

Peer Review

Review of: "Let the Transformative Anthropocene Be Positive!"

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The Authors have identified the major problems concerning the Earth's future and the future of humanity. They very correctly state that in the Anthropocene, humans have exercised their considerable powers to change the Earth, both its living systems and its entire structure. They call for an urgent and ethical reconsideration of the human approach to life on the planet and its exploitation to ensure a balanced future. To address this call, there is a need to consider the set of feedbacks operating during human evolution. The Authors should consider these feedbacks in more detail. Since these feedbacks are complicated, it would be good to solicit the collaboration of anthropologists. The Authors are right in saying that in the Anthropocene, we must revise the ways we look at the relations of humans and the Earth system. This will provide the solution to the problem they identified, but specific ways to achieve it must consider the complexities of human evolution that require careful consideration of the interrelationships between the social structure, technology, and human mental capacities.

I live in Australia, a continent that is an experiment in unthoughtful human interventions into living systems. Before European colonisation, dogs (now Dingo) and agricultural rice were introduced, already changing the ecosystem. After European colonisation, the fauna became dominated by feral cats, pigs, thousands of horses, camels, rabbits, rats, mice, and who knows how many kinds of invertebrates and microorganisms. Even the native fauna was manipulated. In the 1920s, eighteen koalas native to the East Coast of Australia were introduced into Kangaroo Island in South Australia and eventually spread in this part of the continent. They feed on eucalypt trees and, as could be expected, started destroying forests on Kangaroo Island because their population increased too fast. This led to "gentle" control of the koala population growth by costly sterilisation instead of just killing surplus animals because koalas are an "iconic animal" of Australia. The result was a lot of native animals who were artificially sterilised.

Most of science and technology is done by applying Ockham's Razor (the rule of parsimony), which deliberately ignores a number of relationships of a given object of study or construction/intervention. This is the result of the way the human brain evolved - to simplify knowledge by categorisation and then use categories for decision-making. Such a way of thinking was an obviously efficient adaptation in the Pliocene and Pleistocene when foraging was the mode of life. Since the Holocene, however, food production, based on parsimonious manipulations of the environment and animal and plant husbandry favouring selected animals and plants, started influencing the Earth's system.

The Earth is a part of the system of the Universe, and itself is a complex system. According to L. von Bertalanffy^{1,2}, a system is an entity with interrelated and interdependent parts; it is more than the sum of its parts. A change in a system can be described by a set of differential equations where the state of one element of a system depends on changes in all other parts of this system. Any change in a system produces changes in all its parts. When a systems theory is applied to the scientific understanding of the Earth, it becomes evident that any human intervention must change the way life on Earth continues.

Interrelations between elements of a system can be either homeostatic, based on negative feedback loops, or autocatalytic, based on positive feedback loops. Since its beginnings in the Miocene, human evolution has occurred in the system of positive feedbacks^{3,4}. This system is efficient and has resulted in the exponential growth of the human population, as the Authors argue, and in the development of culture, science, and technology. Autocatalytic feedbacks occurring in chemical reactions result in explosions. Any autocatalytic system, by producing exponential changes, must inevitably end in the singularity - an explosive conclusion. The set of feedbacks occurring in human evolution will inevitably end this way; we are now close to the catastrophic end. However, this end may be avoided by reversing some of the positive feedbacks, transforming them into the negative, homeostatic ones. Examples include altering the social organisation in such a way that it does not increase the exploitation of natural resources and focusing technological development on increasing food production without expanding agriculture. The success of this undertaking is unlikely due to human parsimonious (simplistic) thinking that produces violent solutions to problems instead of thoughtful, all-inclusive, considerate actions. In the 21st century, we have witnessed attempts at reversing dangerous autocatalytic relationships - protection of natural environments, reduction of carbon dioxide emissions, etc. Unfortunately, they are now opposed by the eruption of military conflicts, destroying human lives and environments. The future is uncertain because autocatalytic feedbacks operating in our evolution form human minds and

emotions in a way that prevents reasonable collaboration. We should make every effort to reverse this trend.

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3. Henneberg M. 2025. Our One Human Family. A Story of Continuing Evolution. NOVA Publishers, New York.
4. Henneberg, M. and Eckhardt, R.B., 2022. Evolution of modern humans is a result of self-amplifying feedbacks beginning in the Miocene and continuing without interruption until now.

Declarations

Potential competing interests: No potential competing interests to declare.