EESTI NSV TEADUSTE AKADEEMIA TOIMETISED. BIOLOOGIA
ИЗВЕСТИЯ АКАДЕМИИ НАУК ЭСТОНСКОЙ ССР. БИОЛОГИЯ
PROCEEDINGS OF THE ACADEMY OF SCIENCES OF THE ESTONIAN SSR. BIOLOGY

1987, 36, 1

https://doi.org/10.3176/biol.1987.1.01

УДК 577.20

Toomas SUTT

THE ANTHROPIC PRINCIPLE AND THE SYNTHETIC THEORY OF EVOLUTION

D'où venons-nous?
Que sommes-nous?
Où allons-nous?
(P. Gauguin)

Amazing enough, it was neither a philosopher nor a biologist, but a painter, Paul Gauguin, who nearly a century ago so expressively envisaged the ancient problem of the essence of man.

Today we surely know far more about our natural origin, the amount of particular knowledge of man has grown considerably, we have the socialist future ideal, but in the main — the interpretation of the essence of man — we have gained surprisingly little success. The present situation has been very vividly described by Academician Kalju Paaver, one of the most distinguished Estonian evolutionists, as follows: «The ideas of man making his way to cosmos have won great popularity nowadays. Scientists ardently discuss the possibilities of coming into contact with extraterrestrial anthropoids. At the same time the circle of global problems of purely terrestrial type is getting more and more tight. Can our descendants escape from it? Is it sensible to set our hopes on genetic engineering referred to by our contemporary. Paracelsi dreaming of altering man, although it is not quite clear how, why and in what dicertion *Homo sapiens* should be changed? Do we still inhabit the adaptive niche in which a hundred thousand years ago arose a wondrous species — *Homo sapiens*? Are we in our deepest biological nature the same Stone Age hunter in the shape of which the species *Homo sapiens* appeared on the stage of history, but who has to live in the present-day world no matter what his instincts and emotions are, in the world which is not a proper place for such an ex-hunter, who has become conscious of his animal origin, his subjectedness to the stiff laws of the evolution of nature and society that cannot be changed by him?» (Paaver, 1985).

In the circumstances when the menace of nuclear catastrophe and the growing ecological crisis have exposed to danger the existence of the whole living nature including man, the role of biology, especially of the modern Darwinian doctrine, i. e., the philosophical and ethical role of the synthetic theory of evolution in revealing the essence, place and meaning of man in the biosphere of our planet and in the whole Universe as well has grown immensely (Sutt, 1980; Сутт, 1983; Riedl, 1982; Wuketits, 1984).

The change in the cognitive situation of the 20th century natural science is first of all characterized by the triumph of the evolution principle, which consists in the introduction of two fundamental evolutionary conceptions — the theory of the evolving (non-stable) Universe in the 1920s and the synthetic theory of evolution in the 1930—1940s.

The idea of the evolving Universe should be regarded as one of the principal conceptions of the modern natural scientific world picture (Турсунов, 1983) as a further specification of the fundamental principle of evolution. According to this approach the known history of the Universe — from the «Big Bang» up to the origin of *Homo sapiens* — is represented

as a uniform process, characterized by genetical and structural continuity of four types of evolution: cosmic, chemical, biological and social.

In the context of the all-encompassing conception of evolutionism in recent years much attention has been paid (to be more exact, in the first place by physicists, astronomers and philosophers, much less by biologists) to the anthropic principle as one of the new approaches to problems connected with the «phenomenon of man». The aim of the present paper is to view critically its methodological basis and heuristic possibilities proceeding from the principles of materialistic dialectics and the synthetic theory of evolution (STE).

The anthropic principle has been deduced from the idea first formulated by L. Boltzmann that the high level of the observed cosmic order as compared with the more probable chaos situation is the consequence of fluctuation, statistically a very rare phenomenon. The first who actualized the anthropic principle on the background of the latest data of natural sciences were evidently G. Idlis (Идлис, 1958) and R. Dicke (1961). The contemporary interpretation of the anthropic principle was put forward by B. Carter (Картер, 1978) in 1974, who made difference between its strong and weak modification.

In conformity with the anthropic principle the formation of steady complex structures and, consequently, the existence of life is possible only in an actual evolving universe with the corresponding fundamental physical constants observable by man (Картер, 1978; Carr, Rees, 1979; Gale, 1981; Новиков et al, 1982; Wolsky, 1982). Even if the regularities of the evolution of the Universe and the physical fundamental constants only very slightly differed from those actually observed, the universe would have quite other features — neither life nor man would be possible in it. Another conclusion of great importance for this conception follows from the anthropic principle: if life arises on other planets, it will be originated in the same way and on the same chemical basis (carbon, water) (Мароч-ник, Мухин, 1983; Морозов et al., 1984).

