard modern houses. The presence of a new school, a paved road, and a glass-and-steel police station defines the professionally built house as the functional unit, and stamps the self-built home a shanty. The law establishes this definition by refusing a building permit to people who cannot submit a plan signed by an architect. People are deprived of their ability to invest their own time with the power to produce use-value, and are compelled to work for wages and to exchange their earnings for industrially defined rented space. They are deprived also of the opportunity to learn while building.

Industrial society demands that some people be taught before they can drive a truck and that other people be taught before they can build a house. Others must be taught how to live in apartment buildings. Teachers, social workers, and policemen cooperate to keep people who have low-paying or occasional jobs in houses they may not build or change. To accommodate more people on less land, Venezuela and Brazil experimented with high-rise tenements. First, the police had to dislodge people from their "slums" and resettle them in apartments. Then the social workers had to socialize tenants who lacked sufficient schooling to understand that pigs may not be raised on eleventh-floor balconies nor beans cultivated in their bathtubs.

In New York people with less than twelve years of schooling are treated like cripples: they tend to be unemployable, and are controlled by social workers who decide for them how to live. The radical monopoly of overefficient tools exacts from society the increasing and costly conditioning of clients. Ford produces cars that can be repaired only by trained mechanics. Agriculture departments turn out high-yield crops that can be used only with the assistance of farm managers who have survived an expensive school race. The production of better health, higher speeds, or greater yields depends on more disciplined recipients. The real cost of these doubtful benefits is hidden by unloading much of them on the schools that produce social control.

Pressure for more and better conditioning of people in the

name of education has led schools over their second watershed. Planners make programs more varied and complex, but their marginal utility thereby declines. Compulsory attendance has been extended to the point that it now can be defined by teachers as independent study on the city streets, or as a field project supervised by the weavers of Teotitlán del Valle.

Parallel with the growing pretensions of school, other agencies discovered their educational mission. Newspapers, television, and radio were no longer just media of communication. They were pressed into the service of socialization. Periodicals expanded to accommodate all fit news, which meant that a few professional journalists got vast readerships, while the majority was reduced to token representation in the "Letters to the Editor" section.

The industrial manufacture and marketing of knowledge reduce the access of people to convivial tools for self-initiated learning. Witness the fate of the book. The book is the result of two major inventions that enormously extended the balance of learning: the alphabet and the printing press. Both techniques are almost ideally convivial. Almost anybody can learn to use them, and for his own purpose. They use cheap materials. People can take them or leave them as they wish. They are not easily controlled by third parties. Even the Soviet government cannot stop the *samizdat* circulation of subversive typescripts.

The alphabet and the printing press have in principle deprofessionalized the recorded word. With the alphabet the merchant broke the monopoly of the priest over hieroglyphs. With cheap paper and pencil, and later with the typewriter and modern copying devices, a set of new techniques had in principle opened the era of nonprofessional, truly convivial, communication by record. The tape recorder and camera added new media to fully interactive communication. Yet the manipulative nature of institutions and schooling for the acceptance of manipulation have put these ideally convivial tools at the service of more one-way teaching. Schools train people in the use of constantly revised textbooks. They produce readers of instructions and of news. The per capita purchase of nontechnical books by high-school graduates declines with the increased percentage of people who finish high school. More books are written for the school-trained spe-

cialist, and the self-initiated reading of books declines. More people spend more time hooked on the curriculum defined by new principals: the publisher, the producer, and the program director. Every week they wait for *Time*.

Even the library has become a component of a schooled world. As the library got "better," the book was further withdrawn from the handy bookshelf. The reference librarian placed himself between people and shelves; now he is being replaced by the computer. Putting the book into huge deposits and into the hands of computers, the New York Public Library has become so expensive to operate that it now opens only from ten to six weekdays and is open only partially on Saturdays. This means that its books have become the specialized tool of readers who live on a grant to stay away from work and school.

At its best the library is the prototype of a convivial tool. Repositories for other learning tools can be organized on its model, expanding access to tapes, pictures, records, and very simple labs filled with the same scientific instruments with which most of the major breakthroughs of the last century were made.

