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Human Species at a Cross-road

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THE HUMAN SPECIES AT A CROSSROAD

Technological progress has never bestowed upon mankind such miraculous physical powers as it has during the past few decades. We can now fly to the moon. We can see in full colour what is happening now even at the antipode of where we are. It takes us just a few hours to calculate with a computer one million decimals of the numbers π and even more than that if we wanted. Leibnitz, the man who thought up the formula on which that work of the computer was based, would have needed not less than 30,000 years to perform the same calculation. Let us not ask how much paper and ink a quasi immortal Leibnitz would have needed for that job.

By making it possible for information to be transmitted from one place to another with the speed of light and for people to travel with a velocity comparable to that of the sound, modern technology has shrunk, as it were, our earthly abode. We can now contemplate it just as if it were a small backyard. But in spite of the marvelous achievements of modern science and technology, the picture of the world we can thus piece together reveals that mankind has never been in a more critical situation in all its entire known history. We speak of this and that endangered species, but we do not seem to realize that we are perhaps the most endangered one.

The human condition of today viewed in its entirety is apt to cover a sensitive heart with fathomless gloom and cause a pondering mind feel ashamed for belonging to the species of *Homo sapiens*. For indeed, where is the *sapientia*, the wisdom that presumably characterizes our species?

One government after another—be it materially rich or poor—spends a large proportion of people's money (in some cases, people's bare means of subsistence) to produce or purchase the dreadful instruments of war invented by the science and technology of which we are so indiscriminately proud. And the sad thing is that in many places of the world, these instruments are being actually used in what with a shrewd euphemism we call "limited wars". However, these limited wars seem to be unlimited in that they emerge in one new place after another. One may wonder, shuddering with horrible apprehensions, whether these limited wars would not grow into a cosmic pyre that will end the existence of all mankind.

To pay for the means of killing people and, frequently, to reward their political clientele, governments almost everywhere govern by inflation. Ordinarily, what inflation does is to squeeze out craftly a substantial part of the purchasing power of the little money the poor squeeze tightly in their hands for fear that they may not get any at all tomorrow. Unemployment is causing hardship even in the economically advanced countries. But the tragedy of the humans who, in some underdeveloped countries, find no use for their hands surpasses the imagination of those who have never felt it or witnessed it.

Millions of humans do not even have a little money to squeeze it in their hands. Many are so weak physically that they could not even be able to squeeze it, if they had it. Millions of people, old and young (but especially young) suffer from indescribable misery—squalor and starvation—misery as mankind has never known before. Indeed, this time the suffering exists *en masse* and desperately contrasts with the conveniences and luxuries enjoyed by others elsewhere, at times, just next door.

If one is bent over finding a means to do away with these tragic conditions or at least to mitigate their rigors and burdens, one must (as in all cases in which a solution is sought) discover

first the causes of the facts involved. To explore in a quick rhythm the causes of mankind's vicissitudes now brought to the surface by the march of history is what I propose to do first on this special occasion. I shall end my lecture with what I have been preaching for quite some time now under the title of "a minimal bioeconomic program".

A point I can hardly hammer enough is that the solution of mankind's vicissitudes requires an entirely different approach than that of conventional—or, as I prefer to call it—standard economics. That approach relies on the price mechanism and financial transfers exclusively. However, the problem before us is not economic—much less financial. It is bioeconomic, a term by which I intend to spotlight the fact that the economic process viewed from a broader viewpoint is an extension of the biological evolution. Indeed, we must not doubt that our destiny is bound to our existence as a biological species, for in the ultimate analysis, this is what we are: a biological species.

Differences between individuals or between groups of individuals are not only normal but also unavoidable phenomena in the biological world. But only within the human species do we find, from the dawn of history on, inequalities of a different nature—social inequalities which have little, if anything, to do with the biological differences. Economic inequalities between social classes have existed in all organized societies and have always led to social conflicts. Other species—the termites, the ants and the bees, as common instances—also live in organized societies, yet they are free from any social conflict.

