BY DENNIS GABOR

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GROWTH

Nobel Laureate Dennis Gabor, inventor of holography, projects us into his lively mature society, in which hope means more than growth for growth's sake

"Till now man has been up against Nature; from now on he will be up against his own nature." The age-old enemy, poverty, is defeated in one-quarter of the world; almost all the ailments that used to kill half the people in childhood are eliminated. There is no enemy left but man. We have every right to be proud when we look back, none at all for pride when looking forward. The tragic situation has arisen that the very talents that have made the naked ape the master of the earth are now turning against him—his fighting temper, his restless quest for novelty, his craving for excitement and adventure, even his virtues, such as the love and care for his progeny and his willingness to sacrifice himself for his tribe or for his nation.

Science in combination with nationalism has created a situation in which a total war could wipe out all civilization. Science in combination with love for progeny has created overpopulation. Science in combination with the old economic virtues has created techniques that can virtually eliminate work, the most harmless occupation of man, and have brought us face to face with an age of leisure, for which we are psychologically unprepared.

Anxious preoccupation with the future has become very intense among the creative minorities of all industrial countries. More and more thinking people have realized that our free industrial civilization, which with all its faults is far superior to most systems of the past not only in material success but also in humanity, is not likely to survive another generation without fundamental institutional changes.

In this last quarter century of steadily increasing affluence few people dared to face the obvious fact that exponential growth cannot be continued indefinitely. *Growth had become synonymous with hope*, and man cannot live without hope.

It now appears that a crisis is upon us, long before most people expected it. First in Britain, then a little later in the United States, production growth slowed down and even came to a temporary stop, while prices went up steadily, in spite of growing unemployment. The present crisis will probably pass away, production will rise again through new technological improvements. But the causes will remain with us, and I believe that they will be felt again in new crises. It is my belief that the present crisis is already a crisis of *saturation*, foreseen by J. M. Keynes 40 years ago.

I have tried to sketch out a *mature society*—a peaceful world on a high level of material civilization, which has given up growth in numbers and in material consumption but not growth in the quality of life, and one that is compatible with the nature of homo sapiens. This last condition is a very hard one. The conquest of nature by rationalism, which has created science and technology, has brought us face to face with the basic irrationality of man. Irrational man craves security, but he despises it as soon as it is won.

Shall we be able to overcome the multitude of obstacles in a world organized for power and ruled by fear? Can we effect what amounts almost to a mutation in the nature of man? I do not know the answer; I know only that we must not stop trying.

About three-quarters of the population of the globe is still engaged in the fight against a stingy and hostile nature. The most advanced quarter has almost defeated nature, which fights back only as a rotting corpse does: by pollution.

My concern is with the advanced quarter. Our problem is new in history, and we do not know whether it can be solved. It is the problem of men and women living a peaceful, contented life at a high level of material comfort and security, without the daily struggle for life. Freud called our trouble the "malaise in civilization."

That malaise manifests itself most openly on the university campuses. We must not dismiss it lightly because only a small fraction of the students have resorted to violence; there are good reasons for believing that the majority will also soon be seriously disaffected. Nor is there any reason to believe that the disaffected students will settle down to become docile, satisfied members of the consumer society. This is neither likely nor desirable. The consumer society *must* change into a mature society, and the protest of the young generation is a social force we must utilize.

A second group that behaves militantly is the organized, unionized workers. Strikes are an annoyance rather than a serious social danger—a part of the price we pay for a free society. A more important symptom of things to come is *silent* protest—the spreading of voluntary absenteeism. In Britain it is estimated to have caused the loss of at least 30, but perhaps 40, times as many working days as have been lost by strikes. The loss is about 5 to 6½ percent of the total working time, which makes the difference between a

For ID, paintings by Daniel Maffia

good rate of growth and stagnation.

Voluntary absenteeism is a clear symptom of the revolt against the consumer society. A not insignificant minority of workers prefer less work for less pay. Even if there is nothing much to fill their free time, it is sweetened by the feeling that it is an expression of *protest*, by the satisfaction of having damaged a little the hated industrial machinery and by having followed their own free will.

As long as this phenomenon remains within moderate limits, it is a safety valve for the expression of social dissatisfaction. But it *can* lead to serious difficulties.

In the communist countries, where strikes are illegal, the continual monotonous work leads to boredom on the part of the workers, who become even more effectively alienated than those in the capitalist countries. Nevertheless, production has steadily increased in the USSR in the years when it has come almost to a standstill in the U.S. and in Britain, and herein lies a danger. The expectation of growth is the chief driving power in the free economies, but the expectation of reduced or even zero growth slows down the investment rate, which has already fallen to a dangerously low level in the U.S. and Britain. If the gap between expectations and productive investments widens, there will be a crash or governments will take over a larger sector of the economy and further restrict individual freedom.