Manipulative teaching tools raise the cost of learning. Now we only ask what people have to learn and then invest in a means to teach them. We should learn to ask first what people need if they want to learn and provide these tools for them. Professional teachers laugh at the idea that people would learn more from random access to learning resources than they can be taught. In fact, they frequently cite as proof for their skepticism the declining use of libraries. They overlook the fact that libraries are little used because they have been organized as formidable teaching devices. Libraries are not used because people have been trained to demand that they be taught. Neither are contraceptives, and for analogous reasons we have to explore.

People must learn to live within bounds. This cannot be *taught*. Survival depends on people *learning* fast what they *cannot* do. They must *learn* to abstain from unlimited progeny, consumption, and use. It is impossible to *educate* people for voluntary poverty or to manipulate them into self-control. It is impossible to *teach* joyful renunciation in a world totally structured for higher output and the illusion of declining costs.

People must learn why and how to practice contraception. The reason is clear. Man has evolved in a small corner of the universe. His world is bounded by the resources of the ecosphere, and can accommodate only a limited number of people. Technology has transformed the characteristics of this niche. The ecosphere now accommodates a larger number of people, each less vitally adapted to the environment—each on the average having less space, less freedom to survive with simple means, fewer roots in tradition. The attempt to make a better environment has turned out to be as presumptuous as the attempt to create better health, education, or communication. As a result there are now more people, most of them less at home in the world. This large population can survive because of new tools. In turn, it spurs the search for even more powerful tools, and thereby demands more radical monopoly; this monopoly, in its turn, calls for more and more education. But, paradoxically, what people most need to learn, they cannot be *taught* or *educated* to do. If they are voluntarily to keep their numbers and consumption within bounds, they must learn to do so by living active and responsible lives, or they will perish—passive though well informed, frustrated yet resigned. Voluntary and therefore effective population control is impossible under conditions of radical monopoly and overprogramming. An efficient, specialized birth control program must fail in the same way that schools and hospitals fail. It can start with a futile attempt at effective seduction. It will logically escalate to enforced sterilization and abortion. Finally, it will provide a rationale for mega-deaths.

Voluntary and effective contraception is now absolutely necessary. If such contraception is not practiced in the very near future, humanity is in danger of being crushed by its own size rather than by the power of its tools. But this universal practice cannot possibly be the result of some miracle tool. A new practice, inverse to the present, can only be the result of a new relationship between people and their tools. The universal practice of effective contraception is a necessary premise for the limitation of tools which I advocate. But equally, the psychological inversion that will accompany a limitation of tools is a premise for the convivial psychological pressure necessary for effective contraception.

The devices needed for birth control are a paradigm for modern convivial tools. They incorporate science in instruments that can be handled by any reasonably prudent and well-apprenticed person. They provide new ways to engage in the millenary practice of contraception, sterilization, and abortion. They are cheap enough to be made universally available. They are made to fit alternate tasks, beliefs, and situations. They are obviously tools that structure the bodily relationship of each individual to himself and to others. To be effective, some must be used by every adult, and many of them must be used every day. Birth control is an immense task. It must be accomplished within one decade. It can be accomplished only in a convivial manner. It is ridiculous to try to control populations with tools which by their nature are convivial while conditioning the population by formal education to fit more effectively into an industrial and professional world. It is absurd to expect that Brazilian peasants can be taught to depend on doctors for injections and prescriptions, on lawyers for conflict resolution, and on teachers for learning to read, while asking them to use the condom on their own. But it is equally fanciful to expect that Indian doctors will allow illiterate but well-trained hospital assistants to compete with them in the performance of sterilizations. If the public realized that this delicate intervention could be equally or even more carefully performed by a layman whose attention, dexterity, and programming skills were refined in the weaving of saris, doctors would lose their monopoly on all interventions which are economically feasible for any majority of people. Professional taboos and industrial tools stand and fall together once truly rational, postindustrial tools are available. Only the convergent use of convivial tools in all significant areas of need-satisfaction can render their use in each sector truly effective. Only among convivially structured tools can people learn to use the new levels of power that modern technology can incorporate in them.

4. *Polarization*

The present organization of tools impels societies to grow both in population and in levels of affluence. This growth takes place at the opposite ends of the privilege spectrum. The underprivi-

leged grow in number, while the already privileged grow in affluence. The underprivileged thus strengthen their frustrating claims, while the rich defend their presumed rights and needs. Hunger and impotence lead the poor to demand rapid industrialization, and the defense of growing luxuries pushes the rich into more frantic production. Power is polarized, frustration is generalized, and the alternative of greater happiness at lower affluence is pushed into the blind spot of social vision.