Out of numerous hypotheses on the origin of life very prospective from this point of view is the one set forth by I. Morozov, which states that the formation of life from non-living substance proceeded as a kind of peculiar phasic transition (catastrophe from the viewpoint of R. Thom) (Морозов, 1984). It means that the coming into existence of the primary laws of the organic world and the genesis of the regularities of physical nature are the same kind of phenomena — i. e., the origin of life is a «Biological Big Bang».

In the following we try to show that the conclusions of modern biology and the evolutionary theory on the attributive features of biosystems principally coincide with those of cosmology and physics, but, in addition, open up new possibilities for the interpretation of the essence of life and man.

In the first place let us see which structural-functional and evolutionary attributive features of the only form of life known to us up to the present time can be extrapolated to all the theoretically possible forms of life in the Universe.

The following structural-functional invariants should be regarded: 1) organization of living systems on a certain material substratum (proteins and nucleic acids); 2) convariant reduplication (Тимофеев-Ресовский et al., 1969). The main arguments advocating the conception of the protein substratum of the possible forms of life in cosmos are the following: 1) in the whole observable part of the Universe the most wide-spread elements are hydrogen, oxygen, carbon, nitrogen, sulphur and phosphorus, which are necessary for the origin of organic molecules, 2) due to their chemical properties those elements are most suitable for the role they have to perform in organisms: C, H, N, O guarantee the high stability of organic

macromolecules (necessary for the preservation of the genetic information and the self-organization of living systems), but S and P — the transition of energy and chemical radicals in organic reactions. Owing to its chemical properties carbon has the advantage over all the other elements in the sense of guaranteeing necessary structures and functions of living systems (Уолд, 1964). Numerous data allowing us to give the problem of extraterrestrial life a natural scientific interpretation have been obtained through the study of chemical evolution. According to S. Ponnamperuma the possibility of chemical, i. e. prebiological evolution has been verified by: a) the data that prove the principal possibility of the formation of biogenic compounds in model experiments which imitate conditions probably dominating on the Earth at the origin of life; b) study of organic compounds of extraterrestrial origin. Analysing those data he comes to the conclusion that observations prove a unitary character of the chemical and physical laws of nature: at similar initial conditions (identical complex of elementary compounds) possible directions of chemical evolution are probably limited and to some extent may even be predetermined (Ponnamperuma, 1972).

The above-given considerations allow us to admit with certain probability that the same main biochemical principles regulate the possible diversity of life forms in the Universe (Волхонский, 1972; Кальвин, 1971; Кеньон, Стейнман, 1972; Опарин, 1977).

The second structural-functional invariant of life — convariant reduplication — is characterized by T. Dobzhansky as follows: «Despite all the uncertainties inevitable in dealing with a topic so speculative as extraterrestrial life, two inferences can be made. First, the genetic materials will be subject to mutation. Accurate self-copying is the prime function of any genetic materials, but it is hardly conceivable that no copy errors will ever be made. If such errors do occur, the second inference can be drawn: the variants that arise will set the stage for natural selection. This much must be a common denominator of terrestrial and extraterrestrial life» (Dobzhansky, 1972). In a more general sense, the principle of convariant reduplication reveals the purpose of self-preservation of biological systems that can be attained only by their continuous self-renovation. M. Kamshilov has stressed that the preservation of life is possible only at continuous alteration of its content (Камшилов, 1974). At the species level the main contradiction proceeding from the striving of a biological system for self-preservation on the one hand, and the possibility of achieving this aim through continuous transformation of the system itself on the other hand, is realized by natural selection. From the evolutionary point of view natural selection represents the third and most important invariant of life.

