A New Look at the Anthropic Principle:

A Critical Study of Errol E. Harris's *Cosmos and Anthropos A Philosophical Interpretation of the Anthropic Cosmological Principle*

Marie I. George and Warren Murray

The Anthropic Cosmological Principle arose as a response to the question: Why is the universe the way it is? That is, why does it have the age, the size, the composition and the laws that it has? To this somewhat strange question philosophers have been attempting answers since antiquity, although the terms in which the question has been asked, and the kind of answers sought, have varied. Recent interest arises from the ever-more apparent realization that the existence of human beings endowed with consciousness and able to ask such seemingly senseless questions requires certain conditions of life: more specifically, the sort of habitat that is actually found on the planet earth. The constitution of such a planet depends on the processes of development which brought it about, and these in turn depend on the particular manner in which the universe developed. Finally, this latter depends upon the initial relations between the basic forces of nature. As Errol E. Harris sums it up:

> The currently accepted theory of the universe is that it began some eighteen thousand million years ago with a vast explosion. Its present age, size, and rate of expansion all depend upon the relation between the forces of gravity and of the initial propulsive outburst. Had the latter been weaker (Paul Davies tells us), the cosmos would rapidly have fallen back upon itself and contracted to a point. Had it been stronger, the cosmic matter would have dispersed at such speed that galaxies could not have formed. A difference of one part in 10^{60} would have been sufficient to bring about either of these two results . . . In short, the present structure of the universe is perhaps the ultimate example of sensitivity to initial conditions. (*Cosmos and Anthropos*, 48).

Thus, if the most recent cosmological theories are to be given credence, the universe could not be any younger or smaller, and the constants of nature responsible for this size and age would have to have certain determinate values, otherwise a planet inhabited by intelligent observers could not exist. If true, and put into categorical form, this becomes simply a statement of fact, and is what goes by the name of the Weak Anthropic Principle (WAP).

Another possible meaningful response to the above question, however, lies in there being a teleological relation between the appearance of intelligent life on the planet and the constitution of the universe. And this is what is suggested by the other versions of the anthropic principle (AP).

J.D. Barrow and F.J. Tippler's book, *The Anthropic Cosmological Principle* (Oxford University Press, Oxford, 1986) did much to synthesize the arguments for, and to create a more general interest in APs. The work presents an impressive amount of scientific evidence indicating that the appearance of human life required amazingly precise rela-

tionships between various physical factors. It also outlines a variety of other APs of a teleological character. One is reluctant to dismiss the evidence presented as ultimately failing to support any significant anthropic conclusion, yet the work leaves the reader of a philosophical bent with feelings of malaise: the principle in its so-called weak form seems to be no principle at all, only a truism, and the 'final' version has all the trappings of science fiction.

Cosmos and Anthropos, by the well-known philosopher of science Errol E. Harris[2], brought hopes of making sense out of the APs. A major problem with previous formulations of APs is their ambiguity, and thus Harris undertakes a much needed task in trying to define the pertinent notions. His stance is that in spite of shortcomings in previous formulations, the principle can be stated in a defendable form.

In the opening chapter Harris critiques the various versions of the anthropic principles enunciated by Barrow & Tippler, after defining them thus:

> The Weak Anthropic Principle (WAP): 'The observed values of all physical and cosmological quantities are not equally probable but they take on values restricted by the requirement that there exist sites where carbon-based life can evolve and the requirement that the Universe be old enough for it to have already done so.'(1)

> The Strong Anthropic Principle (SAP) 'The Universe must have those properties which allow life to develop within it at some state in its history.'(1-2)

Harris points out that both the WAP and one interpretation of the Strong Anthropic Principle do no more than assert that the present state of the universe cannot be accounted for by just any mathematical relations between physical quantities, but that whatever physical laws are discovered must be compatible with the development of life and intelligence, because we are here. In other words, an explanation must be consistent with the facts.

He proceeds next to expose the obvious flaw in the Participatory Anthropic Principle ("Observers are necessary to bring the Universe into being"), by pointing out that the development of the universe is necessary to bringing observers into being, and therefore it cannot depend on them (7).

