

EARTH AS A SPACE SHIP

by

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In the imagination of those who are sensitive to the realities of our era, the earth has become a space ship, and this, perhaps, is the most important single fact of our day. For millennia, the earth in men's minds was flat and illimitable. Today, as a result of exploration, speed, and the explosion of scientific knowledge, earth has become a tiny sphere, closed, limited, crowded, and hurtling through space to unknown destinations. This change in man's image of his home affects his behavior in many ways, and is likely to affect it much more in the future.

It is not only that man's image of the earth has changed; the reality of the world social system has changed. As long as man was small in numbers and limited in technology, he could realistically regard the earth as an infinite reservoir, an infinite source of inputs and n infinite cesspool for outputs. Today we can no longer make this assumption. Earth has become a space ship, not only in our imagination but also in the hard realities of the  social, biological, and physical system in which man is enmeshed. In what we might call the "old days," when man was small in numbers and earth was large, he could pollute it with impunity, though even then he frequently destroyed his immediate environment and had to move on to a new spot, which he then proceeded to destroy. Now man can no longer do this; he must live in the whole system, in which he must recycle his wastes and really face up to the problem of the increase in material entropy which his activities  create. In a space ship there are no sewers.

Let me suggest, then, some of the consequences of earth becoming a space ship. In the first place, it is absolutely necessary for man now to develop a technology that is different from the one on which he now bases his high-level societies. High-level societies are now based on the consumption of fossil fuels and ores, none of which, at present rates of consumption, are likely to last more than a few hundred years. A stable, circular-flow high-level technology is conceivable in which we devote inputs of energy to the ncentration of materials into useful form, sufficient to compensate for the diffusion of materials which takes place in their use. At the moment we take fuels and burn them, we take concentrated deposits of iron ore for instance, and phosphates, and we spread these  throughout the world in dumps, and we flush them out to the oceans in sewers. The stable high-level technology will have to rely on the oceans and the atmosphere as a basic resource from which materials may be concentrated in sufficient quantity to overcome their diffusion through consumption. Even this, of course, will require constant inputs of energy. There is no way for the closed system to prevent the increase of entropy. Earth, fortunately, has a constant input of energy from the sun, and by the time that goes, man  will probably have abandoned earth; and we have also the possibility of almost unlimited energy inputs from nuclear fusion, if we can find means of harnessing it usefully.

Man is finally going to have to face the fact that he is a biological system living in an ecological system, and that his survival power is going to depend on his developing symbiotic relationships of a closed-cycle character with all the other elements and populations of the world of ecological systems. What this means, in effect, is that all the other forms of life will have to be domesticated, even if on wildlife preserves.

The consequences of earth becoming a space ship for the social system are profound and little understood. It is clear that much human behavior and many human institutions in the past, which were appropriate to all infinite earth, are entirely inappropriate to a small closed space ship. We cannot have cowboys and Indians, for instance, in a space ship, or even a cowboy ethic. We cannot afford unrestrained conflict, and we almost certainly cannot afford national sovereignty in an unrestricted sense. On the other hand, we must beware of pushing the analogy too far. In a small ship, there would almost have to be a dictatorial political system with a captain, and a planned economy. A voyaging space ship, like a battleship, almost has to be a centrally planned economy. A large space ship with three billion passengers, however, or perhaps ten billion, may have a very different social structure. Large social organizations are very different from small. It may be able to have much more individual freedom, a price system and a market economy of a limited and controlled kind, and even democratic political institutions. There must be, however, cybernetic or homeostatic mechanisms for preventing the overall variables of the social system from going beyond a certain range. There must, for instance, be machinery for controlling the total numbers of the population; there must be machinery for controlling conflict processes and for preventing perverse social dynamic processes of escalation and inflation. One of the major problems of social science is how to devise institutions which will combine this overall homeostatic control with individual freedom and mobility. I believe this problem to be not insoluble, though not yet solved.

Once we begin to look at earth as a space ship, the appalling extent of our ignorance about it is almost frightening. This is true of the level of every science. We know practically nothing, for instance, about the long-run dynamics even of the physical system of the earth. We do not understand, for instance, the machinery of ice ages, the real nature of geological stability or disturbance, the incidence of volcanism and earthquakes, and we understand fantastically little about that enormously complex heat engine known as the atmosphere. We do not even know whether the activities of man are going to make the earth warm up or cool off. At the level of the biological sciences, our ignorance is even greater. Ecology as a science has hardly moved beyond the level of bird-watching. It has yet to become quantified, and it has yet to find an adequate theory. Even to an economist, its existing theoretical structures seem fantastically naive, and when it comes to understanding the world social system or the sociosphere, we are not only ignorant but proud of our ignorance. There is no systematic method of data collection and processing, and the theory of social dynamics is still in its first infancy.

The moral of all this is that man must be made to realize that all his major problems are still unsolved, and that a very large and massive intellectual effort is still necessary to solve them. In the meantime we are wasting our intellectual resources on insoluble

problems like unilateral national defense and on low-priority achievements like putting a man on the moon. This is no way to run a space ship.

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