This blindness is a result of the broken balance of learning. People who are hooked on teaching are conditioned to be customers for everything else. They see their own personal growth as an accumulation of institutional outputs, and prefer what institutions *make* over what they themselves can do. They repress the ability to discover reality by their own lights. The skewed balance of learning explains why the radical monopoly of commodities has become imperceptible. It does not explain why people feel impotent to correct those profound disorders which they do perceive.

This helplessness is the result of a fourth disruption: the growing polarization of power. Under the pressure of an expanding mega-machine, power is concentrated in a few hands, and the majority becomes dependent on handouts. New levels of luxuriant overproduction grow faster than the output of commodities which this wanton production imposes.

A 3 percent increase in the standard of living of the U.S. population costs twenty-five times as much as a similar increase in the living standard of India, despite the greater size and more rapid growth of the Indian population. Significant benefits for the poor demand a reduction of the resources used by the rich, while significant benefits for the rich make murderous demands on the resources of the poor. Yet the rich pretend that by exploiting the poor nations they will become rich enough to create a hyperindustrial abundance for all. The élites of poor countries share this fantasy.

The rich will get richer and many more of the poor will become destitute during the next ten years. But anguish about the hungry should not prevent us from understanding the structural problem of power distribution that constitutes the fourth dimen-

sion of destructive overgrowth. Unchecked industrialization modernizes poverty. Poverty levels rise and the gap between rich and poor widens. These two aspects must be seen together or the nature of destructive polarization will be missed.

Poverty levels rise because industrial staples are turned into basic necessities and have a unit cost beyond what a majority could ever pay. The radical monopoly of industries has created new types of demeaning poverty in societies of sometimes profligate affluence. The former subsistence farmer is put out of business by the green revolution. He earns more as a laborer, but he cannot give his children their former diet. More importantly, the U.S. citizen with ten times his income is also desperately poor. Both get increasingly less at greater cost.

The other side of modernized poverty is related but distinct. The power gap widens because control over production is centralized to make the most goods for the greatest number. Whereas rising poverty levels are due to the structure of industrial outputs, the gaping power lag is due to the structure of inputs. To seek remedies for the former without simultaneously dealing with the latter would only postpone and aggravate the world-wide modernization of poverty.

The surface effects of industrially concentrated power can be obviated by income equalization. Progressive taxes without loopholes can be supplemented by social security, income supports, and equal welfare benefits for all. Confiscation of private capital beyond a certain limit can be attempted. Keeping maximum close to minimum income is an even tougher way to stem personal enrichment through the management of corporate power. But such curbs on personal income will be effective only in regulating private consumption. It has no effect on equalizing the privileges that really count in a society where the job has become more important than the home. As long as workers are graded by the amount of manpower capital they represent, those who hold high denominations of knowledge stock will be certified for the use of all kinds of timesaving privileges. The concentration of privileges on a few is in the nature of industrial dominance.

With the introduction of agriculture and animal husbandry, patriarchal government and some centralization of power became fea-

sible. At this stage political means could be used to get the power of many slaves under one man's control. One man could transform a multitude into a tool for the realization of his design. Religion, ideology, and the whip were the principal means of control. But the amount of power controlled was small. The centralization of power which now seems normal could not have been imagined even a century ago.

In modern society, energy conversion enormously exceeds the body power of all men. Manpower stands to mechanical power in a ratio of 1:15 in China and 1:300 in the U.S.A. Switches concentrate the control over this power more effectively than whips ever could. The social distribution of control over power inputs has been radically changed. If capital means the power to make effective change, power inflation has reduced most people to paupers.

As tools get bigger, the number of potential operators declines. There are always fewer operators of cranes than of wheelbarrows. As tools become more efficient, more scarce resources are put at the service of the operator. On a Guatemalan construction site, only the engineer gets air conditioning in his trailer. He is also the only one whose time is deemed so precious that he must be flown to the capital, and whose decisions seem so important that they are transmitted by shortwave radio. He has of course earned his privileges by cornering the largest amount of tax money and using it to acquire a university degree. The Indio who works on the gang does not notice the relative increase in privilege between him and his Ladino gang boss, but the geometricians and draftsmen who also went to school, but did not graduate, feel the heat and the distance from their families in a new and acute way. Their relative poverty has been aggravated by their bosses' claim to greater efficiency.