As to the Final Anthropic Principle (FAP), ("Intelligent information-processing must come into existence in the Universe and, once it comes into existence, it will never die out"), Harris presents evidence supporting the view that we may well be the only intelligent life in the universe, the opposite view being based more on imagination than on fact. He then goes on to demolish the FAP further by evincing the possibility that just as we humans can become extinct, even at our own hands, so too could any other intelligent life form.

The Many-worlds interpretation of the SAP fares no better, in as much as it needlessly posits entities, the existence of which one cannot verify.[3]

Harris's critique, however, suffers from two serious shortcomings: the first is his unqualified acceptance of the AP as a heuristic principle. He gives but one example of such a use:

> [A given quantity of carbon] is available in the world, so there must be an energy level in the overtones of the carbon nucleus that resonates with beryllium. Fred Hoyle, arguing in this anthropic fashion, sought, and . . . found the missing resonance. (153)

Now this line of reasoning has nothing particularly anthropic about it. It illustrates a general principle of method that if something (anything) exists, it must be possible for it to exist. And thus if we do not initially see how it is possible, then clearly we must pursue our research until we do. This principle has nothing *specific* to do with us. Human existence in the world is one fact among many others to be explained.

The second shortcoming in Harris's critique is that he fails to point out that in most of its forms the AP is not a principle, but a conclusion. This is all the more surprising in that he himself recognizes this in arguing against the PAP, as was mentioned above.

The remainder of the book is devoted principally to elaborating his own AP, which he calls the teleological anthropic principle (TAP):

> There exists one, and only one, possible Universe *designed*[4] with the goal of generating and sustaining intelligent observers. (28)

Harris prefaces his presentation of this principle by pointing out that:

> . . . the latest advances in particle physics, approaching a unified field theory, have persuaded physicists of the undisseverable wholeness of the physical universe. Human and all other life is included in this whole in ways that make it intimately dependent on the fundamental physical constants of nature . . . It is this discovery of the unit of the universe, on which physicists now are becoming insistent...that is the really important feature of the principle's recognition. (15)

His interpretation of the world-view furnished by classical physics is quite accurate: a universe envisaged as a mere collection of diverse objects, having no intrinsic connection among them, independent mass points, moved by various forces and entering into chance collisions with one another. Such a vision of the universe made of it a heap, and not a 'cosmos'. It consequently took away the unique position which human beings occupied in the universe: not, of course, the physical one, which is inconsequential, but that which was accorded to them by the idea that the universe exists for their production and their conservation, and to be mastered and governed by them. Recognition of the inadequacy of this description of the universe was necessary, if questions concerning any ordering of the universe to the production of intelligent life were once again to be taken seriously. Modern science has brought a return to a holistic world view in which the parts of the universe are conceived of as interdependent.[5] Life becomes an attribute which the universe

itself gradually acquires, rather than being a phenomenon simply unfolding within the universe. The physical environment enters in some way into the very being of each individual and each species, and is not simply something which impinges upon them from the outside, as was thought to be the case before.

Having thus delineated the difference between the old view and the new emerging one, Harris proceeds to two things: he first examines the nature of wholeness (ch.2), and then the grounds for the physicists' new-found conviction of the unity of the universe (ch.3). It is in the philosophical discussion concerning the nature of wholes that is to be found the book's principal flaw, as we shall see:

> To say that anything is a whole is to imply that it is not a mere congeries of disconnected and separable items, nor even just a loose collection. It also implies that it is a unity of coherent parts. (17)

> Every whole is a system...every system is a whole, structured in accordance with a universal principle of order. (22)

From there Harris goes on to maintain that:

> . . . wholeness, by its very nature, involves dynamic and dialectical self-specification, by way of self-enfoldment (with consequent overlap of specific forms). It tends towards intensification of centreity, increasing self-sufficient and widening comprehension, and culminates as an all-embracing awareness of an all-encompassing world. (26)

And finally claims to have established,

> that the design of a systematic whole involves a dynamic principle of order that, by its very nature, tends towards completion of the whole, in and as an intelligent self-awareness. (28)

In other words, Harris contends that any universe must be a whole, for the entirety of any bunch of things that exist - no matter how separate in time, place, causality - constitutes a universe (cf. 11). Since he further adheres to the view that a whole must be complete, both in principle and in fact (cf. 146), and cannot be so unless it is self-aware (cf. 100), he concludes that the universe must necessarily develop self-awareness.

