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The Dangerous Illusion of Human Efficiency

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All notions of efficiency that pretend to get more out of a process than goes into it are delusions based on a restricted or biased view of the process. Every process, if a strict accounting is made, uses up more energy than it yields.* If a process appears to produce more value than it absorbs this is only because certain inputs are ignored or because they are appraised at less than their value in terms of some common denominator of costs and benefits. Here, of course, is the rub. The person who values the process, even if he is aware of the laws of physics, will not accept its common denominator nor any other. "What if the beef I eat does take enough grain to keep eight others alive," he says. "My life and work are worth a hundred of theirs, even to them. Without the knowledge, or machinery, I produce none of them would be alive at all." The man may even, in one sense, be right. This globe could not support the amount of human life it currently does were it not for human inventions. Whether this justifies the man's position, assuming that he makes a significant contribution to the production of these inventions, is another question. It may well be the central question on which the continuation and continued value of human life depends.

There are elements of truth in the man's reply. All forms of life live on lower forms of life or on energy processes which use up limited supplies of energy in support of life. Coal, oil and uranium deposits run out; even the sun will eventually burn up its supply of hydrogen leaving man, if he still exists, with only the option of escape to another star. While it lasts, human life must exploit other energy consuming processes including lower forms of life. Man's inventions clearly increase the ability of such processes to sustain human life but only at the expense of some other part of the universe. Vegetarians aside, this has not bothered most of us very much—except where human exploitation was involved—until quite recently. But now many people are becoming aware that we are all involved in the "delusion of efficiency." There are new critical problems at the level of the non-living environment, plant and

*a paraphrase of the second law of thermo-dynamics

/Cuernavaca, Mexico/.

animal life, traditional human exploitation and, finally, what may perhaps best be characterized, briefly, as self-exploitation by the privileged classes of mankind. All these levels of energy exchange have, almost simultaneously, developed major new dimensions of which almost no one has, until recently, been much aware.

At the level of the non-living environment, the new dimension is illustrated by the ability of the atmosphere to absorb the products of combustion and nuclear reaction. At the level of plant and animal life the new dimension is the decreasing per capita average of life-sustaining land and water. At the level of human exploitation the new dimension is the growing conviction of the underprivileged that modern technology makes human exploitation unnecessary. At the level of self-exploitation the new dimension is the increasing institutional enslavement of larger and larger proportions of the so-called privileged populations.

The dilemma is that all currently recognized solutions to any of these problems involve increases in the scale, or efficiency, of supporting processes. But efficiency increases may be illusory, since an increase in efficiency, at one level, implies an added increase in scale at another. To exploit a declining food-producing acreage more efficiently we must increase the scale of combustion, or nuclear reaction, as well as the input of labor per acre. To reduce human exploitation we must increase the demand on every acre, not only to feed a growing population but also to feed the existing population better. To increase the standard of life of the underprivileged we must institutionalize the lives of more people in a greater variety of ways.

The popular escape from these dilemmas is to decrease, or at least limit, the size of the human population. While this is a necessary part, and may even ~~xxxx~~ be the core of any long-term solution, it is, obviously, not a complete answer. For one thing population control, in its present ~~formx~~, is merely something that privileged people urge poor people to practice. Not that the privileged are unwilling to practice it themselves. Some of them are but there are not enough of them to make much difference. Furthermore, birth control is quite a different matter for privileged people to whom a large family may be a burden than for poor people to whom each added child may be a blessing, not only psychological but economic. In many kinds of poverty children provide more support than they demand.

This is not the main reason, however, why birth control is not the answer. Recent calculations show that two-hundred million Americans are a greater burden on the earth than two-billion Asians. Standard of living puts a much greater demand on land and energy supplies than mere numbers of people.

Ten Asians would have to give way to accomodate one more American, while only one American could make room for ten Asians. Clearly, the problem will not be resolved along these lines. Either conflict or identification of interests will have to occur, and either one, in terms of current approaches, would require an enormous increase in the exploitation of the world's energy, land and human resources.

A re-statement of the problem may be a necessary prelude to the search for an adequate solution. So long as man burned only wood and

dung, the earth's plant life could absorb the carbon dioxide created and replace the oxygen consumed. If all men, even today, turned from these fuels to the use of coal and oil, in the average amounts currently used in Europe and America, the world's plant life could not maintain the atmospheric balance. It may not even be doing so today, with only a tenth of mankind consuming fossil fuels.

