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ARTIFICIAL ECOSYSTEMS

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A closed ecological system is an ecosystem that provides the maintenance of life through complete utilization of available material, in particular using cycles wherein exhaled carbon dioxide, fuel, and other waste matter are converted, chemically or by photosynthesis, into oxygen, water, and food.

Closed artificial ecosystems are aimed at the creation of isolated completely autonomous analogs of the Earth's biosphere where a person is a part of it. The only thing, ideally, supplied from the outside is energy. The substance circulates inside and does not need any supply.

The successful development of such systems will allow expanding the human habitat both on Earth and on another planet that is not adapted for human life and will allow humanity to settle in the Universe on Ships of generations.

There are some examples of closed ecosystems. They are BIOS (USSR), Biosphere 2 (USA), Mars-500 (Russia), Yuegong-1 (China).

It is impossible to create a completely closed life-supporting system (LSS) at the moment. About 10% of the substances still fall out of the cycle and must be replenished from stocks. But the most serious drawback of closed biological LSS is their low energy efficiency, and, as a consequence, very significant size and weight, especially in comparison with the water and oxygen regeneration systems operating built for the International Space Station. This drawback is fundamentally unavoidable. Therefore, the most realistic projects of closed LSS include both biological and technical elements (biotechnical LSS).

Within the framework of this project, a model of an artificial ecosystem was made. An aquarium was chosen as the object under study. It was populated with eight species of living organisms. The total number could be higher, due to the fact that it was not possible to distinguish all living things. After sealing, the system operated for 9 months before the balance in it was disturbed.

Before launching the system, there were many questions and alleged problems. But during the experiment, some of them were solved themselves while new ones arose. Taking into consideration this experience, a model, working longer and more productively, can be created.

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