All species, including the human, maintain, reproduce and defend themselves with the organs with which each individual's body, i.e., every individual's *soma*, is endowed by birth. We may refer to these organs as *endosomatic*. All species, including the human, have also become better adapted to life through advantageous biological mutations. These mutations occur,

however, sporadically and, moreover, the improvement they bring about is fantastically slow relative to the human sense of the flow of time. It took not less than forty-five million years for the *Eohippus*—an animal which in the Eocene epoch was just the size of a small dog—to become the powerful horse of our days.

The uniqueness of the human species resides in the fact that mankind transcended this slow mode of improvement, an evolutionary step that fundamentally changed man's fate.

Apart from a few cases of marginal significance, only the human species began to use and, later, produce **exosomatic** organs, i.e., detachable limbs, such as clubs, hammers, knives, boats and, more recently, guns, automobiles, jet planes, etc. As best as we can judge, it all started some twenty million years ago when one of our primeval ancestors, the *Proconsul*, happened to pick up a club from the woods and felt (in a way that we can justifiably surmise) that its arm became thereby longer and more powerful.

Unfortunately, the exosomatic evolution that has gradually brought part of humanity to live in the comfort attained now by the Western World has not been an unadulterated blessing. It confronted mankind with three predicaments.

The first predicament has its origin in the fact that the production of exosomatic organs became from a certain moment dependent on the use of **available** energy and **available** matter. These are not just energy and matter, but some special forms of them, which may be illustrated by the chemical energy of a piece of coal and by the concentration of, say, copper in a copper ore. Other species need only solar energy and some chemical elements found within the easily accessible environment. Man, however, has to get its exosomatic ingredients from the bowels of the earth.

Mankind's first predicament is that the stocks of terrestrial available energy and matter **accessible** to man are necessarily finite. Moreover, thermodynamics—a particular branch of physics—teaches us not only that matter-energy can be neither created nor destroyed, but also that available matter-energy continuously and irrevocably degrades by itself into "waste", a useless form as far as human interest is concerned. Coal left by itself will slowly burn out. Occasionally, it may burn in a flash by spontaneous combustion. But the industrial activity in which mankind has been engaged for the past five or six thousand years speeds up this degradation. It is thus in the laws of thermodynamics that lies the root of economic scarcity. In a world where the thermodynamic laws would not apply, the same energy could be used over and over again and no material object would ever wear out. Of course, in such a world life as we know it could not exist either.

The conclusion is clear and inescapable. The continuous depletion of terrestrial resources, which exist in finite quantities, must affect the present level of our industrial activity. Clear symptoms of the environmental limit have become plainly manifest over the past ten years or so. Pollution is spreading practically everywhere. The United States, once a top oil-producing nation, is no longer able to increase its production of crude oil in accordance with its current needs. Sooner or later "growth", that great obsession of both standard and Marxist economist's, must come to an end. The only question is "when"?

The second predicament brought about by the exosomatic evolution is the social conflict.

Endosomatic organs being the natural property of the individual, **they cannot be the object of a "normal" conflict.** (The only salient exception is, again, constituted by man, through the old institution of slavery). Nor would exosomatic organs lead to a social conflict as long as their production and use were confined

to the circle of one family or of one familial clan. Because of the close ties among all members of these small communities, the formula "from each according to his abilities, and to each according to his needs" could work fairly well in them.

However, the production of exosomatic instruments soon began to call for more hands than were available in a familial clan. At that moment production had to become a social instead of a clannish activity. The clans themselves had to become aggregated and fused into a higher type of existence, into what we usually mean by "society". At the same time, as an indissoluble requirement of socially organized production, the participants in production became divided between "supervisors" and "supervised" in the broadest meaning of the terms.

Concomitantly, a second factor came into play. Exosomatic instruments (such as a large boat or a jet-plane) may ordinarily serve a large number of people, yet hardly all members of the society. This fact raised an entirely new issue: who is to benefit from the use of the exosomatic instruments? For, by their nature, exosomatic instruments are not the natural property of any particular individual. For reasons easy to understand, the conflict over the use of exosomatic instruments and their products settled along the very division created by the needs of organized production.