Modern natural science almost satisfactorily describes the process of evolution before and after the origin of life, but the process of the origin as such is a real «black box». A. Oparin, author of one of the most popular theories of the origin of life has admitted: «... Yet there exists a gap between the organization of probionts received at model reproduction and the structure of the most primitive existing prokaryotes» (Опарин, 1977). In this context it should be noted that different scientists are of radically different opinions as regards the physico-chemical preconditions of the origin of life. F. Crick, for example, considers the biochemical basis of the organization of life on the Earth unique. Unlike several other authors mentioned above he declares: «... the data available at present in biochemistry give evidence of the fact that the origin of life in a certain sense was a unique event. As a proof of such a statement serves the biochemical uniformity of all the living organisms, but we do not know whether such a homogeneity existed at the moment of their emergence» (Крик, 1975). M. Eigen, on the contrary, states in his theoretical works that at the

existence of certain physical conditions the origin and evolution of living systems are «in principle an inevitable process» of the self-organization of matter according to the selection principle (Эйген, Винклер, 1979). Here it seems the right place to put forward an idea by M. Eigen from his polemical foreword to the book of J. Monod «Chance and Necessity» in which he writes about the transition from chemical evolution to biological evolution: «Why is it just the transition from molecule to unicellular organism that we have to consider with higher respect than any other stage of evolution?»

Thus despite the discrepancies between the conceptions of the essence of life, the present-day natural scientific interpretations of evolution as of an observable part of the Universe as well as of life on the Earth do not exclude the theoretical assumption that the origin and evolution of life outside the Earth is a probable event. What will be the direction of such hypothetical evolution and what can (must) be its results? From the evolutionary-theoretical point of view three types of answers may be suggested.

First, the origin of life on the Earth and also the appearance of man are regarded as an absolute chance in the history of the Universe. Such an idea is contained in the views of J. Monod. The conception proposed by J. Monod is based on reducing all the properties of living systems to molecular invariants and absolutizing the role of chance in the evolutionary process. Due to the objective difficulties encountered at the explanation of the origin of the genetic code J. Monod suggests the only possible solution of all the problems a pure chance: «... as nothing except a chance, except an absolute and blind freedom can form the basis of the wonderful building of evolution» (Monod, 1973). So it follows from the logic of the concept proposed by J. Monod that the problem of extraterrestrial life does not contain any sense.

The second viewpoint is the following: any extraterrestrial biological evolution undergoes the principal stages analogous to those of terrestrial evolution and in some cases it may take to the appearance of man-like intellectual beings. A typical example of that kind of approach is the conception proposed by A. Lubishchev. Proceeding from the nomogenetic interpretation of biological form he confirms: «I think that at least types, may be also some classes can arise independently, and it is possible that on some remote planets there appear organisms which by our classification belong to protists, coelenterates, annelids, arthropods and even insects. When meeting an intellectual being on some other planet, man will surely distinguish him from a human being, but some features will be alike: he will have head on top of his body, it will contain a highly developed brain, a couple of eyes the structure of which will answer the principles of geometrical optics, he will have pairs of limbs, while forelimbs are applied as labour tools, not as the means of moving; it means that they will have fingers although their number and outer shape may be absolutely different from ours» (Любищев, 1966).

The conception of man as an inevitable result of evolution has been adopted as an absolute in the orthogenesis by P. Teilhard de Chardin. In accordance with that man is the highest predestinated-by-God purpose of the whole cosmic evolution (Teilhard de Chardin, 1955). Of such an opinion is also J. Eccles (1979), who, although supporting the conception of the evolving Universe, gives it a purely objective-idealistic interpretation. The so-to-speak «strong» modification of the anthropic principle has also been adopted by the prominent cosmologist J. Wheeler. According to this modification the structure and regularities of the evolution of the Universe are such that at its certain stage the appearance of man in the role of an «observer» is inevitable.

The third principal approach views the real evolution of life on the Earth as well as its hypothetical forms in the Universe as probable and unique processes. Principles serving as the methodological basis of the conception of the uniqueness of life within the framework of STE are the following. 1) The principle of potential multi-directedness of biological evolution (Шмальгаузен, 1946; Rensch, 1954; Simpson, 1953). That principle expresses the probabilistic character of organic evolution that in various cosmic conditions may be realized in different ways and may take to qualitatively different results (Dobzhansky, 1972; Сутт, 1977; Jacob, 1982; Волькенштейн, 1984; Erben, 1984). Providing that the preliminary conditions of biological evolution (it being the result of the preceding chemical evolution) are on some other planet analogous to those that existed on the Earth three milliard years ago, it is still hardly probable that during that very long period of time the outer environmental conditions on that other planet could change analogously to those on the Earth. But, as the directedness of evolution as adaptatiogenesis, besides the structure of evolving systems is also determined by the actual environmental conditions, it is rather improbable that organic evolution on other planets could take to the same results as on the Earth. In principle, such a possibility cannot be excluded, but its probability is, evidently, very low. T. Dobzhansky, referring to the improbability of the coincidence of the directions of evolution on different planets has written: «Imagine that there was a highly competent biologist living in Eocene times, could he have predicted that man would appear? Or else, suppose that by some utterly unlikely chance there is another planet somewhere, on which there arose animals and vertebrates and mammals like those which lived on earth during the Eocene period. Must manlike creatures develop also on this imaginary planet? I believe that the last two questions must be answered in the negative. Man has at least 100,000 genes, and perhaps half of them (or more) changed at least once since the Eocene. The probability is, to all intents and purposes, zero that the same 50,000 genes will change in the same ways and will be selected again in the same sequence as they were in man's evolutionary history» (Dobzhansky, 1972).