Never before have tools approached present power. Never before have they been so integrated at the service of a small élite. Kings could not claim divine right with as little challenge as executives claim services for the sake of greater production. The Russians justify supersonic transport by saying it will economize the time of their scientists. High-speed transportation, broad band-width communication, special health maintenance, and

unlimited bureaucratic assistance are all explained as requirements to get the most out of the most highly capitalized people.

A society with very large tools must rely on multiple devices to keep the majority from claiming the most expensive packages of privilege. These must be reserved for the most productive individuals. The most prestigious way to measure a person's productivity is by the price tag on his education consumption. The higher a person's knowledge capital, the greater the social value placed on the decisions he "makes" and the more legitimate is his claim to high-level packages of industrial outputs.

When the legitimacy of educational certification breaks down, other more primitive forms of discrimination are bound to assume renewed importance. People are judged to be less valuable manpower because they are born in the Third World, because they are black, because they are women, because they belong to the wrong group or party, or because they cannot pass the right battery of tests. The scene is set for the multiplication of minority movements, each one claiming its share, and each one destined to be foiled by its own intent.

Hierarchies must rise and conglomerate as they extend over fewer and larger corporations. A seat in a high-rise job is the most coveted and contested product of expanding industry. The lack of schooling, compounded with sex, color, and peculiar persuasions, now keeps most people down. Minorities organized by women, or blacks, or the unorthodox succeed at best in getting some of their members through school and into an expensive job. They claim victory when they get equal pay for equal rank. Paradoxically, these movements strengthen the idea that unequal graded work is necessary and that high-rise hierarchies are necessary to produce what an egalitarian society needs. If properly schooled, the black porter will blame himself for not being a black lawyer. At the same time, schooling generates a new intensity of frustration which ultimately can act as social dynamite.

It does not matter for what specific purpose minorities now organize if they seek an equal share in consumption, an equal place on the pyramid of production, or equal nominal power in the government of ungovernable tools. As long as a minority acts to increase its share within a growth-oriented society, the

final result will be a keener sense of inferiority for most of its members.

Movements that seek control over existing institutions give them a new legitimacy, and also render their contradictions more acute. Changes in management are not revolutions. The shared control of workers and women, or blacks and the young, does not constitute a social reconstruction if what they claim to control are industrial corporations. Such changes are at best new ways to administer an industrial mode of production which, thanks to these shifts, continues unchallenged. More commonly, these changes are professional insurgencies against the *status quo*. They expand management, and, at an even faster rate, they degrade labor. A new desk usually means more capital-intensive production in one firm and a new guarantee of so-called underemployment somewhere else in society. A majority loses further productive ability, and a minority is forced to seek new reasons and weapons to protect its privilege.

New classes of underconsumers and of underemployed are one of the inevitable by-products of industrial progress. Organization makes them aware of their common plight. At present articulate minorities—often claiming the leadership of majorities—seek equal treatment. If one day they were to seek equal work rather than equal pay—equal inputs rather than equal outputs—they could be the pivot of social reconstruction. Industrial society could not possibly resist a strong women's movement, for example, which would lead to the demand that all people, without distinction, do equal work. Women are integrated into all classes and races. Most of their daily activities are performed in nonindustrial ways. Industrial societies remain viable precisely because women are there to perform those daily tasks which resist industrialization. It is easier to imagine that the North American continent would cease to exploit the underindustrialization of South America than that it would cease to use its women for industry-resistant chores. In a society ruled by the standards of industrial efficiency, housework is rendered inhuman and devalued. It would be rendered even less tolerable if it were given *pro-forma* industrial status. The further expansion of industry would be brought to a halt if women forced upon us the recognition that society is no

longer viable if a single mode of production prevails. The effective recognition that not two but several equally valuable, dignified, and important modes of production must coexist within any viable society would bring industrial expansion under control. Growth would stop if women obtained equally creative work for all, instead of demanding equal rights over the gigantic and expanding tools now appropriated by men.

5. *Obsolescence*

Convivial reconstruction demands the disruption of the present monopoly of industry, but not the abolition of all industrial production. It does imply the adoption of labor-intensive tools, but not the regression to inefficient tools. It requires a considerable reduction of all kinds of now compulsory therapy, but not the elimination of teaching, guidance, or healing for which individuals take personal responsibility. Neither must a convivial society be stagnant. Its dynamics depend on wide distribution of the power to make effective change. In the present scheme of large-scale obsolescence a few corporate centers of decision-making impose compulsory innovation on the entire society. Continued convivial reconstruction depends on the degree to which society protects the power of individuals and of communities to choose their own styles of life through effective, small-scale renewal.