So long as there were less than a billion men on earth, agricultural land could recreate itself as fast as it became exhausted. Today this requires major inputs of fertilizer made from inorganic sources, of water artificially channeled at great expense, and of labor invested directly on the land.

So long as privileged societies and privileged classes were small they could support a rich cultural life upon a human base of slavery, serfdom or market exploitation of the masses. Today, these means, although still widely practiced, are becoming increasingly difficult to maintain. Most areas of the world have had to return to openly despotic forms of government in order to contain the popular revolts which appear almost everywhere more imanent.

So long as large institutions could choose their members and their clients from among large numbers who were not included in either category, institutional life could not corrupt the values of entire societies. Today, the middle class urban populations of the richer countries are so totally incarcerated in large scale institutions that many people have lost all vestige of identity or independence, their lives all but vestigal scraps of meaning.

The total institutional involvement of modern man is neither

accidental nor avoidable, so long as he puts no limits on his demands. According to the law which governs energy exchanges at the level of physics, man's total energies must become institutionally channeled long before his appetites are satisfied, unless he lives on the energy of others. Nor is this merely a psychological matter of appetites being insatiable. It follows more economically from the law of physics which says that the energy input of a process is always greater than its output. A small elite can consume the energy of its masses; a large elite must consume itself.

The problem, to repeat, is that all solutions proposed by respectable sources, all those which get a hearing today, intensify some, frequently all, of the above trends: more fuel consumption, more food production, more exploitation of the poor by the privileged, more institutional self-imprisonment of the privileged themselves.

The concept of efficiency is a child of the marriage of measurement and the older qualitative concept of effectiveness. Effectiveness originally meant merely that a given means produced a desired end. Just how effective various means were and at what costs their effects were produced could not be systematically thought about until measurement was invented. The union of the two ideas gave man a great new power. He could now select those means which not only gave the best results but gave them at the least cost. He could not then, and still cannot, measure everything or even be aware of all the conditions and consequences of his acts. For a long time many of them did not matter, at least to the person deciding on the action. Even now, only those conditions and consequences with discernible effects on human beings are of much

concern, except to a few scientists, philosophers and theologians.

It is both natural and desirable for human beings to distinguish human efficiency from the more general concept which takes biological and physical events into account. It is natural, that is, for man to treat the world as if it were made for man. The second law of thermodynamics is not, for most men, as important as the facts and principles which place limits on human efficiency, on man's ability to exploit the rest of the world.

The minor thesis of this essay is that, despite further increases in scientific knowledge, man will be increasingly constrained in the foreseeable future by environmental thresholds. Its major thesis is that any further increases in human efficiency will have to break sharply with trends which have characterized all of man's history.

The major trends of human history, especially those of the past five-hundred years, themselves provide the principal basis for man's future increasing constraint by environmental thresholds. Man has run heedlessly into these thresholds in the course of his most recent half-millenium of progress. He has done so by increasing his numbers, increasing his knowledge, and increasing his ability to shape his life and his environment. What guarantees his future constraint is not only his present state and momentum but his pride in, and universal advertisement of, his accomplishments.

Short of catastrophic reduction in the human population of the earth, man's only conceivable escape from the constraints of his newly discovered environmental barriers is new scientific discoveries and

technological inventions. But, even the most fantastic of these that can be imagined would merely guarantee a tighter bind in the almost immediate future—at higher levels of population and per capita consumption. The already generated and currently frustrated potentials for future increase in population and consumption are almost unimaginable. All that is required to double and triple present ~~levels~~ rates of population increase is to provide people already living with the "right to live" enjoyed by the privileged minority. The promise of the extra-ordinary "green revolution" now in progress, promising to double and triple crop yields if inputs of fertilizer, water and work can also be multiplied by at least as many times, would still fall short of providing the food value of the European-American diet on a world wide basis. The average living standard of Europe and America, if extended to the rest of the world, would multiply total fuel combustion by at least a factor of fifty and the use of common metals over a hundred fold. And yet fifteen percent of Americans are regarded as living below the poverty line and the pressure for rising standards of consumption is nowhere fiercer than in the United States; where a three percent annual rise in average income comes to twice the entire income of an average resident of India. Discoveries and inventions in a world like this are like oil-sprays in a forest fire.