The treatments proposed above show that the probability of the origin of intellectual life of terrestrial type on some other planet is extremely low (Dobzhansky et al., 1977). Consequently, already the principle of the potential multidirectedness of evolution disproves the validity of the orthogenetic and nomogenetic interpretations of the possible forms of the evolution of extraterrestrial life.

2) The principle of the diversity of life (Mayr, 1976). It means that in addition to some fundamental structural restrictions («prohibitions»), which are caused by the carbon basis of life and affect all the levels of the organization of living systems, there are mechanisms that actually can produce enormous multiplicity of directions in biological evolution (Завадский, Сутт, 1973). As a proof of such a statement serves the fact that over a million biological species have been recorded in the biosphere of the Earth at the present moment. That principle of STE helps us to explain also the limitedness of biological forms and the role of preliminary conditions for the further directions of biological evolution.

On the ground of the stochastic character of biological evolution it may be concluded that in different cosmic conditions evolution cannot follow the same direction and take to the formation of man-like beings. Besides, we have not sufficient evidence to declare that in the course of organic evolution on the planet Earth the emergence of *Homo sapiens* was predetermined by chemical evolution. The idea of «the possible improbability of the origin of man» sets the anthropic principle into quite a different light. The non-stable Universe, although the only world in which

the origin and evolution of life are possible, does not surely predetermine the appearance of man. The potential possibility of the appearance of *Homo sapiens* on the cosmic arena is realized only in the process of biological evolution guided by natural selection.

Consequently, the modern evolutionary-theoretical conception does not support the idea of «strong» modification of the anthropic principle stating that at a certain stage of the evolution of the Universe man must come into being in the role of an «observer» (J. Wheeler).

From the methodological point of view it is incorrect to confront the anthropic principle with the «traditional scientific way of thought» (Девис, 1985) as well as to declare that certain limitations to the structure of the Universe are conditioned by the existence of man only (J. Barrow). Evaluating the present situation from the standpoint of a biologist-evolutionist we come to a diametrically opposite conclusion: the evolutionary and structural regularities of the Universe are such that man can (but need not surely) exist.

On the basis of the anthropic principle and the above-given principles of STE (potential multidirectedness of evolution and species diversity of life) a hypothesis can be put forward according to which the origin and evolution of life in the Universe are determined by universal laws. However, due to the probabilistic character of organic evolution its actual pathways and results (biological species) are always unique.

The interpretation of the anthropic principle proposed by us is one more argument in favour of the conception of the biological and cosmic uniqueness of man. It is important to emphasize that the anthropic principle does not allow us to draw a conclusion as if man were in a particular position in the Universe neither in the sense of divine predestination nor in the sense of the interpretation of the evolution of man as «vanguard» of the evolution of matter and the anthropic directedness of the evolution of the Universe. The anthropic principle only specifies as cosmological as well as biological limiting conditions of the origin of life and man as unique results of a probable evolutionary process.

The idea of the cosmic uniqueness of man makes some important philosophical and ethical problems very topical, closely connected with the ancient question of the essence of man, his place and meaning in the Universe.

Two «great revolutions» in the history of human thought — the Copernican and the Darwinian — are directly connected with radical re-estimation of the essence of man and his relations with nature, which resulted in a fundamental change in the natural scientific world picture.

Copernicus refuted the geocentric interpretation of the world and put forward a cosmological principle according to which the Earth is not in a privileged position in the Universe. G. Bruno stated even more radically: man is the settler of one of the most ordinary planets among many inhabited worlds. Thus, Copernicus and Bruno displaced man from the centre of cosmos to its borderlands, but Darwin demolished the myth of man as a divine creation and showed that in the biological sense man is one of the millions of species generated in the process of organic evolution. However, there is one essential difference between the world pictures by Copernicus and Darwin: in the first the world is considered to be static, homogeneous; in the second — dynamical, evolving.