I have shown that social polarization is the result of two complementary factors: the excessive cost of industrially produced and advertised products, and the excessive rarity of jobs that are considered highly productive. Obsolescence, on the other hand, produces devaluation—which is the result not of a certain general rate of change but of change in those products which exercise a radical monopoly. Social polarization depends on the fact that industrial inputs and outputs come in units so large that most people are excluded from them. Obsolescence, on the other hand, can become intolerable even when people are not directly priced out of the market. Product elaboration and obsolescence are two distinct dimensions of overefficiency, both of which underpin a society of hierarchically layered privilege.

It does not really matter if forced obsolescence becomes destruc-

tive of old models or of old functions, if Ford discontinues the distribution of spare parts for its 1955 model, or if the police rule old cars off the road because they lack features that safety lobbyists have made standard. Renewal is intrinsic to the industrial mode of production coupled to the ideology of progress. Products cannot be improved unless huge machines are *retooled*—and in the technical sense engineers have given this word. To make this pay, huge markets must be created for the new model. The most effective way to open a market is to identify the use of what is new as an important privilege. If this identification succeeds, the old model is devalued and the self-interest of the consumer is wedded to the ideology of never-ending and progressive consumption. Individuals are socially graded according to the number of years their bill of goods is out of date. Some people can afford to keep up with the Joneses who buy the latest model, while others still use cars, stoves, and radios that are five to ten years old—and probably spend their vacations in places that are just as many years out of style. They know where they fit on the social ladder.

The social grading of individuals by the age of the things they use is not just a capitalist practice. Wherever the economy is built around the large-scale production of elaborate and obsolescent packages of staples, it is only the privileged who have access to the newest model of services and goods. Only a few nurses get the most recent course in anesthesiological nursing, and only a few functionaries get the new model of a "people's car." The members of this minority within a minority recognize each other by the recent date at which the products they use came onto the market, and it makes little difference whether they use them at home or at work.

Industrial innovations are costly, and managers must justify their high cost by producing measurable proof of their superiority. Under the rule of industrial socialism, pseudo science will have to provide the alibi, while in market economies, appeal can be made to a survey of consumer opinion. In any case, periodic innovations in goods or tools foster the belief that anything new will be proven better. This belief has become an integral part of the modern world view. It is forgotten that whenever a society lives by this delusion, each marketed unit generates more wants

than it satisfies. If new things are made because they are better, then the things most people use are not quite good. New models constantly renovate poverty. The consumer feels the lag between what he has and what he ought to get. He believes that products can be made measurably more valuable and allows himself to be constantly re-educated for their consumption. The "better" replaces the "good" as the fundamental normative concept.

In a society caught up in the race for the better, limits on change are experienced as a threat. The commitment to the better at any cost makes the good impossible at all costs. Failure to renew the bill of goods frustrates the expectation of what is possible, while renewal of the bill of goods intensifies the expectations of unattainable progress. What people have and what they are about to get are equally exasperating to them. Accelerating change has become both addictive and intolerable. At this point the balance among stability, change, and tradition has been upset; society has lost both its roots in shared memories and its bearings for innovation. Judgment on precedents has lost its value.

One of the major objections against a stationary-state economy is the fear that the production of a limited and durable number of goods would set intolerable limits on the freedom of innovation and of scientific exploration. This would be justified if I were discussing the transition from the present industrial society to its next model: clean and limited production of goods and unlimited growth in the service sector. I am not, however, discussing the evolution of industrial society, but the transition to a new mixed mode of production.

Industrial innovations are planned, trivial, and conservative. The renewal of convivial tools would be as unpredictable, creative, and lively as the people who use them. Scientific progress is also dulled by the present identification of research with industrial development. Most of the cost of research derives from its competitive nature and pressure; most of its tools are restricted to people who have been carefully programmed to look at the world through the prisms of profit and power; most of its goals are set by the need for more power and efficiency. Leisurely scientific research does not exclude a bevatron or some ultracentrifuges; removal of access restrictions now created by schools would

again admit the curious, rather than the orthodox, to the alchemist's vault; and study for its own sake would produce more surprises than team research on how to eliminate production snags.