This patent inability of science and technology to bail man out of his current problems does not represent a failure of science and technology, nor does it suggest that man should turn his back upon

them. They did, obviously, help man get into his present pickle but they can also be helpful in making clear the extent and nature of his problem and, properly used, in solving it. The problem, to re-state the obvious, is not with science and technology but with man's blind uncritical application of their powers to the satisfaction of his short term wants, without consistent application of their principles to his long term needs and possibilities. Generalization of the second law of thermo-dynamics to problems of human efficiency should long ago have warned man that he was digging his own grave. Not that the law can be proved, as it can in physics, at the level of human efficiency. The concept of human efficiency is too loosely defined to permit such rigorous proof. Nevertheless, the law has found such wide-spread applications, in communications theory for example, that its application to human efficiency, even at the level of analogy, is strongly suggestive. By applying the notion of efficiency uncritically to his own affairs man has painted himself into a corner. This is now obvious at the level of ecology. It is less obvious but perhaps equally true at the levels of sociology and psychology. The uncritical application of false notions of efficiency to his own affairs, to the shaping of his own activities and values, has blinded man to his heedless use of science and technology. This process began with some of the most primitive applications of technology to the conquest and enslavement of less ruthless peoples by those who were more ruthless. It has reached the point of man's voluntary if unconscious enslavement of himself.

By ignoring the cost to slaves, serfs, and exploited wage labor, man learned to delude himself about the true returns of human

efficiency, just as he did in the case of physical processes prior to the discovery of the second law of thermo-dynamics. So apparently successful were his coercive tactics with people whose value he ignored that he gradually extended their use to his own women, his own children, his own brethren and himself. Current exploitation of some by others is even justified today by the statement, only partly false, that no one works harder than the boss. The modern coxswain has, indeed, taken an oar himself but in the process, like his rowers, has had to turn his back upon the trajectory of his craft.

Parkinson's law is merely one expression of the second law of thermo-dynamics applied to the level of human self-exploitation. First stated semi-humorously, by Parkinson's observation that an institution tends to grow larger as the size of its task decreases, it has by now been so impressively confirmed that it is no longer funny. The hidden phenomena of human efficiency go much beyond mere numbers of employees, however. William White's "Organization Man," C. Wright Mill's "White Collar," Vance Packard's "The Status Seekers," and, most recently, Robert Townsend's "Up the Organization" are merely a few of the recent exposures of various aspects of institutional efficiency. The humerous character of most well known works of this kind does not mean that the authors and their observations are not serious. It means rather that serious writings on this subject are usually not read and that authors have learned this lesson from Jonathan Swift's "Gulliver's Travels." Most people will open their eyes and ears to serious exposures of their follies only if these are made to appear not serious. On the surface, at least, most of the above authors, and most of the critics of human

institutions throughout history, have exposed failures or hypocrisies rather than the very premises of human efficiency. They have usually seemed to take for granted that what was being attempted was desirable and possible, but that the job was being bungled. Swift, Dostoevski, and Parkinson, at least, have gone deeper but seldom has the entire concept of human efficiency been called into question by the critics of human institutions.

The actual history of these institutions suggests, however, that their founders knew the costs might exceed the gains, since the major costs were always transferred to others than themselves.

It is only recently that more than the exceptional founders and governors of institutions have been willing to partake of their discipline. Kings commanded their armies, naval officers were not subject to the lash, factory owners employed other peoples children. Even now, people send their children to shools they would not attend themselves. They would claim, of course, that they went to worse ones, but that was when they were helpless children.

Now that more of the managers of institutions do submit themselves to the rigors of their institutions it is partly because these rigors have been abated and partly because the new breed of managers are themselves products of their institutions. Having come up through the institutions, and been shaped by them, they find their constraints less foreign and less onerous than those who are used to a non-institutional life. It is also these products of institutions, who stay within them in order to take advantage of the powers they yield, who have relieved the harshness that formerly characterized

the lower ranks. They could do this, however, only by substituting other controls for the overseer's whip and the lash of hunger. The substitutes constitute a vast proliferation of institutional life, down into the lives of children through the schools, into the very bedrooms of ~~the~~ organization wives, into the lives of workers and consumers by means of advertising and consumer credit, beyond the boundaries of birth and death themselves in pre-natal clinics, undertaking parlors and life insurance policies.