This same argument, repeated again and again throughout the book, suffers from two principal vices: the first is the failure to recognize the many related but distinct meanings of 'whole'. The only kind of whole which Harris acknowledges is the organic whole, characterized by an intrinsic organizing principle relating parts to one another and to the whole. Yet there exist other kinds of wholes which are not of this sort. Even a bundle of sticks (to use Harris's own example of a loose collection) is a whole, though not an organic one, as no one stick bears any relation to any other aside from their being held in contact by an extrinsic principle, the cord binding them together.[6] Harris is clearly ill at ease with

such examples, and insists that nothing less than an "interlock between parts that are systematically interrelated" (17), or an "ordered system" (33) is a genuine whole. Yet this is not the way we use the word, and Harris knows this, as his efforts to avoid a broader definition show only too well: a whole is simply anything that has all the parts that it should have to be fully what it is. Some wholes have this unity of parts from an intrinsic principle of order (as have organisms), and others only from some extrinsic principle (as have bundles, or things in containers). Of those wholes that are intrinsically ordered, some are so by reason of a quantitative principle (such as mathematical numbers and figures), and others by reason of some relation to a common goal or to common activities (such as a sports team). One simply cannot assume that the universe is one or the other of these wholes without first looking to see what evidence will support the claim one is making.

A further aspect of this problem is Harris's claim that disorder is parasitical on order (34). Now however true this may be in some sense, he has not substantiated the claim. Can it be inferred from science? This road might seem at first sight the most promising, but the fact that scientists investigate the universe and seek out its laws on the supposition that order is to be found there, does not prove that such order is ontological rather than purely methodological, nor, a fortiori, that any disorder is parasitical on it. Nor does the great success of science in discovering order and of reducing disorder to order constitute an absolute proof, and that for many reasons, one of which is simply that science is by definition ordered knowledge, and thus whatever is chaotic and disordered in experience must either be reduced to order or excluded from science. Even the new science of chaos, cited by Harris himself in defence of his thesis, bears this out: first, it makes us aware that scientists have been too readily disposed to ignore phenomena that do not lend themselves to orderly investigation, and this exclusion gives the impression of a universe much more neatly ordered than direct experience will allow. Second, it shows that science must always try to go beyond whatever radical disorder may exist, to find some underlying order. Such order may *appear* to the scientists to have ontological priority, but the problem is his methodological bias. Even the recognition of radically disordered (chaotic) phenomena, if such recognition were possible within the framework of science, would still leave intact the further ontological question of the dependence of this disorder on order. The only road open, finally, is that of an in-depth study of order and disorder from a solidly philosophical perspective. This Harris has not given us.

Thus we cannot simply conclude to the primacy of that organic kind of order which Harris is proposing from the fact that the universe is a whole, for the perfection of the universe as a whole may be only that of a quantitative fullness, such as possessed by a whole container of anything, as opposed to a partly empty one; it need not be the perfection of mutually interacting parts ordered in an organic way to the whole.

Harris is correct in thinking that the universe of classical physics was not a cosmos, but only a heap. What he has perhaps not seen so clearly is another fundamental problem with that universe, which was to explain how bodies which had no intrinsic relation to one another could interact. This was especially evident for action at a distance. Newton admitted to having no explanation of this causality, whose mathematical expression alone concerned him. Even positing a common kind of matter did not seem sufficient to explain action by contact, much less that at a distance, and it was this problem which pushed

Malebranche into occasionalism, and Leibniz into the theory of monads and of pre-established harmony. The bodies in such a universe should have been essentially independent of one another, but experience showed they were not. All of the commonly shared characteristics, whether physical, spatial, temporal or mathematical, call for some causal explanation, but the radical ontological independence of each mass point did not readily allow for any natural relation between the entities that compose the universe, and thus their interaction had to be explained from the outside.