Two more unhealthy symptoms of our times must be mentioned. One is the frightening increase in drug addiction, and the other is the mounting crime rate. The fight against drugs will be a never-ending struggle. The great increase in crimes of violence is a manifestation of human nature at its worst. It is time to take it seriously, and not just by strengthening police forces.

"Unfortunately, human nature loves life best when it is in danger."

These four symptoms of malaise in civilization are on different moral levels. Two contain an element of hope. The revolt of the university youth is fed by idealism; in the United States it takes its main strength from revulsion against the Vietnam war. And the silent protest that manifests itself in voluntary absenteeism seems to show that there may be less resistance than one might have expected to slowing down the whirling-dervish economy of the consumer society.

Drug addiction and crime, on the other hand, are truly pathological symptoms, which increasingly affect the weakest and worst members of our rich and free society. The young rebels would passionately deny that it is free, but it is free compared to the totalitarian societies, in which all these ills are cured by repression.

There may be "symptomatic" cures other than repression, but there is only one general remedy: *the love of life*. Unfortunately, human nature loves life best when it is in danger. Can we create a society worthy of being loved, and can we make men and women love life when it is secure?

In 1848 Marx and Engels wrote:

> The bourgeoisie during its rule of scarce 100 years has created more massive and more colossal productive forces than have all preceding generations together. Subjection of nature's forces to man, machinery, application of chemistry to industry and agriculture, steam navigation, railways, electric telegraphs, clearing of whole continents for cultivation, canalization of rivers, whole populations conjured out of the ground—what earlier century had even a presentiment that such productive forces slumbered in the lap of social labour?

It may be somewhat surprising that they said "bourgeoisie" where we would say "science and technology," but they saw something we can easily miss—that it was the rise of capitalism that had accomplished "wonders far surpassing Egyptian pyramids, Roman aqueducts and Gothic cathedrals"—the achievements of the feudal and monolithic systems of the past.

Let us take stock of what capitalism has achieved in that most capitalistic of all countries, the United States. First, saturation in consumer durables, that is, a state in which gadgets have to be replaced only when they have worn out, cannot be far away. Second, the Americans are rich in goods that cannot be easily measured. The overwhelming majority of the workers have well-dressed wives and healthy children, and few have experienced hunger.

But the Americans are far from happy. Everybody is worried about inflation, quite a few about the possibility of unemployment. "Stagflation" (stagnation with inflation) had a worse psychological impact on the Americans than on any other people because they had counted on automatic growth more than anybody else.

I am taking a determined stand on the thesis that growth will have to reach a turning point and that we must work toward a gentle saturation, a stable ecosystem. That is easily misunderstood by those who accuse us "antigrowth heretics" of wanting to stop growth here and now. Growth is multidimensional, and it has healthy and unhealthy sides.

First, there is population growth. Every-

body knows that it will have to come to a stop some time, because the area and the resources of the world are finite. But we cannot stop it overnight. We must resign ourselves to the fact that a stationary state will not be reached in the industrial countries in less than 50 years and in the underdeveloped countries a few decades later, by which time the world population will be hardly less than eight billion.

Second, there is industrial growth. The food industry *must* grow faster than world

population, because about half the world's population is suffering from an insufficient diet. The know-how is available: dwarf wheat, hybrid maize and high-yield rice may be able to feed a world population two to three times the present figure. All these, however, require an enormous increase in the use of fertilizers. Nitrogen can be obtained from the air, but the still vast deposits of potash and phosphates may not last much longer than 100 years. It is useless to worry about this

now, because it is an ethical imperative that we must feed everyone with the means at our disposal, and feed them well.

Industrial development in the poor third or half of the world presents us with a similar dilemma. It is extremely unlikely that these nations can be brought up to the American or Western European level of consumption within 30 or even 50 years. If they were, some of the key metals and minerals would be exhausted well within the next 100 years. Recently attention has been drawn to another danger. The pollution per inhabitant in the wealthiest fifth of the world is about 50 times that in the other four-fifths; full industrial development might raise the world pollution rate to a level at which it could kill off the major part of the world's population.

The situation in the advanced countries is fundamentally different. Our difficulties can be classed, in increasing order of importance, as technological, institutional and psychological. Let us first see how far technology could take us by the year 2000 in the absence of countervailing forces.

About 150 years ago 80 percent of the population had to work the land in order to provide just enough food for all. In the United States about 5 percent of the labor force now produces more than enough food not only for the 200 million Americans but for scores of millions abroad.

