BIOTIC AND ENVIRONMENTAL STABILITY

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Biochemical processes of terrestrial life are supported by the external flux of solar energy; they are reduced to the synthesis and destruction of organic matter. Man has added new processes of synthesis and destruction of various industrial substances, which change the chemical composition of the environment.

The retention of the existing state of natural environment is provided by the balance of the global biotic synthesis and the destruction fluxes down to the fourth decimal position, in other words to a high degree of closeness of the biochemical matter cycles [1]. The natural communities of the living species are capable of supporting the environmental conditions at a level fit for life. The totality of such communities is essentially what we call the terrestrial biota. Transitions between different stable states of the biota combined with their respective enviromental conditions may occur over time intervals characteristic for the process of new species formation, i. e. of the order of one million years. Within a few millenia only random fluctuations may occur [1].

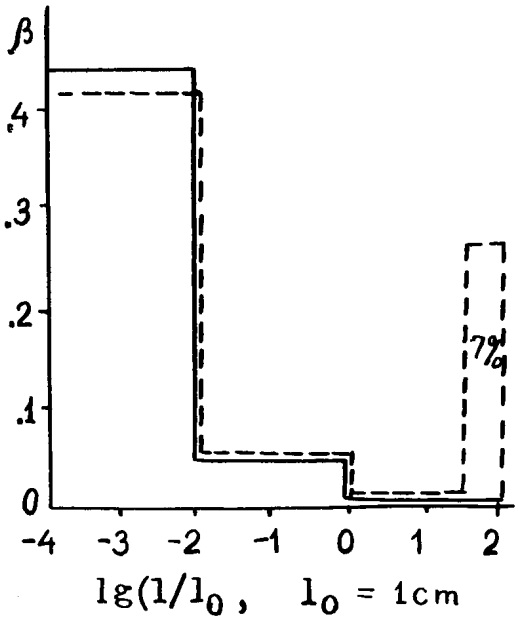

Fig. 1. Density of destruction produced by living beings of body size 1.

Solid line presents universal distribution observed in all nonperturbed systems [1]. Dashed line — contemporary global distribution on land. Difference between areas enveloped by solid and dashed lines characterizes biochemical cycle openness, it is obtained from data on changes in global carbon cycle [2] and is close to area of anthropogenic peak

The enormous biologic synthesis and destruction power developed by terrestrial biota, which exceeds the average rates of environmental changes due to geophysical and cosmic origin by a factor of 10^4, is needed for quick compensation of any fluctuations by means of concentrated deviations from closed biochemical cycles [1]. All these circumstances make the environment quite vulnerable to anthropogenic transformations of natural biota. The interrelations between the biologic synthesis and destruction being completely destroyed the environment may be perturbed so strongly to make it totally unfit for life in about 10 years [1].

If the natural biota perturbation exceeds its threshold level the stability of both the biota and its environment is destroyed. Human activity during the preindustrial era, when mankind used less than 1% of the biospheric products, did not lead to any noticeable changes in the environment. The biota of unperturbed natural communities, which functioned in its role of 'expiation' expenditure', absorbed 99% of the biologic energy fluxes and was capable of compensating for every environmental perturbation, including local disruptions in the biota precipitated by human industrial activities. A similar level of threshold perturbation is yielded by the analysis of the biological energy fluxes distribution over body size of living being in the existing non-perturbed natural communities (fig. 1). In the current century man is using over 10% of biospheric products. The analysis of the global carbon cycle [2, 3] demonstrated that the perturbed land biosphere has already lost its compensation capacities in relation to the anthropogenic force, and the environment has started to change (fig. 2).

The solution of this situation is usually envisaged as a transition to nonwaste technologies and to ecologically clean energy sources. However such a solution is incapable of resolving the problem of environmental conservation. The contemporary rate of perturbation of the environment by industrial enterprizes is by an order of magnitude lower than the maximum possible rate of such perturba-

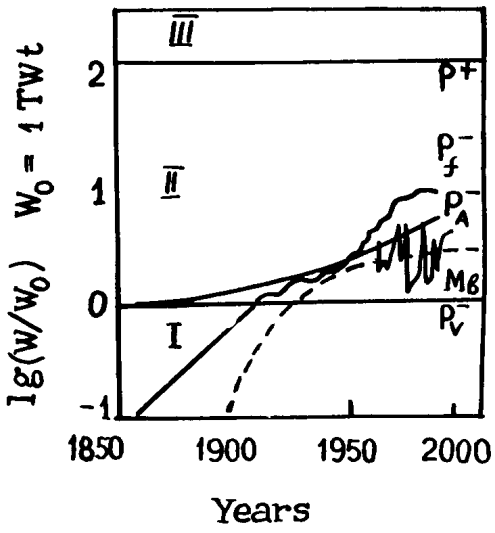

Fig. 2. Anthropogenic consumption and destruction of biosphere. p^+ — climatic limit of energy consumption. M_b — observed power of land organic carbon mass reduction. p_f^- — man's power of energy consumption (primarily — fossil fuel combustion) p_A^- — power of man's food, cattle fodder and wood consumption (the same as anthropogenic peak in fig. 1.; p_v^- — admissible power of food consumption by land surface vertebrates in stationary biosphere, coinciding with threshold of admissible anthropogenic perturbation of biota. Man's energy consumption ranges: 1 — stationary biosphere; II — deteriorating biosphere; III — climatically prohibited zone

tions produced by a disrupted biota with its biochemical cycle completely open, fig. 2. The contemporary land biota is perturbing the environment at almost the same rate as the industrial enterprises do. Further perturbation of natural biota based on using completely ecologically clean energy sources, may bring that biota into a totally disordered state.

The true solution to this situation consists in restoring natural biota on a scale needed to support the global stability of the natural environment. This task calls for a planetary scale reduction of the level of industrial activities; i. e. this would mean turning much of the Earth surface into natural reservations.

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