At present we are the witnesses of the third «intellectual revolution». Its foundations were laid by K. Marx, who regarded man as a biosocial being, especially emphasizing the role of social relations in the nature of man.

In accordance with the principal positions of materialistic dialectics and contemporary natural science we live in the world whose stochastic

regularities of evolution are principally cognizable. The existing and even deepening contradiction between the social character of human activity and the laws of organic evolution form the objective content of the ecological crisis (Sutt, 1980). One of the inevitable preconditions of overcoming this contradiction is the reorganization of human activity in that way that it would correspond to the general structural and evolutionary laws of the biosphere. From that follows a very important ethical truth: mankind is responsible for the future of life on our planet.

The treatment of the relationship between man and nature in the «cosmic context» must, in our opinion, help us to better understand the circumstance that mankind has entered one of the most critical periods in its evolution. This insists on a complete abandoning of the hope of a wonder, including the one expected of mythical extraterrestrial civilizations.

The future of life and man on the Earth depends only on man himself. The overcoming of the contradiction between the character of human activity and the laws of organic evolution, the averting of the nuclear catastrophe and the realizing of the socialist unitarity of mankind are the means of guaranteeing the preservation of the biosphere of the Earth not only as a living environment for man, but also as a unique phenomenon in the Universe. The achieving of this ambition should be considered the utmost duty of man.

Acknowledgements. I am greatly indebted to many colleagues for the innumerable fruitful discussions in the long run of years that contributed much to the formation of the conception put forward in the present paper. With special gratitude I remember Prof. K. Zavadsky (1910—1977) and Academician K. Paaver (1921—1985).

My thanks are also due to M. Roos for the careful translation of the text into English.

REFERENCES

Carr, B. R., Rees, M. J. The anthropic principle and the structure of the physical world. — Nature, 1979, **278**, N 5705, 605—612.

Dicke, R. H. Dirac's cosmology and Mach's principle. — Nature, 1961, **192**, N 4801, 440—441.

Dobzhansky, T. Darwinian evolution and the problem of extraterrestrial life. — Perspect. Biol. Med., 1972, **15**, N 2, 157—175.

Dobzhansky, T., Ayala, F., Stebbins, G., Valentine, J. Evolution. San Francisco, 1977.

Eccles, J. C. The Human Mystery. Berlin—Heidelberg—New York, 1979.

Erben, H. K. Intelligenzen im Kosmos? Die Antwort der Evolutionsbiologie. München—Zürich, 1984.

Gale, G. The anthropic principle. — Sci. Amer., 1981, N 6, 114—122.

Jacob, F. The Possible and the Actual. New York, 1982.

Mayr, E. Evolution and the Diversity of Life. Cambridge, Mass.—London, 1976.

Monod, J. Zufall und Notwendigkeit. München—Zürich, 1973, 141.

Paaver, K. In: Eesti Loodus, 1985, N 5, 328—330.

Ponnamperuma, C. Organic compounds in the Murchison meteorite. — Ann. N. Y. Acad. Sci., 1972, **194**, 56—70.

Rensch, B. Neuere Probleme der Abstammungslehre. Stuttgart, 1954.

Riedl, R. Evolution und Erkenntnis. München—Zürich, 1982.

Simpson, G. G. The Major Features of Evolution. New York, 1953.

Sutt, T. Inimene ja evolutsioon. — Eesti Loodus, 1980, N 3—4, 130—135, 220—225.

Teilhard de Chardin, P. Le phénomène humain. Paris, 1955.

Wolsky, M. Reflections on the «Anthropic Principle». Manhattanville, 1982, 10—13.

Wuketits, F. M. Evolution, Erkenntnis, Ethik. Darmstadt, 1954.

Волхонский А. Г. О формальной структуре генетического кода. — Цитология и генетика, 1972, № 6, 487—494.

Волькенштейн М. В. Сущность биологической эволюции. — Усп. физ. наук, 1984, **143**, вып. 3, 429—466.

Завадский К. М., Сутт Т. Я. К вопросу о природе ограничений эволюционного процесса. — В кн.: История и теория эволюционного учения, вып. 1. Л., 1973, 42—47.