What has happened in agriculture can happen in all industries. At present in the U.S., blue-collar workers make up only one-third of the labor force, in the European industrial countries about half. The proportion is steadily sinking.

How far can this proportion decrease by 2000 A.D.? A straight extrapolation of the last five to ten years gives about 20 percent for the U.S., about 40 percent for the U.K. But these are extrapolations of the reductions obtained in the face of constant opposition by the labor unions. The blue-collar labor force *could* decrease by half a million a year instead of increasing by one and a half million, and this gives about 10 percent by 2000 A.D.

But are there no limits set to the efficiency of technology by the exhaustion of raw materials? Probably not. Uranium is present in the rocks and the seas in immense quantities. It has proved economical to grind down granite and separate the uranium, and it can be extracted from the seas at probably not more than four times the present price. This reservoir can never be exhausted, because the rivers wash more uranium into the seas each year than could be consumed by a world population several times the present and fully industrialized. There is therefore no danger of industrial civilization coming to an end through shortage of power, and with abundant power all metals can be extracted from even the poorest deposits.

Let us now turn to other dimensions. Medical science has already extended life expectancy in the industrial countries to over 70 years, but for older people it is usually not much better than medicated survival. It is not too much to expect that by the end of the century science will restore for the older people the health and strength of the prime of life.

Technology can even solve an apparently impossible problem: providing more unspoiled nature for an increased population. The new crops are so economical that only a fraction of the area now under cultivation would be needed even in countries like India. But still greater progress can be expected from the growing of micro-organisms on oil, in the sea and in tanks. It would then be possible to concentrate food production in a restricted area and let people do with the rest as they like.

In the case of rapid transport, technology starts defeating itself. In 1970 six million Britons enjoyed holidays abroad. There is no technical or economic hindrance to this number growing to, say, 30 million. But Venice or Florence can hardly take twice the present number of tourists, let alone ten times. The beauties of the

past cannot be shared by all. This is a problem technology cannot solve.

This sketch of material development is completely realistic in terms of the scientific-technological possibilities, completely unrealistic if we take into consideration the present state of the world and the present moral development of man. In its riches it is far beyond the dreams of the early utopians, but we no longer believe in utopias. Why not? One reason is that in this century we have lived through two terrible world wars. But the other, and probably the more important, reason is that we have also seen an epoch of unparalleled material progress—without enthusiasm or pride.

America has just passed the threshold of what Herman Kahn called the "post-industrial society" with $4,000 GNP per capita and is on the way to its upper limit of $20,000. Unemployment is held at 4 to 6 percent by keeping 2.5 million young men under arms, by a major war in Vietnam, by an enormous war industry, but chiefly by Parkinson's Law. The American economy could manage without the Vietnam war, but the alternative would be to increase civilian consumption much more steeply. In order to take up the 1.5 million new workers per year, the GNP per capita ought to increase by at least 4.5 percent a year instead of the 3.5 percent averaged in the previous 20 years. But if that increase were maintained until 2000 A.D., it would have meant a 4½-fold increase per capita and a spending power of about $40,000 per family in 1971 dollars!

Something will have to give. If we cannot think of something better, the consumer society will come to an end through that nausea that is already becoming manifest in the rebellious students.

I believe that there is no need to break with the Protestant ethic, with the principle that "He who does not work, neither shall he eat." All we have to do is *not* interpret "work" as "production."

In fact, much that passes nowadays for productive work is sham production. The millions of workers who have become redundant on the production line have been absorbed by the offices. Around 1950 some very able men estimated that ten of the rather slow electronic computers available then could do all the computation necessary in the U.S. There are now more than 70,000 fast computers there. The analytical minds that devised the computers are giving more and more attention to their applications. This, however, brings us back to the same dilemma. It will not be possible much longer to boost consumption at the same rate that rationalization and computerization increase individual efficiency.

The public sector of our economy is likely to defend itself longer against this dilemma than the private one. Every new social service means setting up new offices with thousands of public servants. I have long regarded Parkinson's Law as a healthy manifestation of the Protestant ethic. Decent people want to work because they want to feel socially useful.

The transition toward a mature society will be difficult, but not impossible. It should not mean the replacement of individual drive by a Parkinsonian bureaucracy. For the great transformation before us we must capture as much as possible of the spirit of early, heroic capitalism without its cruelties and crudities.

The fear of machines is almost as old as industrial civilization. There are two sides to this problem. On the one hand, industry based on technology is an essential organ of our civilization; it has a fierce will to survive, and for this it must remain profitable. The other side is the will of creative technologists to produce innovations. These two forces have created something that seen from the outside appears to be "technology autonomous."