A changeless society would be as intolerable for people as the present society of constant change. Convivial reconstruction requires limits on the rate of compulsory change. An unlimited rate of change makes lawful community meaningless. Law is based on the retrospective judgment of peers about circumstances that occur ordinarily and are likely to occur again. If the rate of change which affects all circumstances accelerates beyond some point, such judgments cease to be valid. Lawful society breaks down. Social control does not accommodate community participation and becomes the function of experts. Educators define how people are to be trained and retrained throughout their lives—shaped and reshaped until they fit the demands of industry and are attracted by its profits. Ideologues define what is right or wrong. The tooling of man for the milieu becomes the major industry when this milieu changes beyond a certain rate; then man's need for language and law, for memories and myths, imposes limits to the change of tools.

6. *Frustration*

I have identified five realms in each of which the efficiency of tools can upset the balance of life. Faulty technology can render the environment uninhabitable. Radical monopoly can force the demand for affluence to the point of paralyzing the ability to work. Overprogramming can transform the world into a treatment ward in which people are constantly taught, socialized, normalized, tested, and reformed. Centralization and packaging of institutionally produced values can polarize society into irreversible structural despotism. And, finally, engineered obsolescence can break all bridges to a normative past. In each or several of these dimensions a tool can threaten survival by making it unfeasible for most people to relate themselves in action to one of the great dimensions of their environment.

In the assessment of society it is not sufficient to select just one of these realms. Each one of these balances must be preserved. Even clean and equally distributed electricity could lead to in-

tolerable radical monopoly of power tools over man's personal energy. Not only compulsory schools but pervasive teaching media can be used to upset the balance of learning or to polarize society into an oppressive meritocracy. Any form of engineering can lead to unendurable obsolescence. It is true that man's physical niche is threatened; but just as he evolved within one particular physiological environment, so he also evolved within a social, political and psychological environment which can also be irreversibly destroyed. Mankind may wither and disappear because he is deprived of basic structures of language, law, and myth, just as much as he can be smothered by smog. Future shock can destroy what is human just as much as radical monopoly or social polarization.

I have argued that in each of five realms conceptual criteria can be used to recognize escalating imbalance. These criteria serve as guidelines for political processes by which the members of a technological society can develop constitutive boundaries within which tools must be kept. Such boundaries circumscribe the kind of power structures that can be kept under the control of people. By growing beyond this range, tools escape political control. Man's ability to claim his rights is extinguished by his bondage to processes over which he has no say. Biological functions, work, meaning, freedom, and roots—insofar as he can still enjoy them—are reduced to concessions, which optimize the logic of tools. Man is reduced to an indefinitely malleable resource of a corporate state. Without constitutive limits translated into constitutional provisions survival in dignity and freedom is squelched.

Present research is overwhelmingly concentrated in two directions: research and development for breakthroughs to the better production of better wares and general systems analysis concerned with protecting man for further consumption. Future research ought to lead in the opposite direction; let us call it counterfoil research. Counterfoil research also has two major tasks: to provide guidelines for detecting the incipient stages of murderous logic in a tool; and to devise tools and tool systems that optimize the balance of life, thereby maximizing liberty for all.

Counterfoil research is not a new branch of science, nor is it some interdisciplinary project. It is the dimensional analysis of

the relationship of man to his tools. It seems obvious that each person lives in several concentric social environments. To each social environment there corresponds a set of natural scales. This is true for the primary group, for the production unit, for the city, the state, and the organization of men on the globe. To each of these social environments there correspond certain characteristic distances, periods, populations, energy sources, and energy sinks. In each of these dimensions tools that require time periods or spaces or energies much beyond the order of corresponding natural scales are dysfunctional. They upset the homeostasis which renders the particular environment viable. At present we tend to define human needs in terms of abstract goals and treat these as problems to which technocrats can apply escalating solutions. What we need is rational research on the dimensions within which technology can be used by concrete communities to implement their aspirations without frustrating equivalent aspirations by others.

The barriers beyond which destruction looms are of a different nature from the boundaries within which a society freely constrains its tools. The former establish the realm of possible survival; the latter determine the shape of a culturally preferred environment. The former define the conditions for uniform regimentation; the latter set the conditions of convivial justice. The boundaries of doom are constitutive requirements common to all postindustrial societies. Statutory characteristics setting more narrow bounds than those absolutely necessary are the result of joint options made in a commonweal, as a result of its members' defining their life style and their level of liberty.