As I have noted earlier, species other than ours live in societies based on organized production; yet they are not plagued by any form of social conflict. The answer to this apparent puzzle is that those species came to live in society through *endosomatic* evolution, which means that each member's role in production is established at birth through its soma. For example, the ant doorkeeper is born with a flat head and, moreover, its instincts are such that it likes nothing better than to block the entrance to the ant colony with its head. In such a society there can be no conflict between one "social class" and another.

The social conflict of human societies exists only because the human species came to live in society as the result of exosomatic, not endosomatic, evolution. Nothing in the soma of a newborn human indicates his future role in society. He may become a ricksha man just as well as a mandarin. And the rub is that, in contrast with the ant doorkeeper, a ricksha man would like to be a mandarin and, as a part of his ordinary efforts, would struggle to exchange roles.

Social elites of all times have asserted their superiority by asking the same question: "Where would you, the governed, be if it were not for us to help you survive?" And the fact is that this claim has always contained a substantial amount of truth. The high priests of Ancient Egypt did inform the farmers on the Nile when the time was ripe for preparing the fields; the capitalists did create new jobs through their ventures; and the technocrats do answer now a legitimate call of a highly complex mode of existence.

The social conflict will therefore remain part of the human lot as long as our mode of life depends on the production of large-scale exosomatic instruments. Contrary to the Marxist fundamental faith, socialization of the means of production cannot bring the social conflict to an end. Where there are now directors and presidents, there will be (as we know only too well by now) commissars and party secretaries—a new class with the same old privileges.

Since social inequalities is deep-rooted in our exosomatic mode of existence, the only means to prevent its aggravation must be political and aimed at maintaining the freedom of criticism and the right to vote in and out, the leaders and their appointees. Admittedly, the pressure of an increasing population on a finite and tight-fisted environment is apt to upset this apple-cart (a point to which I shall return later).

Let me turn now to the third predicament that stems from our exosomatic evolution.

Mankind has been, and still is, divided into races. Races, however, can coalesce with each other with no biological obstacle. But because of its exosomatic evolution, mankind has found itself divided also into different exosomatic species. While the Egyptians were building the pyramids that even nowadays arouse our admiration, people in Central Europe were living in a Cro-Magnon type of Economy. Such differences still exist and in some cases are even greater. Compare the mode of life of North Americans with that of the bushmen of the Kalahari. Exosomatically, even *Homo indicus* is an entirely different individual from *Homo americanus*. *Homo indicus* travels mainly on foot or, at best, in a small cart pulled by a donkey, and cooks in a primitive hibachi by burning dried dung. *Homo americanus* travels in an automobile, when not flying in an aircraft, and cooks electrically in a self-starting, self-stopping and self-cleaning stove. This exosomatic separation, although deeper and more resistant than that between two biological species of the same genus, must be understood only in relation to whole population. Only population—not individuals—can be exosomatically different. As we know it from facts, there is nothing to prevent a *Homo indicus* from becoming, say, an excellent jet pilot.

Yet the existence of the exosomatic differences has a very grave importance. Over the past quarter of a century massive financial aid was directed, especially by the United States, toward the economic improvement of numerous countries. In some cases—Western Europe and Japan—the aim was quickly achieved. However, especially in the case of the neediest countries, the effect was next to nil.

The puzzling contrast is easily explained in the light of the foregoing observations. Western Europe and Japan belonged

to the same exosomatic species as the United States, the main supplier of the recovery equipment. But since the worst suffering countries formed a different exosomatic species, the same equipment could not possibly fit their exosomatic structure any more than a feather of a bird could replace the fin of a fish.