Technological industry creates the material necessities and luxuries of life, but also plastic bottles, throwaway goods and other sources of solid waste and pollution. It also creates fashion, putting pressure on the consumer to discard durable goods while they are still usable. At a conservative estimate, without fashions or waste, the industrial effort could be reduced by at least a quarter—but what would the redundant workers do? If they join the unemployed, they cannot buy what the remaining three-quarters of industry produces. This is the whirling-dervish economy at its most obvious.

The other source of the seemingly autonomous drive of technology is the self-interest and the mentality of the technologists. Creative, inventive minds in industry are always searching for new products. There is rarely a preexisting demand because the imaginations of the consumers are far behind those of the inventors.

The race to the moon was a logical outcome of the drive of inventors. It is a compulsion for them to look, at every stage of technology, for the next difficult but feasible objective—and if something *can* be made, it *must* be made!

I have firsthand knowledge of the compulsion to invent, because I have lived by it and for it during my long scientific-engineering life. It is wonderful to live with a dream that slowly turns into hardware or into a workable process. It is not without regrets that I have come to realize that invention, in the sense of gadgeteering, must end. But the inventive spirit must not perish. It must now be redirected toward social inventions.

Many technologists have become aware of the contrast between the scientific, purposeful organization of engineering projects and the haphazard, inadequate processes of society. Many thousands of them are deeply conscious that we have our priorities wrong. The avant-garde of technologists are engaged either in war work or in pyramid building (the space race), or they are desperately trying to give something to the already overloaded consumer society. They are aware that meanwhile the social machinery is groaning, that it is racked by pollution, the senseless drive toward megalopolis, stagnation, inflation, unemployment, drugs and crime! How willing many of the best would be to work instead on law enforcement, city planning, traffic reorganization and the like—if only there were jobs.

It is fashionable nowadays to say that we still know nothing about man's nature. Indeed, it may be a few hundred years before we have a science of psychology on a level with the "hard" sciences. But we cannot wait so long when man's condition may change as radically in the next 50 years as it has in the past 5,000.

Here are two observations most people will be able to check from their own experience or insight: 1) man is wonderful in adversity, weak in comfort, affluence and security; 2) man does not appreciate what he gets without an effort. The first gives us a warning of the dangers, the second a hint how to avoid them.

1. *Man is wonderful in adversity.* Not all, of course, but a good many whom in daily life one might take for weaklings. I know three Hungarian writers who spent years in the prisons and concentration camps of Rákosy's Hungary. All three assert that they never felt physically better and mentally more alert than when they were fed on mildewed bread, frost-bitten potatoes and stone-hard beans—and not much of those. The powers of resistance these intellectuals developed are almost unbelievable. One of them did not notice that he was being tortured when he

was shut in a cabin in which sharp spikes forced him to stand upright because he was too intent on thinking out a reply to a question from a fellow intellectual.

2. *Man does not appreciate what he gets without an effort.* Our whole technological civilization is running in the direction of getting more with less effort! I will not dwell on the obvious argument that somebody still has to do the work. This does not take us very far, because with a highly developed technology all the work in the world could be done by a volunteer minority.

There also exists, however, a contrary tendency in human nature that asks not only for effort but for *sacrifice.* Arthur Koestler argues that this belief in human sacrifice, even in self-sacrifice, is a built-in evolutionary error in man and is likely to lead him to destruction. He may well be right: collective madness of the type of religious wars may yet recur. But these mental epidemics do not occur by "spontaneous combustion"; they require leaders and organizations, and a watchful society ought to be able to stifle the chain reaction at an early stage. What is likely to remain, the *individual* will to solidarity and sacrifice, can then be canalized into constructive channels.

The teachings of the great founders of religions and of moralists have not permanently prevailed against the dark sides of human nature, but now they have a powerful ally in science. It is a fashionable stupidity to reproach science for not having an ethical content. Indeed, science is ethically neutral, but it was this neutrality that enabled science to achieve great moral improvements in human society, first by *driving out superstitions.* Man's mind has a sinister bias. It finds an explanation for everything, and in the prescientific mind the explanations and the remedies were mostly cruel.

The second great moral achievement of science was that *it made physical pain unnecessary.* As long as pain was unavoidable, people delighted not only in public tooth pulling but also in public executions. Not many people nowadays could stand the sight of an executioner digging a red-hot poker into a screaming wretch.

Most contemporary intellectuals tend to forget these things. Let me remind them of the moral progress they have made *themselves* through the progress of science and technology. Here is a quotation from David Ricardo, who, according to his contemporaries, was a benevolent man: The comforts and well-being of the poor cannot be permanently secured without some regard on their part, or some effort on the part of the legislature, to regulate the increase of their numbers, and to render less frequent among them early and improvident marriages.