Supersonic transports could be easily ruled out to protect the environment, air transport to avoid social polarization, cars to protect against radical monopoly. The balance of purpose I want to highlight at this point provides a further criterion by which to select desirable tools. In view of this balance it might even be possible to exclude public transportation moving at high velocity.

There is a form of malfunction in which growth does not yet tend toward the destruction of life, yet renders a tool antagonistic to its specific aims. Tools, in other words, have an optimal, a tolerable, and a negative range. Tolerable overefficiency also dis-

turbs a balance, but a balance of a subtler and more subjective kind than those discussed before. The balance here threatened is that between personal cost and return. It can be expressed more generally as the perception of the balance between means and ends. When ends become subservient to the tools choosen for their sake, the user first feels frustration and finally either abstains from their use or goes mad. Compulsory maddening behavior in Hades was considered the ultimate punishment reserved for blasphemy. Sisyphus was forced to keep rolling a stone uphill, only to see it roll back down. When maddening behavior becomes the standard of a society, people learn to compete for the right to engage in it. Envy blinds people and makes them compete for addiction.

Wherever the maximum velocity of any one type of commuter vehicle grows beyond a certain mph, the travel time and the cost of transportation for the median commuter is increased. If the maximum velocity at any one point of a commuter system goes beyond a certain mph, most people are obliged to spend more time in traffic jams, or waiting for connections, or recovering from accidents. They will also have to spend more time paying for the transportation system they are compelled to use.

The critical velocity depends to a certain extent on a variety of factors: geography, culture, market controls, level of technology, and money flow. With so many variables affecting a quantity, it would seem that its value could fluctuate over a very wide range. Just the contrary is true. Once it is understood that we refer to any vehicular velocity in the transportation of people within a community, we find that the range within which the critical velocity can vary is very narrow. It is, in fact, so narrow and so low that it seems improbable and not worth the time of most traffic engineers to worry about.

Commuter transportation leads to negative returns when it admits, anywhere in the system, speeds much above those reached on a bicycle. Once the barrier of bicycle velocity is broken at any point in the system, the total per capita monthly time spent at the service of the travel industry increases.

High output leads to time lack. Time becomes scarce, partly because it takes time to consume goods and to undergo therapies,

and partly because dependence on production makes abstention from it more costly. The richer we get in a consumer society, the more acutely we become aware of how many grades of value—of both leisure and labor—we have climbed. The higher we are on the pyramid, the less likely we are to give up time to simple idleness and to apparently nonproductive pursuits. The joy of listening to the neighborhood finch is easily overshadowed by stereophonic recordings of "Bird Songs of the World," the walk through the park downgraded by preparations for a packaged bird-watching tour into the jungle. It becomes difficult to economize time when all commitments are for the long run. Staffan Linder points out that there is a strong tendency for us to overcommit the future, so that when the future becomes present, we seem to be conscious all the time of having an acute scarcity, simply because we have committed ourselves to about thirty hours a day instead of twenty-four. In addition to the mere fact that time has competitive uses and high marginal utility in an affluent society, this overcommitment creates a sense of pressure and harriedness.

Life in a society where speedy transportation is taken for granted renders time scarce in both of these ways. Activities related to the use of speedy vehicles by *many* people in a society occupy an increasing percentage of the time budget of *most* members of that society, as the speed of the vehicles increases beyond a certain point. Beyond this point the competition of transportation activities with stationary activities becomes fierce, especially competition for the allocation of limited real estate and available energy. This competition seems to grow exponentially with the rise of speed. The time reserved for commuting displaces both work and leisure time. Hence, the speedier vehicles are, the more it becomes important to keep them filled at all times. If they are individual capsules, they tend to become disproportionately costly and scarce. If they are public vehicles, they tend to be large, and run at infrequent intervals or along only a few routes.

As speed increases, the adaptation of life patterns to vehicles becomes more tyrannical. It becomes necessary to make constant corrections and amendments to the allocation of shorter periods. It becomes necessary to make appointments and commitments

months or even years ahead. Since some of these commitments, which have been made at great cost, cannot be kept, there is a sense of constant failure which produces a sense of constant tension. Man has only a limited ability to submit to programming. When speed increases beyond a certain point, the transportation system vies with other systems in exhausting human tolerance for social controls.

