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The Zoo Hypothesis

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Extraterrestrial intelligent life may be almost ubiquitous. The apparent failure of such life to interact with us may be understood in terms of the hypothesis that they have set us aside as part of a wilderness area or zoo.

INTRODUCTION

The most interesting scientific problem of our age involves the question of the existence of extraterrestrial intelligent life. Arguments summarized below make it likely that intelligence exists on many planets throughout our galaxy and that most of these civilizations are much older than our own. This problem has been the subject of considerable work both theoretical and experimental (see Oparin and Fesenkov, 1960; Cameron, 1963; Shklovskii and Sagan, 1966; Sagan, 1973; and other references therein) and our understanding of the subject has certainly progressed rapidly in the last decade or so. However, this problem has proved to be extremely difficult, in part because it involves understanding what a civilization much older than ours might be like. It is difficult enough to predict our own development for a few decades hence, but we need to know about other civilizations that may be older than ours not by decades but by eons.

Among currently popular ideas about extraterrestrial intelligence, the idea that "they" are trying to talk to us has many adherents (see, e.g., Drake, 1963). This idea seems to me to be unlikely to be correct and the zoo hypothesis is in fact the antithesis of this idea.

STARTING PREMISES

Three working hypotheses or starting premises are used in most discussions of the problem of extraterrestrial life. These premises are stated below with a discussion of their origin and references to the literature. Although this discussion is brief, these premises are in fact crucial and if any of them proves to be incorrect, then the zoo hypothesis falls.

A. Whenever the conditions are such that life can exist and evolve, it will. Life is to be understood as a chemical reaction that occurs whenever the necessary reactants are present under the appropriate conditions for a sufficient time. This statement represents a considerable extrapolation of our present knowledge. In fact the opposite hypothesis, that life is statistically unlikely even in ideal conditions, has been expressed (e.g., by Townes, 1971). Discovery of primitive life on Mars or Venus would probably settle this question. Our current understanding of biochemistry seems to support premise A (Shklovskii and Sagan, 1966, Chapter 14; and Calvin, 1963).

B. There are many places where life can exist. Planets are probably quite common in the universe. As many as 20% of all stars may have planets and as many as 10% of these planets may have surfaces on which life can form. (However Oparin and Fesenkov, 1960, think that only one star in 10^5 or 10^6 has a planet with a surface suitable for life. See also von Hoerner, 1963). This statement also represents more than we know at present; no star other than our sun is definitely known to have planets comparable to the earth. Objects that may be planets have been detected around a few other stars (see Shklovskii and Sagan, 1966, Chapter 11; Huang, 1963; and van de Kamp, 1969), however these objects are much more massive than the earth. Planets comparable to the earth around almost any other star would go undetected with present techniques. The opposite hypothesis, that the solar system is unique, was believed by Jeans, 1929, Chapter XVI, but is now discredited (see, e.g., Levin, 1964, for a summary of current thinking).

C. We are unaware of "them."

Who is Out There?

It is statistically unlikely that there exists anywhere in our whole galaxy any other civilization whose level of development is at all comparable to ours. We would expect to find either primitive life forms, perhaps comparable to those on the earth a few million years ago, or very advanced life forms, perhaps comparable to what will be on earth a few million years hence (!)

There are three general categories of possibilities defining the technological evolution of a civilization:

(1) Destruction (from within or without)
(2) Technological stagnation.
(3) Quasi-continuous technological progress.

Also there are many other mixed possibilities such as partial destruction and rebuilding, and the surprisingly popular finite-lifetime idea. These possibilities are sketched diagramatically in Fig. 1 with specific reference to our own extrapolated future. It is likely that some fraction of all civilizations follow each of these possibilities. However, analogy with civilizations on earth indicates that most of those civilizations that are behind in technological development would eventually be engulfed and destroyed, tamed, or perhaps assimilated. So, generally speaking, we need consider only the most technologically advanced civilizations because they will be, in some sense, in control of the universe.

Technological progress may be defined as increasing ability to control one's environment. Already at our level of technology we affect almost everything on earth from elephants to viruses. But we do not always exert the power we possess. Occasionally we set aside wilderness areas, wildlife sanctuaries, or zoos in which other species (or other civilizations) are allowed to develop naturally, i.e., interacting very little with man. The perfect zoo (or wilderness area or sanctuary) would be one in which the fauna inside do not interact

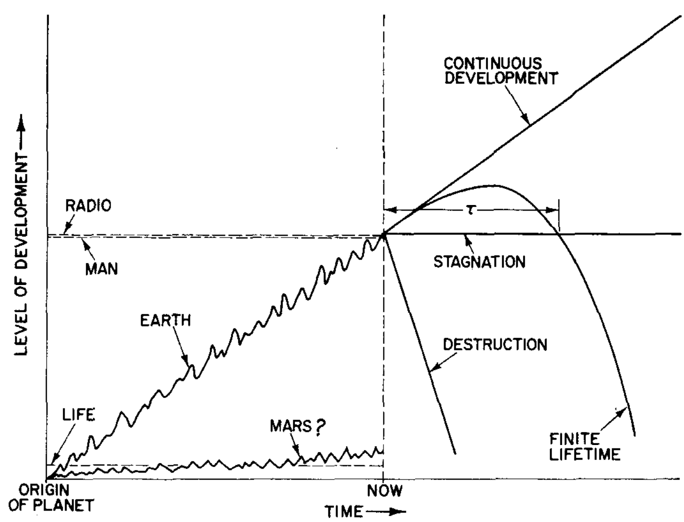

FIG. 1. This is a sketch of the top level of development, defined in terms of complexity, versatility, and ability to control the environment, either of the organism itself or of the civilization to which it belongs. The various possible extrapolations for our future are discussed in the text.

with, and are unaware of, their zookeepers.

The Zoo Hypothesis

Premise C above now seems to me to be extremely significant. I believe that the only way that we can understand the apparent non-interaction between "them" and us is to hypothesize that they are deliberately avoiding interaction and that they have set aside the area in which we live as a zoo.

The zoo hypothesis predicts that we shall never find them because they do not want to be found and they have the technological ability to insure this. Thus this hypothesis is falsifiable, but not, in principle, confirmable by future observations.

Conclusions

The zoo hypothesis as given here is probably flawed and incomplete. I hope that it can provide some sort of inspiration for further work. Among other hypotheses that one might consider, the laboratory hypothesis is one of the more morbid and grotesque. We may be in an artificial laboratory situation. However, this hypothesis is outside the purview of science because it leads nowhere, it immediately calls into question the premises on which it is based, and it makes no predictions. Or one might suppose that extraterrestrial civilizations have not yet found us or that they know we are here but they are uninterested in us. These latter two hypotheses are probably incompatible with the high level of technological sophistication they undoubtedly possess.

The zoo hypothesis seems to me to be pessimistic and psychologically unpleasant. It would be more pleasant to believe that they want to talk with us, or that they would want to talk with us if they knew that we are here. However the history of science contains numerous examples of psychologically unpleasant hypotheses that turned out to be correct.

Acknowledgments

Although the ideas in this paper are not in the mainstream of current scientific thought about the problem, they are also not new. Science-fiction authors, in particular, have toyed with similar notions for many years. And at least a few previous writers have suggested such ideas as a serious possibility.

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