

ANTHROPIC PRINCIPLE—a way of reasoning whereby one tries to draw conclusions concerning the global properties of the universe from the evident fact of man’s existence in the universe and of any form of life in general. If life exists in the form of intelligent thinking being on at least one planet in the universe, then conditions favorable to the appearance and development of life must exist.

The term “anthropic principle” was first officially introduced into scientific language by the cosmologist B. Carter while he was in Kraków in 1973 on the occasion of the 500th anniversary of the Copernicus’ birth at the International Symposium of the Astronomical Union. What he called the anthropic principle is a general cognitive attitude toward the universe that starts from certain knowledge about the observers who exist in it. Despite what the word “principle” suggests, it is not a fundamental law of physics or biology like principles of behavior, but a set of concepts according to which not only is man adapted to the universe, but the universe is adapted or suited to man.

In its basic formulations this principle appeals to contemporary scientific knowledge and is treated as a directive of an epistemological character. The anthropic principle provides a deeper understanding of various connections between the organic world and the inorganic world. It provides a new insight into the chain of universal properties required for the existence and development of life. It makes us aware of the fact that biological evolution is heavily dependent upon the large-scale structure of the universe and is profoundly intertwined in global changes in the universe. What we observe around us is not some arbitrary state of affairs but a state of affairs in harmony with our presence as observers. The anthropic principle is also a cognitively valid tool for explaining those properties and behaviors of the universe that elude the causal explanations universally applied in the natural sciences. The fact of life imposes, at least in a cognitive sense, clear restrictions on the values of the physical constants and cosmological constants responsible for the properties of the universe being such as they are and not otherwise. Man’s appearance in the universe required a precise tuning of physical constants and laws of nature over the whole history of the universe, from the “big bang” to the present. Despite the obvious local character of life, the anthropic principle teaches that life is clearly related to the universe as a whole and has become a significant fact on the scale of the whole universe.

The term “anthropic” sounds very close to other terms such as “anthropocentric” and “anthropomorphic” and so to avoid undesired associations some authors have proposed calling the anthropic principle “the principle of self-selection”, “psychocentricity”, or “knowability”, but these terms have not been widely accepted. The term “anthropic principle” has been generally accepted for use in cosmology; and at least in a certain sense in philosophy.

THE FUNDAMENTAL FORMULATIONS OF THE ANTHROPIC PRINCIPLE. Depending on the character and kinds of connections of biological life with the properties of the universe as a whole, authors have proposed different formulations of the anthropic principle. Carter has proposed the so-called weak and strong versions of the anthropic principle. J. A. Wheeler has proposed the so-called participative principle. F. J. Wheeler has proposed the final principle.

The Weak Anthropic Principle. The best known formulations of the weak anthropic principle were provided by: (a) B. Carter: “we are not saying that the universe would not exist if we didn’t exist. We are saying that since we are and we can make abstractions, then the universe

must be such as it is.”; (b) J. Barrow: “The observed values of physical magnitudes that change in time are not arbitrary but take the values of $V(x,t)$, designated by the spatial condition such that $(x \in L)$, where L designates a set of places in which life can develop, and by the condition limiting the time t to the period of the biological and cosmological evolution of living organisms and the environment that sustains life”; (c) J. Barrow and F. Tipler: “the observed values of all physical and cosmological magnitudes are not equally probable, but are indicated by the properties of the universe due to which carbon-based life can evolve, and the universe is sufficiently old for such evolution to have taken place”

The common feature of all these formulations is that they state that the properties of the universe that *a priori* appear to be surprisingly improbable can be understood only from the point of view of the presence of conscious observers in the universe. The weak version of the anthropic principle states nothing beyond that which is provided by data of observation. The data shows that there are certain subtle adjustments in the universe without which life could not have arisen or developed at all. These adjustments appear mainly as conditions necessary for life to come into existence. Consequently the weak version of the anthropic principle does not explain the absolute numerical values, physical constants, and their combinations, nor does it provide any original predictions on the global evolution or local structures of the universe.

For this reason it may be accused of tautology and of not providing anything of significant value to our knowledge of the universe. Nevertheless most scholars grant it an important role in revealing the wide range of connections and mutual conditionings that exist in nature, especially those that allow us, among other things, to include biological evolution among the general transformations of the whole universe. They also grant it an important role in explaining the properties of the universe and the processes in it, although this kind of explanation clearly departs from the causal explanation generally accepted in the natural sciences.