Certainly, we still have to utter warnings against overpopulation, but we do not address them to "the poor" but to everybody. This is the moral progress of sociologists in a hundred-odd years.

Until fairly recently in human history, only a minority had the chance to develop their full personalities. Only the machine age made it possible to raise the ideal of a democracy, in which everyone has a chance to develop his full personality and is treated according to his merits. The technological age has taken us a step further. "To each according to his needs" used to be nothing but an empty slogan. In the age of affluence, we can and must take it seriously.

"Unemployment is held at 4 to 6 percent chiefly by Parkinson's Law."

The needs of people must be satisfied for two entirely different reasons. One is the ethical postulate that nobody should suffer unjust hardship. The other has to do with stability; a society in which many people are unhappy cannot be stable.

Elevating humanity to a higher degree of civilization will not be possible without elevating it to a higher *moral* level. So far, the Protestant ethic has been sufficient as a moral mainstay; it will not be sufficient in the future. It needed only a minimum of human decency to recognize that the "toiling masses" who maintained the whole of the society deserved social justice. But when the toiling masses are no longer needed, justice will have to find other foundations.

How can we make a reasonable compromise between the needs and wishes of individuals and the requirements of a highly developed technological society?

If we are to tackle this problem rationally, we must take account of the tremendous diversity of human character. Individuals are so vastly diverse that it would be hopeless to construct a scheme of classification that could do justice to every one of them. The classification I have attempted may be, at least for a start, sufficient for the social engineer who wants to know his material.

Intelligence, the ability for problem solving, is the first component of human character that has found a satisfactory quantitative measure. IQ does not signify anything absolute; it is merely the standing of the individual in the group in which he was tested.

Although the demand for intelligence is increasing, it is by no means certain that it will continue to do so for more than perhaps one generation, except in the top brackets. During the technological revolution, intelligence became indispensable for production. It may be of equal importance in the future but for a different reason: *in order to understand our civilization and to be at peace with it.*

Not many employers would engage a man on the strength of his intelligence alone without having at least some idea of his honesty. Ethical behavior, however, cannot be tested by any battery of questions. Reasonably reliable indications can be obtained only from observation of actual social behavior, and this creates another important difference between the IQ and the Ethical Quotient, or EQ. The first can be applied to schoolchildren, the other only to adults. I regard crime prediction from tests, heredity and family circumstances as one of the most important future tasks of psychological science. If an EQ measure were devised and extended to younger age groups, it would be of the greatest interest for recommending corrective education.

It would be of equal interest to find out how EQ and IQ are correlated. When we measure human types—the "dedicated nurse" with average intelligence but high EQ, the "dedicated physician" with high IQ and EQ, and two low-EQ types, the "master criminal" and the "moronic criminal"—we realize that *a civilized society would hardly be possible without a strong correlation between intelligence and ethos.*

If one asked employers what quality they would appreciate after intelligence and honesty, many would answer "motivation." But how can we ascertain motivation? An experienced educator or psychologist can gain a thorough acquaintance with the ideals, values, dreams and wishes of young people and can project from their behavior during their school years and from their family circumstances whether

their attachments to their life plans are likely to be lasting.

Another general descriptor that may be of importance for social engineering is dominance. A mature society will not survive without some sort of vertical order. What we must guard against is "pure" dominance—the will of individuals to subject others to their power because they enjoy doing so. In its extreme form I would call this "power addiction," and power addicts must be excluded from power. Experienced educators will have no difficulty in recognizing the incipient power addict and can warn society against him.

The opposite end of the dominance scale, submissiveness or suggestibility, also has social dangers. It too ought to be noticed at an early age by educators, and special care ought to be taken to put the suggestible into the right environment.

One more descriptor I want to single out will strike many readers as strange: *the capacity for happiness.* In the present epoch, when the pressure of scarcity is waning and we are approaching something like social justice, the happiness of individuals will be more and more limited by their *own* talent for it. And the most valuable people in a mature society will be those who are happy and can spread goodwill and happiness around them.

No utopian writer has yet dared to visualize a Cockaigne, a society in which nobody works. But we are faced with the enormous double task of arresting the growth of the consumer society before it collapses through wars or through existential nausea and changing "human nature" to fit into a system in which progress is not measured by the annual growth of the Gross National Product.

I cannot visualize anything like a "final" state or, more realistically, an almost stationary state that lasts long enough for education and bioengineering slowly to transform the majority of human beings into the highest types of homo sapiens and the highest types into "supermen." But I can visualize a *state of transition* toward it. This would still be a "consumer society" in the sense that it supplies its citizens lavishly with material goods. But it also provides them with *work.*

I will assume for the transitional period a level of technology no higher than the present one but much better organized. We must keep up a level of employment not very different from the present, but the distribution of occupations will have to be made gradually very different. The time no longer needed to produce goods will be used to improve the quality of life.