Modern man receives the benefits of his institutions only by submitting himself to them completely. Even though he does this, however, he never has enough money nor credit to avail himself of all of the benefits they teach him to want. He is the final proof that human efficiency costs more than it produces, that institutions merely displace costs rather than create values.

What must be done? These words, spoken on the eve of the Russian revolution by Lenin, demand a much more profound answer than he gave them. The industrial workers to whom he spoke might be the first to reject an adequate answer; for this is not, as Lenin thought, to shift the benefits of human efficiency from owners to workers but, almost, to turn our backs upon the concept of efficiency itself.

Almost, but not quite! The price of a complete rejection is too high. The earth could not sustain a third of the present human population if institutionalized technology were abandoned. This much cost man has succeeded in shifting to the environment and a shift back would be catastrophic for man. More than that, almost all of the ~~remainder~~ the remaining third of mankind would be forced back to the level of bare subsistence.

A non-industrial world would again support only a tiny elite; the ten percent who, today, live in relative freedom from a hand to mouth existence, would shrink back to one percent or less. Man can no more afford a complete rejection of institutionalized efficiency than he can afford to let it continue on its unbridled course. Human efficiency is strong medicine; it has the power to kill but also the power, if carefully controlled, to keep alive.

By using efficient means man has far surpassed the boundaries which nature would otherwise have set him, not only in numbers but in his own nature and expectations. He is no longer a child of nature nor can he revert to his former state. He can live now only with the artificial support of the lethal powers he has himself devised. He must understand their lethal nature, however, and control them well of they will kill him. The atomic bomb is merely a symbol. The apparently benign instruments of man's efficiency, even those which merely save life itself, are equally deadly.

The way physics understands efficiency may provide insight not only into its nature but, possibly, also insights useful for its control. An efficient device, in physics, is one which transfers work from one point or aspect of the environment to another. It is, thus, a means of displacing costs rather than a means of creating values, since it always absorbs more energy than it transfers.

Nevertheless, displacing costs may be a very useful thing to do, even though it has to be done at a price. Such devices must necessarily have a limited use; otherwise they would use up all available energy while supplying a smaller equivalent in another form. Confined to a limited use, it then makes sense that efficient devices

be used to displace those costs which most need to be displaced, in the interests of the total system, and in an amount which uses no more energy than the total system can afford for these purposes. This is also just common sense. It is what a prudent man, free of compulsions, actually does. He applies efficient means to those limited aspects of his life where they give the greatest pay-off at the least cost. He knows that to try to be efficient in all or even most things would destroy his freedom. He can follow this policy so long as he remains prudent and free. The problem of applying these principles to all mankind is that prudence and freedom cannot be assumed but have to be achieved. There are additional problems of agreement and scale. Great as these problems are there is no alternative but to face them.

The following sketch of a solution is no more than a preliminary exploration. It is not a program and nothing is said about how it might be achieved. It is appended partly to avoid a merely negative reaction to the statement of an unpleasant problem which no one, however, can afford to ignore. It does, hopefully, offer a starting point for constructive as well as critical discussions.

To begin negatively, there are three institutions which above all others fan the flames of galloping efficiency. They are nation-states, production cartels, and schools. The first is the instrument of military competition, the second of consumer competition, the third of the personal status scramble. With these engines of efficiency in operation all prospects of its control and limitation are totally obscured. Nations, corporations and persons competing for survival obviously

cannot afford to limit the scope or level of their efficiency. A world must be imagined, therefore, in which this kind of competition is strictly controlled. Difficult as this is, it is not the greatest difficulty. The heart of the problem is to imagine a way of life which would provide people with some of the benefits of efficiency, which would enable them to maintain and even increase these benefits, but would at the same time maintain their fear, respect and, perhaps necessarily, their dislike of efficiency enough to keep it, and their demands upon it, under strict control.

