

COMMITTEE VI
The Universe and Its Origin:
From Ancient Myth to Present Reality
and Fantasy

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ON THE UNIQUENESS OF LIFE

by

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DISCUSSION PAPER

on

Seth Shostak's

THE SEARCH FOR EXTRATERRESTRIAL LIFE

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1. A quest for a theory of life origin

Any search for extraterrestrial life should not only be based on a definition of life, suitable for the detection of living beings in the desert of the Universe. It should also resort to a general theory of life, particularly concerning its origin, its evolution, its spread, its duration. Outside such context any speculation on 'another' life is unfounded and unsuitable to scientific treatment.

This is also true for the so called 'intelligent' life. The only meaning of 'intelligence' which has any bearing to the research for extraterrestrial life is 'capability to produce messages' or, more realistically, to send and receive radio-messages. Under this respect man would have not been intelligent until very recently. Also intelligence and message-transmission require not only an operational definition but a theory, connecting them to life, as essential features or as unnecessary and occasional attributes.

Much of the mentioned theories could be studied by observing terrestrial life in the present and past manifestations. The current picture of life is admittedly inadequate and naive, particularly in reference to its origin. The primordial soup of Oparin-Haldane is fully unwarranted, the occurrence of the first life by chance aggregation of atoms or small molecules is unmaintainable. The selection theory of organic evolution is patently insufficient.

2. Origin of life as a miracle.

Within our available logical and empirical parameters life is an impossibility even on the Earth. Whether it is considered an unauthorized natural event or a supernatural miracle, the emergence of life cannot be ranked among the facts to which an expected frequency can be assigned. Our a posteriori reconstructions of its emergence are presently so poor that we are fully unable to propose a framework in which to locate life as a specific case. We don't even know if any form of life, essentially different from what we design life, and yet definable as life, is thinkable. Is life a category or a singularity? Is it an episode or a totality, like Universe?

In the time dimension terrestrial life is of the same order of magnitude as the Universe. It may be 4×10^9 to the 9^{th} years old (fossil record), in a 12×10^9 to the 9^{th} years old Universe. Since its origin life has changed less than the Universe in the same lapse of time. If there is plenty of space around for life to come and colonize Earth, there is not so much time for 'another life' to have anticipated ours.

If life is singular and born by a miracle in the depth of the time, its probability of existing (irrespective on the fact that it really exists) is zero. The same is the probability of it to occur in

other celestial bodies. Once a miracle has occurred we cannot rule out another one. This is however a transcendent belief and it is outside the realm of deductive science.

3. Continuous origin of life

On the opposite side, one could reason in quite different terms. The origin of life can be held as a normal and relatively frequent event. Life, or 'a life', could continuously be originated in the interstellar space (or on planets?), and regularly feed the earth's biomass which would otherwise lose its richness. This is the (quite respectable) thesis maintained by Sir Fred Hoyle and his collaborators.

The same alternatives have been put forward for the Universe origin. Besides the largely accepted theory of a suddenly arisen expanding universe, an equilibrium universe was surmised in which matter would be continuously formed to keep the density of its expanding mass constant.

4. A test for the monogeny of life

The question: was life formed only once in the dawn of Earth, or was it continuously renewed through successive accessions from the outside space, may receive some answer.

The alternative: monophyletism (common descent) or polyphyletism (multiple origin) can hardly be tested on the basis of the morphological comparison between extant or extinct animals and plants. The molecular comparison, bearing a much larger and objective record of the history of life, may perhaps throw some light into the matter.

Many proteins are known which are ubiquitous in the most diverging organisms. One can consider each kind of protein to consist of two parts (or domains): one, the core, which is essential to its function and is invariable, the other which is dispensable and variable. The invariable core does not inform us about the relationship between similar proteins, since each protein of a given type must attain such structure and cannot exist otherwise. The variable domain is instead very informative. If a given protein in two animals is conservative in the variable domain, the two forms of the protein must have a relatively recent common origin and have diverged lately. If the difference is vast the divergence must be remote. If the variable domains are just random the two forms of the protein may be fully independent (and just 'converge' in the invariable core).

The best studied ubiquitous protein is cytochrome C, a respiratory protein present in all animals plants and microbes. It consists of about 100 aminoacids- of 20 types- arranged in series as the 20 letters of an alphabet in a 100 letters' sentence. In man and chimp all aminoacids are the same, in man and the gray kangaroo the amino acids are the same in 90% positions (94 out of 104).

In the less similar human and baker's yeast sequences, 64

positions conform. This was interpreted (M.O. Dayhoff, 1970) as an "impressive testimony to the evolution of all these organisms from a common ancestor". The alternative of independent origin was taken as non plausible. Since any of 20 possible aminoacids can occur in every position, "the number of different possible chains -argues Dayhoff- is 20 to the 100th. With so many possibilities it is improbable that two unrelated organisms would happen independently to have manufactured such similar structures".

This reasoning should be corrected taking into account that almost 50 per 100 positions are unvariable (or almost so) and constitute the functional core, when animals and plants are considered. The actual relationship is to be checked in the 50 unconstrained positions. Of these about 45 bear different aminoacids, so that the unexpected coincident aminoacids are perhaps only 5 per cent, a value not so impressive as to make independent origin implausible.

Thus similar proteins in different organisms might have in some instances independent origins, thus speaking in favour of a multiple derivation of life. The matter needs to be carefully reassessed.

The occasional embodiment of new genic DNA into the flow of life cannot be ruled out. In fact this is the case in the processes of lysogenization well known in bacteria and in the integration of the information from RNA viruses (retrovirus) into DNA higher organisms through inverse transcription. These latter cases are somewhat in contrast with the central dogma of molecular biology, and they change indeed the scenario of the emergence of life.

If life is continuously formed (in the interstellar space?), the problem is only to ascertain whether there is a suitable habitat around to host it. And there is little doubt that such habitats occur, probably even inside our Galaxy.

Paradoxically enough a reductionistic-materialistic view of life would attribute its origin to a miracle and confine it to our planet. Conversely, a more orderly view of life would make its emergence a natural, continuous, universal process.

I feel that an accurate investigation into the structure of life, to check its currently assumed uniqueness, would be more fruitful in the exploration of the possibility of extraterrestrial life, than a search by radioastronomical techniques.

In search of the 'needle in the bottle of a hay' it seems more reasonable to ascertain whether people use and lose needles in the region rather than to explore the hay, straw by straw, by a lens.

5. On the interstellar communications

The occurrence of extraterrestrial life doesn't involve that it should become detectable to us or that it should be able to send to or to receive messages from the Earth.

We are probably too conceited of the present historical contingencies, to the point of believing that space technology is an

obliged path in the evolutionary development of life, an unavoidable commitment to the spacial destiny of any living matter. In fact it represents an instant in the million years of the H o m o history. Although charged with mythical values, the conquest of the skies is but a byproduct of a military enterprise and it is only supported because it is part of a larger conquest or defence strategy. It is but the last expression of the Titanic attempt to overturn the Olympian Reign through material instruments.

"The Earth is not being invaded by intelligent beings in spacecraft", write Hoyle and Wickramasinghe (1981). "Such a concept is but a crude perception of the real situation; it is to 'see through a glass darkly', just as the part who is struck by the beauty of a rose or the majesty of the starry sky perceives only glimpse of far deeper wonders".

(Reference to be added)