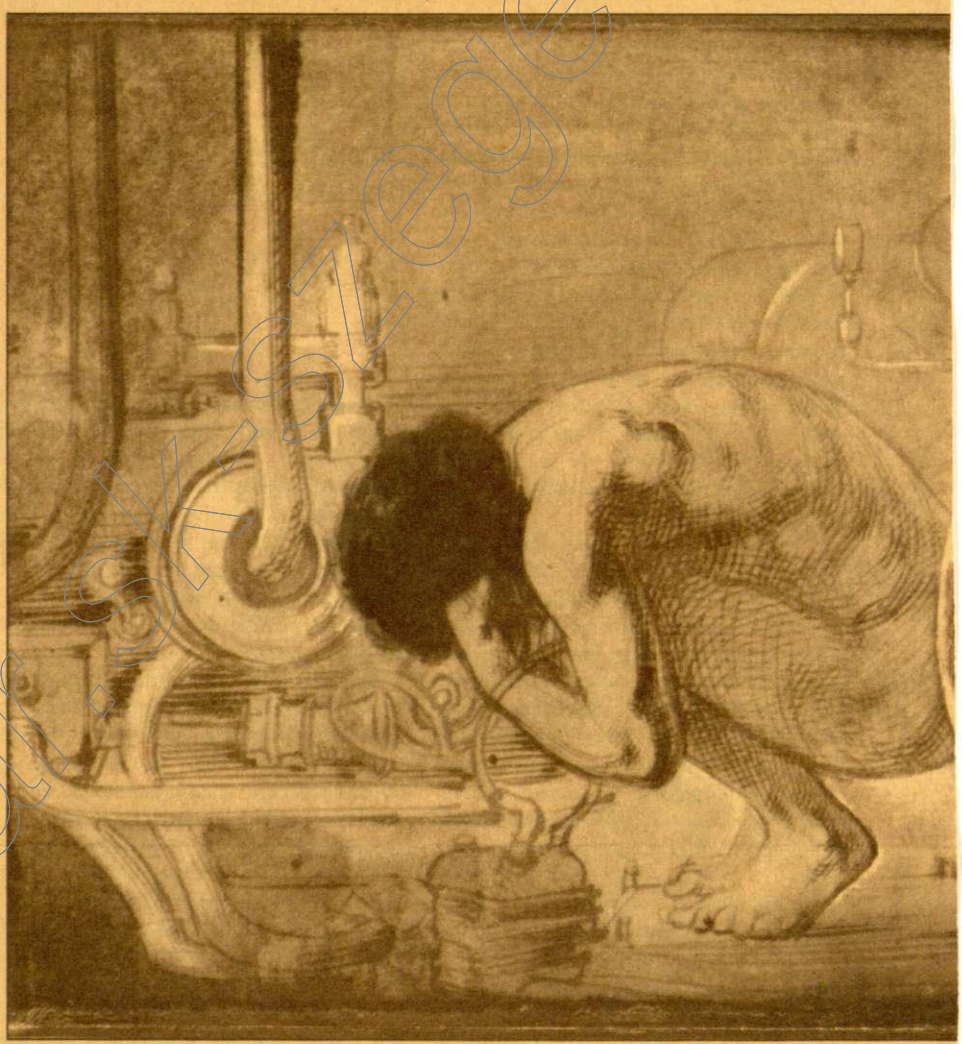
Automation and mechanization of manual and clerical work are powerful means for increasing the wealth and well-being of our industrial civilization. But if we do not halt them, we cannot stop the lowest intelligence brackets from becoming unemployable on the production line. If we pay such people just enough to live on, we destroy their purchasing power, apart from making them miserable. If we pay them well, we create a dangerous attraction for those who have the intelligence to work but do not like it much.

I see only one way out of these difficulties: we must maintain *full employment* in the transitional period, extending it even to the least intelligent. Extra work must be provided not by Parkinson's Law but by a great extension of services.

Up to now the greater part of the labor force that has become redundant on the shop floor has gone into offices. But a high-level civilization requires personal service in shops, catering establishments, even in the home, not by machines and not by slaves but by free people.

But how can we make the approach to such a new distribution of employment without ordering people into appropriate lines? There are, it has been said, two nonviolent ways of effecting reforms: Thomas Jefferson's principle, "It is a good thing, let us realize it," and Alexander Hamilton's principle, "Make it pay!" A thorough transformation can come about only from the combination of the two. The governments and the leaders of opinion must prepare reeducation and retraining plans and enlist the support of those concerned. But they must also make it pay for individuals and interest groups.