A society can be imagined whose members, organized in family-size non-corporate enterprises, would produce and exchange food, personal services and artesan products. These enterprises should be strictly limited in the permitted size of their holdings and paid employment. This society would also contain a public, highly technical sector producing those agricultural and manufactured products and services most subject to economics of scale. The scope of this subsector would be limited to the labor input of a small fraction of the labor potential of the society, to be provided by the required service of each member for a limited period of years. In return for this service each member of the society would have a life-time right to draw upon the technical sector for a roughly equal share of its products. Within strict limits and with adequate safeguards, individuals who chose to give additional years of service to the technical sector, or whose services were particularly needed, might earn additional claims upon it, or upon the services of their fellow members. The essence of the idea is that people would live most of their lives in a non-institutional environment

engaged in work with small-scale tools and facilities, and in exchange on a person to person basis. They would learn to know and respect and probably dislike the technical sector through their required service within it and while they would constantly be tempted to increase its output they would also be deterred by the more extended service this would require of them and by the fact that their personal increase in benefits would be small. For almost everyone, opportunities to improve any aspect of his own way of life would be much greater outside the technical sector than within it.

The policies governing the technical sector would be made by people whose lives were lived largely outside it. They would be experienced enough to understand its requirements but would not live under ~~them~~ its control or direct influence. Computers would undoubtedly play an even greater role in management than they do now, but they would be programmed by people whose minds had not been formed under their spell. ~~They~~ technical sector of this society would be publicly owned and so, probably, would the land, but the rest of the economy could be privately operated. The competition of the technical sector and the public ownership of land would provide most of the necessary controls on the private economy but some additional restrictions on organizational size and scope of activities might be required. There would be little need for public services in this society except for the transportation and communication services provided by the technical sector.

no P People could exchange services in the market or organize cooperatives, on a local scale, to provide the services they desired.

Compared to the industrial ~~sectors~~ areas of today's world, life in this projected society would be somewhat primitive. A restricted technical

sector could obviously not provide private automobiles or all of today's major household durables, although it might provide the components from which they could be built. The large scale entertainment and luxury goods and service industries of today would not exist, but many reasonable small scale substitutes could be developed. Much more of all kinds of responsibilities would devolve upon the household and small community than is now the case in large urban concentrations. Those would probably be gradually dispersed since the relative compulsions and attractions of urban life would be greatly reduced. Much less would be done for people than is now done in the wealthier parts of the world, but people would be far more free to do things for themselves, to choose where and how they wanted to live, at what they wanted to work or play and with whom. There would be no extremes of poverty or wealth but there would be an infinitely greater variety of styles of life and activity. Both equality and superiority would decline in importance as the qualitative variety of life increased.

There are two major problems posed by this dystopia. One is to ~~dissuade~~ awaken a humanity sold on the existing utopia, backed by the cumulative historic successes of science and technology of the present cornucopian day-dream. People will be reluctant to exchange this dream, which is before their eyes and under their hands, for a much less glamorous ~~potatoes~~ promise in the sky.

The other problem ~~is~~ would be to maintain the tension and the balance of the projected society, if it were ever established. Actually the second problem must be faced before the first, since faith in this possibility is a necessary precondition of steps to bring it into being.

Two general arguments will be raised against the feasibility of the society sketched above. The first is that the technical sector could not be run by amateurs, as is envisioned. This argument is not impressive to those who have worked in the bowels of institutions. As many managers have testified, the myth of managerial efficiency is precisely that. In wars and other emergencies, when amateurs are drafted in large numbers into responsible institutional roles, many of them do better than the veterans. This is when most institutional innovations occur and the amateurs are largely responsible for them.

The second argument is harder to refute; it is that despite all precautions a limited technical sector would gradually increase its scope; that an elite would grow up around or within it and that this elite would eventually capture and subvert the society. This is, of course, the great danger of any society which allows a powerful dynamic process to exist within it. In the last analysis the only counter-rebuttal may be that at least the safeguards suggested would put off the evil day on which humanity destroys itself once and for all.

For this day to be seriously delayed, however, men must first become convinced that a delay is possible and desirable—and before that, even, that real danger is imanent. The probability of each of these occurring, taken separately, seems not too great; their joint probability is, of course, even less. No matter what the odds, however, the game of "avoid catastrophe" always remains worth playing.