Machines turn against men at a much lower level of power than would be ruled out by the first five criteria. But while these criteria identify necessary safeguards for life and liberty, the *balance of purpose* depends on a different kind of value. Conceptual rather than empirical criteria can be set for the constitutional limitation of power. It ought to be relatively easy for a majority to rule what abuse it will take from any minority, or what damage it will not expose its offspring to. The recognition of the most socially desirable power of a tool is of a different nature; it can only be the outcome of political procedure. The value obtained for time wasted on speed transportation is conditioned by the consensus in a community about the level of its freedom as a concrete option of its civilization.

Transportation beyond bicycle speeds demands power inputs from the environment. Velocity translates directly into power, and soon power needs increase exponentially. In the United States, 22 percent of the energy converted drives vehicles, and another 10 percent keeps roads open for them. The amount of energy is comparable to the total energy—except for domestic heating—required for the combined economies of India and China. The energy used up in the United States for the sole purpose of driving vehicles built to accelerate beyond bicycle speed would suffice to add auxiliary motors to about twenty times that many vehicles for people all over the world who want to move at bicycle speeds and do not or cannot push the pedals because they are sick or old, or because they want to transport a heavy load or move over a great distance, or because they just want to relax. Simply on the basis of equal distribution on a world-wide scale, speeds above those attained by bicycles could be ruled out. It is of course mere fantasy to assume an egalitarian consensus sufficiently strong to accept such a proposal. At closer inspection though, many com-

munities will find that the very same speed limit necessary for equal distribution of mobility is also very close to the optimum velocity giving maximum value to community life. At 20 mph constant speed Phileas Fogg could have made his trip around the world in half of eighty days. Simulation studies would be useful for exploring imaginative policies that seek optimal liberty with convivial power tools. To whose advantage would Calcutta's traffic flow stabilize if speeds were limited to 10 mph? What price would Peru's military pay for limiting the nation's speed to 20 mph? What gains in equality, activity, health, and freedom would result from limiting all other vehicles to the speed of bicycles and sailing ships?

Negative returns are not unique to transportation. Ninety percent of all medical care for patients with terminal diseases is unrelated to their health; such treatment tends to increase suffering and disability without demonstrably lengthening life. The maximum feasibility of service for the optimum care of an individual patient lies within a certain range. Beyond this range medical bills measure the health of a patient in the same way that GNP measures the wealth of a nation. Both add on the same scale the market value of benefits and the defensive expenditures which become necessary to offset the unwanted side effects of their production. The technological escalation of medicine first ceases to serve healing and then ceases to prolong life. It turns into a death-denying ritual of terminal care: a final race in which the personality best fitted to machines turns in the most spectacular performance.

Counterfoil research is concerned first with an analysis of increasing marginal disutility and the menace of growth. It is then concerned with the discovery of general systems of institutional structure which optimize convivial production. This kind of research meets psychological resistance. Growth has become addictive. Like heroin addiction, the habit distorts basic value judgments. Addicts of any kind are willing to pay increasing amounts for declining satisfactions. They have become tolerant to escalating marginal disutility. They are blind to deeper frustration because they are absorbed in playing for always mounting stakes. Minds accustomed to thinking that transportation ought to pro-

vide speedy motion rather than reduction of the time and effort spent moving are boggled by this contrary hypothesis. Man is inherently mobile, and speeds higher than those he can achieve by the use of his limbs must be proven to be of great social value to warrant support by public sacrifice.

Counterfoil research must clarify and dramatize the relationship of people to their tools. It ought to hold constantly before the public the resources that are available and the consequences of their use in various ways. It should impress on people the existence of any trend that threatens one of the major balances on which life depends. Counterfoil research leads to the identification of those classes of people most immediately hurt by such trends and helps people to identify themselves as members of such classes. It points out how a particular freedom can be jeopardized for the members of various groups which have otherwise conflicting interests. Counterfoil research involves the public by showing that the demands for freedom of any group or alliance can be identified with the implicit interest of all.

Withdrawal from growth mania will be painful, but mostly for members of the generation which has to experience the transition and above all for those most disabled by consumption. If their plight could be vividly remembered, it might help the next generation avoid what they know would enslave them.