Instead of paying for people to be idle on the shop floor and for inflated offices, the taxpayer will pay for larger educational institutions, and he will receive services formerly reserved for the minority.



Like most reforms, this will work out properly only in the second generation. But come it must, because the alternatives are both ridiculous and frightening.

When it does not pay for private capital to steer toward the public welfare, the democratic solution is: "Make it pay!" This does not mean that we must make lame ducks solvent or that we ought to pay for pollution control out of public subsidies. There is no need always to make up the difference with taxes. If

plastic bottles present a disposal problem, the public will go back to glass bottles, and it can be made to pay for electric motorcars when internal combustion engines are prohibited. Of course, the public will have to pay for all this; but it will get clean air and safety in exchange.

There are other establishments in the public interest where it is not so easy to raise the capital without using the taxpayers' money. In most highly industrialized countries the expenditure of the public sector is now about half the GNP. In the European countries a considerable part of this is health and old-age insurance. Heavy taxation for these services will make it difficult to finance public transport, new towns, slum clearance and a new education system.

In terms of materials and services, the transformation is possible; therefore it must be possible to finance it. The first step is to admit that our system is not as efficient as many like to believe. Employers will be more willing to admit this than unions. But if we can convince them that increased efficiency does not mean unemployment, we may reach the second step—public consent. The third step is financing.

Let us assume the resistance of the labor unions can be overcome if there are large programs offering new jobs to the redundant workers. Industrial (and many commercial) firms will be only too happy to speed up the streamlining process. They will have no difficulty in raising the capital in the open market, because they can expect lower overhead costs and increasing outputs.

But how can we raise the capital for the public program? In a free economy, socially beneficial programs can compete with profitable ones only if they show a profit for individual enterprise; otherwise the capital has to be taken from the taxpayers. I believe, though, that there is an intermediate way. Take the profit out of taxes but not the capital. Let the State issue a bond for the financing of public works redeemable according to the index of industrial shares with an interest rate tied to the market value. The dividends will have to be paid by the taxpayers of the future, but they will enjoy the social benefits.

These first steps toward the mature society are far from revolutionary. They presuppose a society that is devoted to work but that provides for its leisured future. It is a capitalistic society, but it has eliminated the "free-for-all" fight that now produces such painful conflicts between private and public interests.

The mature society must be an open, free society; otherwise it will not be capable of development and will not deserve to exist. To this extent it must also be permissive. A permissive society can exist only if coercion is replaced by inner discipline, and this must be imparted by the right sort of education. The more permissive a society is, the less it can do without a hard apprenticeship.

I believe in a loving, permissive early education in the family to perhaps the age of 6 and in an education to responsibility, which must contain an element of hardship, to the age of perhaps 18. By that age, social responsibility must be sufficiently inculcated and a certain measure of effort must be made to become a habit so that the university years can become an introduction to the permissive society.

A hard apprenticeship to qualify for membership in a highly permissive, super-

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abundant society is a necessity for all. Competitiveness is necessary only for an elite. The highly gifted and well-motivated minority *need* obstacles to overcome. It is very important to give such people competitive careers in which they can be socially useful, but it is equally important not to admit power addicts to these careers.

Fifty years ago universities were viable institutions. In the industrial nations they took something like 4 to 8 percent of an age group and educated them to become doctors, lawyers, higher administrators, scientists, engineers and teachers, with only a moderate dropout rate.

The blown-up universities of the present still imitate the old elite universities, but in their quality some may not be far above secondary schools. What will be the future of the lower-grade students when they leave these universities? They will be trained for jobs they could have had without ever seeing a university.

I am in enthusiastic agreement with the right to higher education, but this must not be confused with the right to attend courses designed for an elite in talent and motivation. The elite universities may take 10 to 15 percent of the population, which appears to be a reasonable match between talents and higher professions.

The high ideal is what Werner Jaeger called *paideia*. In Lewis Mumford's words:

Paideia is education looked upon as a lifelong transformation of the human personality, in

which every aspect of life plays a part.... *Paideia* is...a task of giving force to the act of living itself: treating every occasion in life as a means of self-fabrication, and as parts of the converting [of] facts into values, processes into purposes, hopes and plans into consummations and realizations. *Paideia* is not merely a learning: it is making and shaping a man himself as the work of art that *paideia* seeks to form.

The governments of the near future will have immensely difficult problems to solve. They will have to steer the world toward a stable ecosystem, engineer the transformation from the whirling-dervish economy of the epoch of exponential growth to a mature society and devise an education that replaces the pressure of the economics of scarcity with personal responsibility. And all this while maintaining the maximum freedom compatible with social stability.