Here again, our parochial view of the economic process in its intimate structure led us astray. To put it in a plastic way: a *Homo indicus* needed help after his donkey fell into a ditch and broke one of its legs. On the advices of his economic authorities, *Homo americanus* hurried along with a steel radial tire to remedy the trouble of the "vehicle": he could not conceive that people travel but in automobiles. This is not said in a facetious vein. The R & D in Western countries is interested only in improving their own exosomatic instruments—to design a microwave oven with more self-controls, or a quieter air conditioner, and so forth. All these gadgets can be of no help to the people of South Asia or of tropical Africa: they are exosomatic species different from the Western ones. The underdeveloped can be helped only if the R & D everywhere focuses its attention on how to raise the actual exosomatic level of the underdeveloped. To put an electric stove, a refrigerator, and a color television set in every household of the world is a beautiful dream. The fault lies with those who claim that it can be actually realised with our present technical means and, moreover, over a short period by a few development plans.

However, in contrast with the inequality between the "supervisors" and the "supervised" which has its root in the socially organized production, the exosomatic differences between nations will normally fade away in the end, whether we work toward it or not. With a shrunken world, we are all neighbours now and nothing could stop pressures to work on the economic and social gradients. The only problem is whether unprecedented catastrophies would not thrust mankind in convulsions of a different nature. This is why natural resources emerge as the most

critical factor of the probable fate of mankind, not only in the foreseeable future, but also beyond.

Mankind is at a unique and complex crossroad in its history. One issue, however, pervades the entire landscape: to continue its existence as an exosomatic species mankind needs a continuous supply of available energy and available matter.

Some say that we should not worry about matter since the whole Earth is made of matter. The rub is that not every site harbors a mine of mercury or tin, for example. And because the Earth is a closed material system and because recycling cannot be complete, matter may in the long run become more critical than energy. At this juncture, however, it is the scarcity of available energy that seems to menace our present technology.

According to the most optimistic estimations, fossil fuels will not last very long if they are used up at the present rate. Uranium will not provide even as large a source of energy if burned in the conventional reactors. True, it can last substantially longer—about hundred times longer—if used in what academic sales-talk has called the breeder. Unfortunately, an economy based on the breeder produces large quantities of plutonium, that demonic element which is not found in natural state, is highly toxic, and can be used as the kernel of a rudimentary atom bomb put together in a basement shop. The last fact as well as the issue of the safe operation of any atomic reactor, but especially of the breeder, and the safe storing of the accumulating nuclear garbage justify one to ask whether, at this crossroad, it would be wise for mankind to move toward an economy based on nuclear reactors.

To see how horrid is the landscape before us, we may recall that years ago Edward Teller—"the father of the hydrogen bomb"—urged us not to take the ill-fated road to fission energy; mankind must wait for the less dangerous means offered by controlled thermonuclear reaction, by controlled fusion. But as years

went by without any encouraging sign of probable success, Edward Teller now judges that we must without delay accelerate the construction of breeders: there is no more respite to wait for the fusion.

Of course, there is solar energy, too, about which there is much talk today. Compared with other sources of energy it represents a truly astronomic power. All fossil fuels together could provide only two weeks of sunshine, whereas the sun will shine for at least another two hundred billion weeks! Moreover, the flow of solar energy reaching the ground of the Earth is twelve thousand times the flow of all kinds of energy consumed now by the whole world. And in contrast with all other forms of energy, the direct use of solar energy produces practically no environment harm. Yet solar energy is not the philosophical stone many now seem to believe. Its intensity at the ground level is extremely weak. While it is a blessing for life that it is so weak, concentrating it for industrial use meets insuperable obstacles. To count on the natural process of photosynthesis to supply us with fire power (and hence motive power) is not a solution, unless mankind is prepared to return to another Wood Age. There should also occur a substantial amount of deurbanization and reduction of population so as not to deforest the entire planet (as we were on the verge of doing before the discovery of the steam engine and of the coke smelting).

Some writers, obviously intent to decry Malthus, claim that the Earth could feed as many as one hundred billion people, provided every acre would be cultivated with high-yield varieties and by fully mechanized agriculture. What these writers sadly ignore is to ask how long population of this size (or of any size for that matter) can be supported. To work for years on end in order to transform the whole Earth into a chimerical farm capable of producing so much food each year would be downright silly. A population of one hundred billion (and even smaller) could not subsist for long.

