The Smith of the Gods

26 - « Entropic degradation and the Promethean destiny of human technology »

260- How can consciousness act upon the course of processes which seem able to be reduced to the kingdom of matter and of energy? This question was posed by the mathematician Alfred James Lotka on the subject of biochemistry. Alfred J. Lotka, anticipating in his theories the general systems theory of Ludwig von Bertalanffy, developed a global approach of the “ system of the world ”, Vernadsky's biosphere, which opened the way to the ecology of ecosystems, developed after the Second World War by the students of professor G.E. Hutchinson at Yale University, notably the brothers Eugene and Howard Odum, who opened the dialogue with their work “ Entropic degradation and the Promethean destiny of human technology ”. Alfred James Lotka is a pioneer in the biophysical approach to economics, introducing in 1945 the term “ exosomatic ” to designate the accelerated technical evolution of the human species which, according to him, intimately forms part of the biosphere. One indeed begins to realize that the entropic (unidirectional) process of the industrial economy integrates badly into the cyclic functioning of the biosphere. Hence the idea, ever more obvious, that the present “ economic development ” is not sustainable. Lotka's system comes close to the definition of negentropic processes, reversing the consequences of the entropic process, which will be better defined later in the general (entropic) systems theory.

261- In Plato's Protagoras, Protagoras will teach Hippocrates “ the best way to govern one's house, to put oneself in the best state to act, to speak in the affairs of the city and to speak for it ”. In other words, a brilliant politician. But according to Socrates, excellence by nature could not be taught, despite all the pretensions of the sophists on this subject. He founds this reasoning on two arguments: when a discussion bears on a technical subject, only the specialists are qualified to speak and to give their opinion (intellection). When, on the other hand, the discussion is of a political nature, then everyone feels authorized to emit an opinion, without ever having received the teaching of a master on this subject (doxa): this behaviour is indeed the proof that politics is considered as being unable to be taught. In order to refute Socrates point by point, Protagoras then launches into a sophistic discourse. For the first argument, he uses the myth of Prometheus (who is the one who thinks before) and of his brother Epimetheus (who is the one who thinks after). Prometheus is the son of the Titan Japetus and of the Oceanid Clymene; Prometheus would be the creator of the human race. He would have shaped the first man with earth and water. He is also charged by the gods with the creation of the terrestrial world, with distributing the qualities and the physical gifts among the living beings. His brother Epimetheus asks to take care of it. He sets to the task scrupulously, guided, it seems, by the double requirement of just equilibrium and harmonious diversity: the strongest will be less fast and the small animal will know how to fly in the air or to hide under the earth. One will have hair, the other a skin, one will be carnivorous and the other herbivorous. But when all the species are harmoniously endowed and all the talents

generously distributed, Epimetheus' mistake bursts into the open: man has been forgotten. Man remains naked and defenceless. In order to repair his brother's mistake, Prometheus will steal the secrets of fire and of technical skill from the god Hephaestus. He gives technical knowledge to men, allowing them to compensate for their nakedness. But in order to prevent the men, holders of these new powers, from coming to kill one another, Zeus granted them all as well, through the intermediary of the god Hermes, the feelings of modesty and of justice, founders of political consciousness and of community life. This is the reason why every man has within him the notion of politics and can express an opinion on this subject. Protagoras closes his argumentation by comparing virtue to a mother tongue. If it can be learned without a particular master, by listening and imitating, that is not a reason to affirm that it is not a knowledge capable of being taught. But must one ignore the nuance between instilling and teaching?

262- Thus, were the Greeks of Antiquity right to attribute this transmission of fire without the concomitant wisdom to the initiative of Prometheus? For Alfred Lotka, it is the properly planetary, evolutionary aspect of modern technology, often symbolized by this myth of Prometheus, which happens to be, as Schumpeter and Tarde had well seen, at the heart of economic development. Chronologically, the first Promethean revolution was the mastery of fire. The importance of this discovery derives from two singular properties of fire. First of all, fire represents a qualitative conversion of energy, the conversion of a certain form of chemical energy into calorific energy. Moreover, fire proceeds like a chain reaction. With one single small flame, one can burn a whole forest, indeed all the forests. Fire put men in a state to warm themselves and to cook food, but above all to melt and to forge metals, to fire ceramics and limestone. The technological era opened by the gift of Prometheus I - as we should call him - was the age of wood. Indeed, for centuries, wood remained the sole source of efficient calorific energy. With time, the gift of Prometheus the first contributed to his own extinction. Indeed, the hitch of every Promethean gift is to accelerate technical development, which, in its turn, contributes to the growing exhaustion of the “ fuel ” which maintains it. Thus, with ever-growing industrial development, the forests of the world are in peril. Salvation came from Prometheus II, this time on the part of two ingenious mortals: Thomas Savery, who invented a steam pump, and Thomas Newcomen, who invented the first steam engine on the principle of Clausius. Their gift was indeed Promethean. The steam engine, like fire, represents a qualitative conversion, namely the conversion of calorific energy into motive energy. Just like fire, the steam engine also sets off a chain process. With one single steam engine and a little coal, one can extract enough coal and other ores to produce other steam engines with which one can produce yet other steam engines and so on, as long as there is enough fuel and appropriate ores. Just like the gift of Prometheus the first, the steam engine brought about a leap both qualitative and quantitative in the state of technology. It put humans in a position to use for the first time a new and more powerful source of motive energy, that of fossil fuels. We still live in the age of these fuels. But the extraordinary mineralogical bonanza which began some two hundred years ago now prematurely approaches its end, the inevitable work of the second Promethean gift.

263- Today, the crucial question is whether a new Prometheus will come to resolve the present energy crisis in the same way as Prometheus II resolved the crisis of the age of wood. The ordinary nuclear reactor is not a Promethean gift. It only broadens the source of heat as the discovery of oil did around 1860. The breeder reactor could be a Promethean gift, for it performs a qualitative conversion, that of fertile materials into fissile fuels. This conversion also sets off a chain process, at least on paper. Unfortunately, the breeder reactor is surrounded by grave risks not yet sufficiently assessed. As for the control of a thermonuclear reaction, no light is yet to be seen at the other end of the tunnel. Moreover, it is not excluded that the use of thermonuclear energy will remain confined to bombs in the same way as gunpowder and dynamite. Admittedly, the situation can change completely from top to bottom without any warning. But since nobody can be sure that Prometheus III will arrive, nor know exactly what his gift will be, only one strategy imposes itself without appeal, namely a well-planned general conservation. It is in this way only that we will have more time to await the discovery of a new Promethean gift, such as biogenic energy or intellectual energy allowing solutions of scale at the electronic level, the mastery of the reprocessing and of the regeneration of nuclear waste, or at worst, to slide slowly and without catastrophes towards a less “ hot ” technology. Obviously, this latter technology could only be a new age of wood, different nonetheless from the one of the past, because our technical knowledge is more extensive than today. It could not be otherwise, given that every evolutionist process is irreversible. And if this return becomes necessary, the profession of economists will undergo a curious change: instead of being exclusively preoccupied with economic growth, economists will look for optimal criteria to plan degrowth. The economist Georgescu-Roegen does not deny technical progress (historically unpredictable), he only underlines the physical and economic limits, which moreover do not exclude other limits, biological, social, political and ethical. He also reminds us that it is not univocally synonymous with progress! The redoubtable social problem of unemployment is perhaps indeed inseparable from a reorientation of “ technical progress ”. In this domain of the social responsibility of science and technology, degrowth is more topical than ever, or at the very least the stabilization of this growth.