Neither the unaided human mind nor the intellect aided by the methods of mathematical analysis can cope with the complications presented by socioeconomic problems. The situation would be almost hopeless were it not that the electronic computer was invented, just in time.

I derive most of my confidence in the computer simulation of economic and social systems from the pioneering work of Professor Jay W. Forrester at MIT [see Jay W. Forrester, "The Computer and Social Catastrophe," *Intellectual Digest*, November 1971]. In Forrester's words: "Evolutionary processes have not given us the mental skill needed to properly interpret the dynamic behavior of the systems of which we have become a part."

Everybody knows how unsuccessful governments have been in stopping inflation and how often their actions produced results opposite to those intended. But it is a long step from this admission to trusting the computer, a mindless device that must be fed by human intelligence. The encouragement comes from Forrester's observation: the human mind can specify the components of very complicated economic systems and even the relationship between any two of them, *bit by bit;* but it cannot embrace the whole simultaneously, and it fails even more conspicuously in predicting the dynamic behavior of such a system. On the other hand, the computer, once it has been given a complete specification of the system, however complicated, can trace its dynamic consequences with perfect reliability.

At the request of the Club of Rome, Forrester made a model of a worldwide economic system. The results are striking. Almost every computer run to the year 2100 points to a catastrophe in well under 100 years, by exhaustion of natural resources coupled with increasing pollution. Almost any attempt to boost the quality of life beyond its present level speeds up the catastrophe. The runs that lead to a stable ecosystem are strongly counterintuitive and unpopular. One of these presupposes in 1970 a reduction of the capital investment rate by 40 percent, of the birthrate by 50 percent, natural-resource usage rate by 75 percent, food production by 20 percent.

These computer simulations require not only every scrap of factual knowledge we can put into them but also intuition. But instead of trying to predict the whole system intuitively, intuition must be applied *piecemeal.* Leave the complication to the computer; it will do the rest better than any human mind or even an academy of social scientists could do it.

We have no choice other than gradual approach to a stable ecosystem or catastrophe. I have sketched various single features of the transition period in education, employment and economics. How will these features fit together in a consistent world? What can we offer man? The first thing we must offer him is *hope.*

Hope is an *individual* value for the professional man who has the hope of climbing the ladder. But the average manual worker's only hope is that his trade union will secure his share of the annual growth of wealth. This has led to the modern form of class war. The best way to mitigate this problem is by breaking the lifelong tie between a man and his occupation and by giving individual hope to everybody. A chance for a change of occupation is an old utopian idea. It is not a universal cure, but I believe that most people will welcome a chance of changing their occupation at least once.

> "Lofty ideals, like happiness, cannot be approached in a straight line."

Second, we can offer him play. Play is not "serious," though it can be played very seriously. It is not "real" life, though it can absorb much of the diligence, courage, ambition of the player. A game is an artificial universe, with milder rules; it can be enjoyed actively or vicariously, with only a fraction of the participation demanded by "real," hard life.

Not long ago only a few thousand people savagely refused the straitjacket of regular work—the tramps. Today the voluntary gypsies can be counted by the tens of thousands. There are now more than 2,000 communes in the United States and at least 100 in Britain whose members have tried to separate themselves from the mainstream of industrial civilization. A mature society ought not only to tolerate but to foster them. In the first place, they are a safety exit for rebels who would have a disruptive effect if they were left in the mainstream. There is, however, a more important reason. Communes may well become the germ of that *diversity* without which the civilization of tomorrow might remain just as dull and monotonous as that of today.

Hope, play, diversity—three offerings of a mature society to man that may go some way to reconcile him with his fate: to be happy.

Can a great new civilization arise from all this confusion around us, a civilization that can be compared with the great creative epochs of the past? I think that, even taking a very sober view, we cannot doubt that an educated population, conscious of its great cultural heritage, living mostly in small planned cities designed by gifted architects, will develop a better artistic appreciation than those who are now living in the hideous small towns or neurotic big cities of Britain or the States. With a great part of their energies freed from acquisitiveness and petty strife there may be even an awakening of human talents that, in Lewis Mumford's words, "may make the Renaissance look like a stillbirth." And perhaps there will appear that lovely mutant, that joyful creator, "Mozartian Man."

Such lofty ideals, like happiness, cannot be approached in a straight line. Almost all the present trends of our world are against us: overpopulation, nationalism, economic group inertia and general aimlessness. Our best potential ally, youth, is deeply confused. All this must not discourage the truly creative intellects among us. If they rise to the real, great challenge of our times, mankind may be able to step on a higher plateau without, as usual, first falling into an abyss. ◻

GABOR
DENNIS,

(Nobel Prize winner)

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