Events in one part of such a universe should have had no relation to those in another part, however close, no more than events in novels written by different authors could be expected to have any relationship to one another. At least in novels by different authors there might well be certain things in common, such as there being written in the same language, being inspired by similar experiences and similar places, presupposing certain characteristics of people in the real world known to both authors, etc. These common features would not be due to the creative causalities of the individual authors, but would be rather the result of a higher level of reality and of causality presupposed to the writing of the novels. Thus not having the characters interact would be the result of the independence of the two authors as causes, whereas any interaction between the characters would have to suppose communication between the authors. Might not things in the universe share some things in common in a similar way, while being at other levels quite separate? This possibility Harris does not consider. If this common causality were not there, then how could things interact at all? Two morsels of independent matter floating through "space" could no more collide with one another, then Odysseus's ship could run into Moby Dick. The universe, then, must possess at a minimum a unity of material constituents, interacting according to some orderly causality.

A closer look at Harris's argument for the unity of the universe reveals that as a result of unduly restricting the meaning of 'whole', he unwittingly falls into equivocation, as can be clearly seen in the explication of the two syllogisms his argument implies: first syllogism: the universe is a whole; a whole is something complete; therefore the universe is complete. Second syllogism: Nothing is complete if it lacks intelligence; the universe must be complete; therefore the universe must develop intelligence. The first syllogism is materially correct, if the terms are properly understood. The second syllogism is doubly defective: first, in maintaining that completeness requires intelligence (the major term); second, in substituting 'develop' for 'have' in the conclusion. Either the universe is or is not a whole. If it is, it is by defintion complete and need not develop intelligence. If it is not, no reason has been given to show why it need develop intelligence. The equivocation lies in equating 'complete' with 'perfect', and then assigning only one possible meaning to 'perfect'. A plant lacks intelligence, and thus is less absolutely perfect than a human being. Still, it may be complete, (and therefore 'perfect' in its own way) if it has all those parts appropriate to it as a particular kind of plant. Harris is saying that the universe must be complete, since it is some sort of whole. For the same reason, even a universe devoid of intelligent life must be complete, for it too is some sort of whole. Yet he insists that a universe devoid of intelligent life is incomplete, meaning less perfect than a universe containing such life. Plainly 'complete' does not mean the same thing in each statement. And thus the conclusion drawn, namely that the universe must develop intelligence, does not follow.

The second major problem in Harris's basic argument lies in the assertion that the universe brings itself to consciousness. A thing acts insofar as it is in act, not insofar as it is in potency. The sort of universe Harris postulates throughout the book pulls itself up by its own bootstraps.

With such an unsound key argument, one might well wonder what further interest the book could have. Harris redeems himself to some large extent, however, in those susbsequent sections devoted to manifesting the unity of the physical universe, in part by tracing and explaining the complexification which has taken place in its evolution. While the various levels of complexification are always regarded by Harris as degrees of the universe's necessary self-realization, the attempt to identify and define these levels, and to criticize the inadequate explanations furnished for them, are not in every case colored by this viewpoint.

Harris begins by presenting the account of the production of the chemical elements proposed by the most recent scientific theories. He points out that complexification in the inanimate realm is not only a development from beings with fewer parts to those with more, but involves as well an increase in the intricacy of their structure: The more numerous parts of more complex things are not simply added on; they are arranged into patterns or determinate structures, the lattices of crystals being a case in point.