The anti-Malthusians think mechanistically and linearly, whereas the economic process is entropic and irreproducible. To begin with, the strictly organic carrying capacity of the globe is not only limited, but it also decreases, albeit imperceptibly, with the years. For there is no natural process by which the nutritive elements return entirely to the soil. To boost up production by high-yield varieties and mechanized agriculture means to grow food on terrestrial resources—chemical fertilizers, iron, copper, gasoline, etc.

But let us not ignore that organic agriculture has its own price. Some land must be set aside to grow not food but fodder for our organic partners in toil, oxen, horses, and water buffaloes. Hence, we must make room for them, by keeping our own number low. In a way not foreseen by Malthus or his followers, we can now see the interlocking of the "optimum" size of population and the economy of natural resources.

The importance of natural resources in the life of our species is written on the entire face of history. It was the degradation of the pasture lands by millenary grazing that triggered the Great Migration. Pressure of population on land also caused the second Great Migration, from the Old to the New Worlds. Great Powers (and even small ones) have always waged war for the control of natural resources even when the battle cry was ideological. This truth is nowadays more obvious than ever.

It is hard, therefore, to understand why standard economics has completely ignored the role of natural resources in the economic (let alone political or social) process. My fellow economists are nowadays quick to counter that Harold Hotelling did develop a theory of exhaustible resources in a famous paper of 1931. Elegant though that mathematical piece was, it has set a completely wrong pattern of thought about the economics of natural resources, pattern which has recently been revived by several economists, by T.C. Koopmans in particular.

Hotelling's idea is that the optimal distribution of exhaustible and finite resources over time is that which maximizes the sum of discounted future utilities. I shall gloss over some minor issues—such as the measurability of utility even for a community and the significance of adding utilities even over time—to observe that discounting is a normal behavior for an individual: **the individual is mortal**. But a nation and especially the entire mankind are quasi **immortal entities**. The assumption that these entities ought to discount the future is plainly inept.

A second point on which standard economics goes wrong is that it confuses risk even with historical uncertainty. The future of mankind is not a definite lottery lot with a definite probability, but the most uncertain uncertainty. We have not witnessed and will never witness the evolution of another mankind to know in advance what will happen to us and when. This is why our only reasonable behavior criterion is to **minimize regrets**, not to **maximize expected utility**.

The consequence is simple. We must take into account the future generations, without any discount, just as if they were present now to bid together with us in an imaginary market. We all know the elementary economic principle according to which the value of an irreproducible object—say, the Mona Lisa of Leonardo da Vinci—is its auction price. But we must correct it by adding "provided that absolutely everyone interested in the object is allowed to bid". Otherwise, the highest bid for Mona Lisa may very well be only a few dollars. The ordinary price mechanism obviously fails in this respect totally and hence cannot result in the optimal allocation of natural resources over time, as standard economists stubbornly maintain.

A minimal bioeconomic program emerges without difficulty from the foregoing observations and critiques. Its pillar is the idea that, given the uncertainties surrounding the new sources of energy and the irreversibility of some of their effects on life

in general, we must proceed with caution so as to minimize regrets. To wit, we must aim to keep fossil fuel economy going as long long as possible in order to miss the chance—if such a chance exists—to discover some safe ample sources of energy.

The world—especially, Washington—resounds with loud schemes that claim to solve the energy crises. None has yet worked in fact. Therefore, before beginning to erect buildings without staircases and elevators, we should make certain that the schemes for screening out gravitation work and work without increasing the current consumption of available matter-energy for the same job.

The upshot is that the only reasonable plan for action is to act on **demand**, waiting for the hopeful moment when **supply** can be effectively increased without incalculable dangers. To act on demand, however, is not a simple commandment and should not be interpreted as such. In the center of it there is an intricate knot of thorny issues—the size of population, the multiple inequalities, and the scale of our values.

With all the foregoing observations in mind I can now turn to my minimal bioeconomic program.