The Strong Anthropic Principle. The most often cited formulations of the strong anthropic principle are provided by: (a) Carter: “the universe (and so also the fundamental physical parameters that characterize it) must be such for man-observer to appear at a certain stage of its development”; (b) Barrow and Tipler: “the universe must possess properties that allow life to appear at some stage of its history”.

Unlike the weak version of the anthropic principle, the strong version states that the perceived connections between the fact of life’s existence, and the values of the fundamental physical constants and cosmological parameters have the character of necessary, causal, and teleological connections. This means that the end or goal of the universe’s existence and development is to produce life and to create an intelligent observer. The universe is knowable and at the same time it operates teleologically, and man is only one of the manifestations of the consciousness of the universe.

We cannot demonstrate such properties of the universe on the basis of the findings of the natural sciences. For this reason the strong anthropic principle ceases to be a statement of natural science and takes an explicitly philosophical character. The principle thus takes on an explicitly metaphysical character and its value as knowledge depends upon the cognitive value of its underlying philosophical determinations.

Participative Anthropic Principle. This was first formulated by the American physicist and

cosmologist J. A. Wheeler in the 1970's. He derived the theory by connecting anthropic ideas with interpretations of quantum mechanics. The best known formulation of this principle has the following form: "Observers are necessary to bring the universe into existence". As we can see, this principle goes further yet than the strong version when it ascribes to the observer the function of bringing the universe from a state of potentiality in some sense to actual existence. Man ceases to be a passive observer of physical phenomena on a global scale and becomes an active participant in them and becomes responsible for the actualization of the whole universe.

Because of such radical statements this principle was criticized as unscientific, highly speculative, and as leading ultimately to radical ontological and epistemological conclusions. Elements of Berkeleyan sensualism and German idealism are especially evident in it.

Final Anthropic Principle. This is in general the most radical formulation of the anthropic principle. It states that "the rational transformation of information must appear in the universe, and since it has appeared in the universe, it must endure forever." It was proposed by F. J. Barrow and J. D. Tipler and developed within the so-called theory of the omega point. Its authors reduce biological life, including conscious human life, to an extremely complex transformation of information, and they appeal to natural science and try to demonstrate the possibility of the continuous and unending duration of life in the universe. The actual expression of this unlimited duration of life is the existence of a so-called final observer whose task is the ultimate and full actualization of the possibilities of the universe. This observer, whom Teilhard de Chardin called the "omega point", is the final end of all cosmic evolution, including life, mainly in the form of consciousness, and it gains control over all the matter of the universe. The authors do not identify the omega point with God, as did Teilhard de Chardin, but treat it in purely naturalistic terms. It fully belongs to the universe and is at the same time the ultimate organizer of the history of the universe.

The authors want to give the final anthropic principle an explicitly scientific character and appeal to the latest achievements of physics, astronomy, and cosmology. A detailed analysis of their arguments, however, reveals the deeply speculative character of the principle. Not only does it lack any deeper scientific roots but also implies very radical philosophical positions.

THE COGNITIVE VALUE OF THE ANTHROPIC PRINCIPLE. The presented formulations of the anthropic principle show that although certain versions evoke serious reservations, the idea itself of linking the structure and evolution of the universe with the existence of life in the universe is reasonable. In keeping with physical and biochemical laws, life requires strictly defined conditions to exist and develop. Thus life cannot appear in an arbitrary universe that was not prepared to receive life. Natural scientists, philosophers, and theologians who have considered this fact have recognized the cognitive value of the anthropic principle. Natural scientists see the possibility of explaining with this principle many subtle coincidences in physics and cosmology, and many cosmological problems that the so-called standard model cannot handle. Philosophers and theologians in the light of this principle have considered the interesting problematics of philosophy and world-view.