He then goes on to show how living things depend upon the inanimate physical universe. Convincing evidence is cited to support the contention that determinate characteristics of the physical universe are indispensable for the existence and support of life. For example:

> There is . . . a precise match between the temperature of the sun, determining the colour of its light, and the ability of chlorophyl to absorb it, without which there would be no photosynthesis, so completely indispensable to the existence of life and so necessary to the atmospheric balance of oxygen and carbon dioxide essential to life's support. (57)

A considerable amount of scientific evidence in the same vein leads Harris to conclude that:

> It is not just one or two notable coincidences disclosed among the scientific facts we have been reviewing that should excite our interest, but the ubiquitous convergence of conditions towards what is beneficient to the propagation and support of life. The unity of the physical world seems, as it were, to focus itself in this convergence, as if it were the implication of its intrinsic order from the start. The minutest divergence from the initial disposition of forces would have rendered the whole concatenation impossible. (59)

He goes on to add an additional nuance to this conclusion:

> "*[I]f there is only one primary equation from which all physical forces can be deducted* . . . then the delicate equilibria and the precise concurrence of factors that precondition the emergence of life must have been implicit from the beginning." (60, emphasis ours)

When he says that the emergence of life "must have been implicit from the beginning," by "must" he does not simply mean that as a matter of fact the universe must have allowed for the development of life, given that life is here. He means that the universe could not have been other than such as to have developed life. He repeatedly suggests that there is only one possible universe, and that this is the consequence of there being only one primary equation (51, 98, 155 etc). It is hard to understand the reason for insistence on these points. If several primary equations compatible with the appearance of life were possible, would the emergence of life have been any less implicit from the beginning? Why all these contortions simply to eliminate any element of contingency, unless it is because he senses that his basic argument about the wholeness of the universe is faulty?

Harris is aware of the possibility of holding that the initial conditions, although such as to allow for the development of conscious life, might not necessitate the eventual appearance of such observers (cf. 9, 10). In other words, this development of intelligent life may have been a matter of chance, rather than necessity. He never really faces this position head-on, nor does he adequately support his claim that there is only one possible universe, and this closes off to him interesting areas of investigation.

A large part of the wonderment underlying anthropic principles is the amazing number of coincidences involved in the developmental phases of the universe. The actual constitution of the universe is the result of laws of nature which in turn are the result of the initial proportion of total energy to mass. There is no reason to suppose that this initial proportion could not have been other, and thus that the laws of nature could not have been other. With a computer one can extrapolate what kind of universe one would have if, for example, the relation of the electromagnetic force to the weak nuclear force was other than it is. By varying relations between these and other fundamental constants, one can find out what kind of chemical elements would and would not have existed. Scenarios with a universe in which carbon-based life would be absent admit of description. We must be wary, however, of drawing any conclusions based on such extrapolations, for doing so amounts to an appeal to ignorance. If physical theories concerning the origin of the universe were better established than they are,[7] one might argue that some such extrapolations would involve detectable physical contradictions (such as would occur if we imagined a mosquito the size of an elephant), and thus if an extrapolation did not involve a detectable contradiction, this would be some indication that it was really possible. Physics at this point of its development is not able to exclude the possibility that the relations between the forces must be exactly what they are. It may eventually be found that all of them are forms of one basic force, and that this force is tied to the very structure of matter (which is the position Harris would favor). And then again, it may not be.

He is right in insisting that physicists are *unduly* surprised by the close relation between the conditions necessary for life and the constants of nature, for this is largely due to picturing things in a disconnected way characteristic of classical physics. However,

he is wrong in suggesting that they should not have been surprised by the extent of the "fine-tunedness" of the constants allowing for life, for this is not something which could be known in advance. Indeed, as noted above, he himself admits that this "should excite our interest" (59).

A serious weak point in regard to this question is Harris's failure to acknowledge that the coincidences necessary for our existence seem to be of two orders: 1) as already mentioned above, there are coincidences of a determinate nature, e.g. the constants of nature have determinate values which are conducive to life. This is to say, that the particular values are such than almost any others would render life, and especially intelligent life, impossible. 2) in addition to these determinate coincidences there are chance coincidences. It is no doubt these latter which we generally think of when coincidences are invoked, but the term does have a broader extension. A coincidence is the conjunction of two events, without there being a determinate cause of this conjunction. A determinate coincidence, then, is called determinate, not because it has a determinate cause, but because the things which happen together are not together due to chance (an event is chance when it represents an exception to the general rule, thus happening in the fewer number of cases).