First, the production of all instruments of war, not only war itself, should be prohibited completely. It is utterly absurd (and also hypocritical) to continue growing tobacco if, avowedly, no one intends to smoke. The nations which are so developed as to be the main producers of armaments should be able to reach a consensus over this prohibition without any difficulty if, as they claim, they also possess the wisdom to lead mankind. Discontinuing the production of all instruments of war will not only do away at least with the mass killings by ingenious weapons but will also release tremendous productive forces for international aid without necessarily lowering the standard living in the donor countries.

Second, through the use of these productive forces as well as by additional well-planned and sincerely intended measures, the underdeveloped nations must be helped to arrive as quickly as possible at a good (not luxurious) life. These nations must in the first place become able to feed themselves. "Factories, not food, for the hungry" must be our guiding slogan*.

Both ends of the spectrum must effectively participate in the efforts required by this transformation and accept the necessity of a radical change in their polarized outlooks on life—one side arguing that the evil stems from the excessive growth of population, the other, that all would be well if only the developed nations were to consume less. We must struggle to convince each side that the other is right, too.

Third, mankind should gradually lower its population to a level that could be adequately fed only by organic agriculture. Naturally, the nations now experiencing a very high demographic growth will have to strive hard for the most rapid possible results in that direction, just as the rich nations will have to abandon their spendthrift habits.

Fourth, until either the direct use of solar energy becomes a general convenience or controlled fusion is achieved, all waste of energy—by overheating, overcooling, overspeeding, overlighting, etc.—should be carefully avoided, and if necessary, strictly regulated (especially in the advanced economies).

Fifth, we must cure ourselves of the morbid craving for extravagant gadgetry, splendidly illustrated by such a contradictory item as the gold cart, and for such mammoth splendors as two-garage cars and the Concorde.

* At the Dai Dong Conference (Stockholm, 1972), I suggested the adoption of a measure, which seems to me to be applicable with much less difficulty than dealing with installations of all sorts. My suggestion, instead, was to allow people to move freely from any country to any other country whatsoever. Its reception was less than lukewarm.

Sixth, we must also get rid of fashion, of "that disease of the human mind", as Abbot Fernando Galliani characterized it in his celebrated *Della moneta* (1750). It is indeed a disease of the mind to throw away a coat or a piece of furniture while it can still perform its specific service. To get a "new" car every year and to refashion the house every other year is a bioeconomic crime. Other writers have already proposed that goods be manufactured in such a way as to be more durable. But it is even more important that consumers should reeducate themselves to despise fashion, which must be a very bad thing—as Oscar Wilde ironically noted—if we want to get rid of every new one after only six months.

Seventh, and closely related to the preceding point, durable goods must be made still more durable by being designed so as to be repairable. To put it in a plastic analogy, in many cases nowadays we have to throw away a pair of shoes merely because one lace has broken.

Eighth, in a compelling harmony with all the above thoughts we should cure ourselves of what I have been calling "the circumdrome of the shaving machine", which is to shave oneself faster so as to have more time to work on a machine that shaves faster so as to have more time to work on a machine that shaves still faster, and so on *ad infinitum*. We must come to realize that an important prerequisite for a good life is a substantial amount of leisure spent in an intelligent manner in a world in which there is no undue suffering anywhere.

Considered on paper, in the abstract, the foregoing recommendations would on the whole seem reasonable to anyone willing to examine the logic on which they rest. But one thought has persisted in my mind ever since I began looking at the economic process from a nonmechanical and nonlinear viewpoint. Is not my program, minimal though it is, utopian? To this accusation I would plead guilty, but with pride (not with vainglory).

For only utopian thoughts have helped mankind at all times. Hence, I firmly hope to see some time soon candidates for political office in some rich nation promising to help people to get rid of their "bigger and better" luxuries and others, in the less fortunate nations, preaching that growthmania has done only harm to both the poor and the rich.

And I also hope that one day mankind will recognize the value of a new commandment, which is

"LOVE THY SPECIES AS THYSELF"