In this context it is certainly necessary to evaluate the cognitive value of the anthropic principle. The principle is used in the so-called anthropic explanation which departs markedly from the explanation in terms of cause and effect that is universally accepted in the natural sciences. This explanation runs in the opposite direction from inference. A certain state of the

universe, and no other state, is explained by the presence of life in the universe. In the cause-effect schema of explanation that is universally applied in scientific practice, life is the result of properties of the universe favorable to life and these properties explain life. Despite many reservations to the anthropic schema of explanation, most scholars recognize that it has a certain value as knowledge, but they regard this as dependent upon the truth of the theses it proclaims. In the case of the weak anthropic principle, the explanation has value in terms of natural science, as do all the consequences of the fact. The strong versions of the principle, however, are philosophical in content to a greater or lesser degree and therefore the cognitive value of explanations based on these principles depends upon how well their contents are demonstrated. In most cases they are very radical philosophical theses and are based on ontological arguments. For this reason an anthropic explanation that appeals to different versions of the strong anthropic principle meets with serious reservations and does not enjoy wide acceptance among scholars.

B. Carter, *Large Numbers Coincidences and Anthropic Principle in Cosmology*, in: *Confrontation of Cosmological Theories with Observational Data*, Dor 1974, 291–298; J. A. Wheeler, *Genesis of Observership*, in: *Foundational Problems in the Special Sciences*, Dor 1977, 3–33; B. J. Carr, M. J. Rees, *The Anthropic Principle and the Structure of the Physical World*, *Nature* 278 (1979), 605–612; J. Demaret, *Barbier Ch., Le principe anthropique en cosmologie*, *Revue des Questions Scientifiques* 152 (1981) n. 2, 181–222, n. 4, 461–509; B. J. Carr, *The Anthropic Principle*, *Acta Cosmologica* 11 (1982), 143–151; J. D. Barrow, *Anthropic Definitions*, *Quarterly Journal of the Royal Astronomical Society* 24 (1983), 146–153; B. Carter, *The Anthropic Principle and its Implications for Biological Evolution*, *Philosophical Transactions of the Royal Society* 24 (1983), 443–447; W. Skoczny, *Główne warianty zasady antropicznej* [Main variations of the anthropic principle], *Zagadnienia Filozoficzne w Nauce* [Philosophical Questions in Science] 7 (1985), 21–27; J. D. Barrow, F. J. Tipler, *The Anthropic Cosmological Principle*, Ox 1986, 1988; P. C. W. Davies, *Zasada antropiczna* [Anthropic Principle], *Postępy Fizyki* [Advances in Physics] 37 (1986) n. 3, 213–258; I. Hacking, *The Inverse Gambler's Fallacy: the Argument from Design. The Anthropic Principle Applied to Wheeler Universe*, *Mind* 96 (1987), 331–340; J. Życiński, *The Anthropic Principle and Teleological Interpretations of Nature*, *RMet* 41 (1987), 317–333; W. Skoczny, *Filozoficzne aspekty zasady antropicznej* [Philosophical aspects of the anthropic principle], *Częstochowskie Studia Teologiczne (Częstochowa Theological Studies)* 15–16 (1987–1988), 259–273; F. W. Halberg, *Barrow and Tipler's Anthropic Cosmological Principle*, *Zygon* 23 (1988) n. 2, 139–157; B. Rok, *O interpretacji zasady antropicznej w kosmologii* [On the interpretation of the anthropic principle in cosmology], *SF* 2 (1988), 67–80; B. Carter, *The Anthropic Principle: Self-selection as an Adjunct to Natural Selection in Cosmic Perspectives*, in: *Cosmic Perspectives: Essays Dedicated to the Memory of M. K. V. Bappu*, C 1989, 185–206; J. Leslie, *Universes*, Lo 1989; *Physical Cosmology and Philosophy*, NY 1989; F. J. Tipler, *The Omega Point as Eschaton: Answers to Pannenberg's Questions for Scientists*, *Zygon* 24 (1989), 217–253; J. Życiński, *Zasada antropiczna a kierunek ewolucji* [Anthropic principle and direction of evolution], *SF* 2–3 (1990), 291–302; P. A. Wilson, *What is the Explanation of the Anthropic Principle?*, *American Philosophical Quarterly* 28 (1991) n. 2, 167–173; *The Anthropic Principle*, C 1993; Y. V. Balashov, *Philosophical Roots of the Anthropic Principle*, *Theoria et Historia Scientiarum* 3 (1993), 23–30; R. J. Deltete, *What Does the Anthropic Principle Explain?*, *Perspectives in Science* 1 (1993), n. 2, 285–305.

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