Chance coincidences then, precisely insofar as they are due to chance, are unexplainable in terms of the general laws. This would not seem to be the case for the determinate coincidences, since often these may be brought under something more fundamental. Does such a subsumption necessarily always explain them? It would seem not. For example, the ratio of the mass of the electron to that of the proton (something which has extreme importance for the way the universe is), can be subsumed under the individual masses of each: given these masses, they necessarily have the ratio they have. Yet why do they have these respective masses? One could next turn to the properties of the subatomic particles, but then the question becomes: Why are the subatomic particles such as to combine in ways that give the electron a mass x, and the proton a mass y? And so on. Yet another example of this lack of adequate explanation through subsumption is to be found in the ratios between the fundamental forces of nature. One sees the consequences of their having these exact ratios, and one can figure out what would happen if they were other, but this in itself can hardly constitute a fully satisfactory explanation.[8] If, however, scientists were to discover a single equation from which all the others could be derived, then we would be in possession of the only scientifically satisfactory explanation possible. Harris knows that this must be so, if his position is to be vindicated within the explanatory framework he has accepted for it.

Even conceding such a fundamental equation behind the determinate coincidences, there remains the problem of the chance ones. Insofar as these chance coincidences cannot be immediately explained by the general laws of nature as now known, Harris would have to affirm that there are other laws as yet undiscovered, which would render such events highly probable, or even necessary. As already indicated, such a belief can find no justification in science itself unless and until such laws are discovered.

As an example of such apparently chance coincidences, we would cite the problem of our moon. Why does the earth have a moon the size it has? If this could be explained

as the result of the normal evolution of a planet like ours, we would have an answer. Yet the normal evolution of a planet such as ours does not seem to imply so big a moon; our moon is thus not normal.[9] This apparent chance coincidence plays a very important role in the evolution of life: without the moon there would be no large tides such as are necessary for the evolution of certain forms of marine life, and, eventually, of land animals. Numerous other coincidences of this sort are documented in scientific literature.[10] Harris, however, completely fails to recognize them as coincidences of a different sort from those which pertain to laws of nature conducive to life, and thus as requiring a quite different analysis.

What conclusions, if any, can one draw from such a concatenation of chance events, concurring to one and the same end? Can the conjunction of this huge number of coincidences be interpreted in any manner as an indication that the evolution of the universe had intelligent life as its goal? Can anyone (i.e. the human species) be so *lucky*? These kinds of interrogations, taken seriously by many critics of AP, are simply side-stepped by Harris. It has been objected, for instance, that whatever direction or form the evolution of the universe took, there would always be coincidences, and therefore any other scenario than the one which actually obtained would be just as improbable, statistically speaking. The defenders of the argument for goal-directed evolution then respond that the likelihood of things is not just a function of absolute mathematical probability, but must be determined in relation to the level of being and of order that are produced. A house is not as likely a thing as a random (non-orderly) pile of bricks. Put generally, order is far less likely than any state of disorder.

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After considering the evolution of the inanimate universe, Harris turns to the realm of living things. He defines life as "an open system of chemical processes in dynamic equilibrium capable of maintaining its specific form by spontaneous (autugric) adaptation to environing conditions"(65). He then asserts that living things are plainly higher or more complex than non-living things in that they have a capacity of self-maintenance, i.e. the ability to re-adjust themselves in response to external changes in such a way as to sustain their existence. Metabolism he regards as 'the first form of freedom', understanding freedom as self-determination (64).