Девис П. Случайная Вселенная. М., 1985.
Идлис Г. М. Основные черты наблюдаемой астрономической Вселенной как характерные свойства обитаемой космической системы. — Изв. Астрофиз. инст. АН КазССР, 1958, № 7, 39—54.
Кальвин М. Химическая эволюция. М., 1971.
Камшилов М. М. Эволюция биосферы. М., 1974.
Картер Б. Совпадения больших чисел и антропологический принцип в космологии. — В кн.: Космология. Теория и наблюдения. М., 1978, 369—380.
Кеньон Д., Стейнман Г. Биохимическое предопределение. М., 1972.
Крик Ф. В кн.: Проблема CETI (связь с внеземными цивилизациями). М., 1975, 61.
Любищев А. А. Систематика и эволюция. — В кн.: Внутривидовая изменчивость наземных позвоночных и микроэволюция. Свердловск, 1966, 45—57.
Морозов Л. Л., Кузьмин В. В., Гольданский В. И. Попытка оценки космологических условий возникновения жизни. — ДАН СССР, 1984, 275, № 1, 198—201.
Морозов Л. Л. Поможет ли физика понять как возникла жизнь? — Природа, 1984, № 12, 38—48.
Марочник Л. С., Мухин Л. М. Галактический «пояс жизни». — Природа, 1983, № 11, 52—57.
Новиков И., Полнарев А., Розенталь И. Численные значения фундаментальных постоянных и антропный принцип. — Изв. АН ЭССР. Физ. Матем., 1982, 31, № 3, 284—289.
Опарин А. И. Материя — жизнь — интеллект. М., 1977, 201.
Сутт Т. Я. Проблема направленности органической эволюции. Таллин, 1977.
Сутт Т. Проблема уникальности жизни и человека в свете современного дарвинизма. — В кн.: Вопросы современного дарвинизма. Тарту, 1983, 174—188.
Тимофеев-Ресовский Н. В., Воронцов Н. Н., Яблоков А. В. Краткий очерк теории эволюции. М., 1969.
Турсунов А. Познание эволюционных процессов во Вселенной. М., 1983.
Уолд Дж. Почему живое существо базируется на элементах второго и третьего периодов периодической системы? Почему фосфор и сера способны к образованию макроэргических связей? — В кн.: Горизонты биохимии. М., 1964, 102—113.
Шмальгаузен И. И. Проблемы дарвинизма. М., 1946.
Эйген М., Винклер Р. Игра жизни. М., 1979.

Academy of Sciences of the Estonian SSR,
Institute of Zoology and Botany

Received
Jan. 7, 1986

Toomas SUTT

ANTROOPSUSPRINTSIIP JA SÜNTEETILINE EVOLUTSIOONITEOORIA

Elussüsteemide invariantide (valgud ja nukleiinhapped kui materiaalne substraat; konvariantne reduplikatsioon; looduslik valik; bioloogilise liigi unikaalsus) ja antroopsusprintsiibi analüüsi alusel esitatakse hüpotees, mille järgi elu teke Universumis allub universaalsetele seaduspärasustele. Evolutsiooniprotsessi stohhastilisest olemusest tingituna on selle konkreetsed suunad ja tulemused (bioloogilised liigid) alati unikaalsed.

Nimetatud hüpoteesi põhjal antakse antroopsusprintsiibi järgmine tõlgendus: kuigi mittestatsionaarne (evolutsioneeruv) Universum on ainuvõimalik maailm elu tekkeks ja evolutsiooniks, ei ole inimese ilmumine kosmilisele areenile predetermineeritud. Inimese teke on tõenäosuslik ja unikaalne sündmus, mille võimalikkus realiseerub bioloogilise evolutsiooni käigus loodusliku valiku kaudu.

Тоомас СУТТ

ПРИНЦИП АНТРОПНОСТИ И СИНТЕТИЧЕСКАЯ ТЕОРИЯ ЭВОЛЮЦИИ

На основе анализа инвариантов биосистем (белки и нуклеиновые кислоты как материальный субстрат, конвариантная редупликация, естественный отбор, уникальность биологического вида) и принципа антропности выдвигается гипотеза, согласно которой возникновение жизни во Вселенной детерминируется универсальными закономерностями. Однако, ввиду стохастического характера процесса эволюции, ее конкретные пути (потенциальная многонаправленность) и результаты (биологические виды) всегда уникальны.

На основе представленной нами гипотезы дается следующая интерпретация принципа антропности: нестационарная (эволюционирующая) Вселенная хотя и является единственным миром, в котором возможны возникновение и эволюция жизни, не обязательно предполагает появление человека. Потенциальная возможность появления человека на космической арене реализуется лишь через естественный отбор в ходе биологической эволюции.