At this point he asks a crucial question: Can the evolution of the various life forms be satisfactorily explained by random variation plus natural selection? What follows in this section constitutes some of the book's most compelling argumentation. To cite but one example:

> It is not just that the eye is a highly complex organ, but that its effective use is not possible without the coordinated functioning of associated muscles, glands, neural engrams and behavioral dispositions, involving numerous other . . . parts of the body . . . If all these factors were to be supplied piecemeal, by chance mutations, they must occur in the proper sequence and mutual association, which is not only stupendously improbable, but, if the mutations occurred in the wrong

> order, they would be disadvantageous and selection would eliminate them. (81, 82)[11]

While not denying any causality to random variation plus natural selection, he does insist that,

> they are not sufficient to account for the results, which are not additive accumulations of characteristics but intimately and integrally organized systems of structure and function. [A] more organismic account is needed. (83)

His "more organismic account" of things is only a reiteration of the notion of the self-specifying universal's expressing itself. This is followed, however, by a pointed criticism of the idea that evolution is not progressive, but is simply the constant change of living forms subject to natural selection under environmental pressures:

> It has been alleged that mosquitoes have been more successful in adapting themselves to wide difference of climate than have humans. No mosquito [however] is capable of making [such a reflection]. (87)

Such common sense is absent from ch. 7, however, which is devoted to developing the Gaia hypothesis, originally put forward in its modern form by James Lovelock. According to this worthy successor to the world's great myths, the earth is a single organic whole which progressively comes to life, and then maintains it. The earth is composed of living and non-living parts, (just as the body is of living and dead cells), and due to its living parts, it has the ability to re-establish equilibrium in itself, in this way preserving its life. Harris, not surprisingly, finds this a promising hypothesis, since it is similar to his own view that the earth is an individual capable of bringing itself to consciousness in the minds of its member organisms, and in so doing, accomplishing the coming to consciousness of the entire cosmos of which Gaia is a specific phase (cf. 100). While there are doubtless similarities between the earth and an organism, our experience clearly shows us that we are not parts subordinated to a greater whole, at least not in the way that parts of an organism are submitted to the organism. While organic parts such as white blood cells, appear to have a life of their own, in that they grow, reproduce etc., it is plain that they exist for the sake of the whole: they ingest germs not for their good (it generally results in their own death), but for the good of the whole. The relation of humans to the earth is quite different. One might also point out, along with Harris himself, that characteristic of living things is a certain independence or autonomy. Thus while an organic part is defined in terms of the whole, an organism is not defined in terms of its environment.

It also becomes plain that the self-organizing principle he refers to throughout takes its inspiration from the ancient notion of soul (98, 99). Just as the soul is conceived of as the organizing principle responsible for the development of an embryo, and moreover is held to be present in every part of the organism, so too the world soul brings the world to completion, and is implied in every part of it.

Subsequent chapters (8-10) discuss the nature of sensation, and of intelligence. For Harris, intelligence is defined by reflective consciousness or awareness of self. Much of what is said in these chapters takes its inspiration from German idealism, "Naturphilosophie,"[12] process philosophers such as Teilhard, Whitehead, Alexander and Bergson, as well as from Husserl and more recent thinkers such as David Bohm. This is hardly the place to take up possible fundamental objections against these position, most of which must already be familiar to our readers.

The later chapters (11, 12) leave one wondering to what extent Harris's conclusions are really based upon science, as he claims. Is what is being presented finally any more than the age-old idea that there is a hierarchy of being in the world, and a mutual dependence of one being upon another? Science may furnish the details of the mutual interdependence of beings on one another, but the idea itself stretches far back in time; it arises, in fact, quite spontaneously from more generally accessible evidence, such as that of a simple food chain. Furthermore, if science has made us aware that the complexification of beings is an historical process, it is still the task of philosophy to define the nature of this complexification, or of any resultant hierarchy. In *Cosmos and Anthropos*, science seems a kind of footnote to philosophical arguments, and Harris almost admist as much in the closing pages. Although this in itself is not a criticism, since philosophy does have something important to say here, it does suggest that Harris may be unsure from which quarter his arguments are, or should be, coming.

The final chapter (12), as is appropriate, re-examines the arguments from design. Although to be praised, among other things, for its attempt to define the different senses of design, the chapter is far too summary, and contains a number of confusions, such as those mentioned above in respect to the notion of whole. It is a bit ironic that Harris should spend all of three pages examining the possibility that the source of intelligence might be something outside nature, while finding the notion that the initially blind universe created intelligence is itself unproblematic. In the final analysis, Harris maintains that the universe designs itself, and in the place of a 'Supreme Architect' we are presented with a form of necessary emergent pantheism.[13]

In conclusion, we must pass a mixed judgement on this book. While it merits praise for attempting to eliminate ambiguities in previous formulations of the AP, its efforts to arrive at clear, coherent and satisfactory definitions of many key terms too often have fallen short. Moreover, the exact relation of AP to philosophical arguments from design has been left unclarified. Harris finally leaves us with more questions than answers: What is responsible for the ordered development he outlines? Is this movement inevitable or not? Is there a way of reconciling chance coincidences with a necessary movement?

Thus the challenge to vindicate any teleological form of the AP remains. The question of whether modern science supports the notion that the universe is ordered to the development of intelligence awaits those willing and able to grapple with the notions of complexity, finality, order, chance, consciousness, and intelligence.

Notes

1. The authors wish to thank Douglas B. Rasmussen for his helpful comments.

2. A full and nuanced understanding of Harris's philosophical position would require further readings in his other books, such as *Nature, Mind and Modern Science* (1954).

3. A similar critique is made by C. Brown in his review of Barrow and Tipler's *The Anthropic Cosmological Principle*, in *Reason Papers*, Spring 1988, 217-223.

4. In the last chapter, Harris discusses different meanings of 'design'. He concludes that natural forms are designed for the sake of human existence in the sense that "[t]he whole which contemporary physics has revealed . . . necessarily involves the generation of its own observation by intelligent beings, in whose minds it brings itself to consciousness." As to the sense of 'design' which implies a designer, Harris concludes that "If God is conceived as the absolute universal principle of order manifesting itself in and as the universe, and transcending all finite phases, the argument from design, as proof of his existence, can be justified in this, its modern form, without requiring any inference from a contrived plan to a Supreme Architect . . ." (171).

5. Although not necessarily hierarchical, as in ancient cosmologies. This difference would seem to be of some importance in the context in which Harris is working. Indeed, the hierarchical whole is precisely distinguished from the heap by the fact that its parts are unequal in function and value, whereas those of the latter are essentially interchangeable, and have no pre-eminence over one another.

6. Harris's efforts to find such a relationship (17), misses the point: the relationships he is talking about ("mutual effect or influence") are the effects, rather than the cause, of the sticks being together.

7. One problem inherent to speculation concerning the origin of the universe is that of ascertaining whether or not the laws of nature themselves have evolved since the beginning. If in fact physical laws have not always been the same as they are now, present theories which assume this would be seriously flawed.

8. The fruitless character of a question is not always obvious. On this point, see Paul Edwards on "Why" in the *Encyclopedia of Philosophy*, xx.

9. Although there is yet no definitive answer as to the origin of the moon, its unique characteristics are readily acknowledged by astronomers. For a serious, but fairly non-technical discussion of this question, see William K. Hartmann, *Moons and Planets*, (Belmont, California, Wadsworth Publishing Company, 1983), 149-151.

10. For one recent, extremely interesting and important example of a coincidence affecting the extinction of many forms of life (including the dinosaurs) and the development of mammalian life, cf. Luis W. Alvarez, "Mass Extinctions Caused by Large Bolid Impacts," in *Physics Today*, July, 1987.

11. Even more developed and convincing arguments are given by geneticist Michael Denton in *Evolution: A Theory in Crisis* (London: Burnett Books, 1985), who argues convincingly that natural selection acting on random variation does not adequately account for evolution beyond the species level. Cf especially chapter thirteen.

12. For example, Harris cites with approval Schelling's views that an organism involves a concept, and that a concept implies the existence of a cognizing mind (103).

13. See note 2 above concerning Harris's views on 'design' and 'designer' in the universe.