

BEGINNING WITH THE END

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God, Science, and Wolfhart Pannenberg

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Contingency, Time, and the Theological Ambiguity of Science

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..... 1. Introduction

"The most miraculous thing is happening. . . . The physicists are getting down to the nitty-gritty, they've really just about pared things down to the ultimate details, and the last thing they ever expected to happen is happening. God is showing through. They hate it, but they can't do anything about it. Facts are facts. And I don't think people in the religion business, so to speak, are really aware of this—aware, that is, that their case, far-out as it's always seemed, at last is being proven. . . ."

"Mr. Kohler. What kind of God is showing through, exactly?" (*Dialogue between Dale Kohler, a computer freak, and Roger, a divinity school professor, in Updike 1986*)

Contingency and time are obviously important concepts for any theology. Wolfhart Pannenberg has developed his own understanding of these two concepts in his theology. The present paper is not an analysis of Pannenberg's view. I discuss these concepts in relation to cosmology (in the astrophysical sense). It will be argued that scientific cosmology does not provide a basis for an inductive argument for God; God is not showing through, nor ruled out. This ambiguity implies that science does not offer a basis for a metaphysics which thematizes God's presence, a 'mystical metaphysics'. However, one could use the apparent absence of God as argument for a theology in which each moment in time is confronted with an atemporal 'otherness'. I suggest that it is important to develop such a 'prophetic metaphysics' in dialogue with scientific understandings of the world. The paper ends with some tentative questions about Pannenberg's approach.¹

Science is, as I will argue, neutral with respect to both contingency and necessity (2.1). 'Complete theories' suggest necessity, but they are based upon abstraction of diversity (2.2). The data used in 'anthropic arguments' suggest *global empirical contingency*, and hence the need for a theistic explanation. However, the discussion about anthropic principles offers a variety of metaphysical options and does not

support a 'design' argument for the existence of God (2.3). The 'mystery of existence' is in itself beyond science. Such global ontological contingency offers the possibility to see the universe as grace, but it need not be interpreted that way (2.4).

Physical systems can be described from within time, as evolving. However, they also allow for descriptions which consider whole histories at once (3.1). These two approaches offer opportunities for theology, especially if they are combined together with an emphasis on the present (3.2).

In the final section the conclusions will be related to a theology which primarily thematizes God's absence (4). This leads to a view of the relation between theology and the sciences which seems to be different from the way Pannenberg has argued for theologically relevant dimensions in the facts (Pannenberg 1985, 19f; Chapter 2 of this volume) and certainly from the way Tipler has, in his contribution to this volume, subsumed theology under science (Chapter 7). The paper therefore ends with some questions about the way Pannenberg seems to use contingency, time, and the sciences in general (5).

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2. Contingency

R.J. Russell (1988) distinguishes global,² local, and nomological contingency. Within the first and second Russell considers ontological and empirical contingency, say, the difference between the mystery of existence, why there should be a universe, and the specific way the universe is. Cosmology seems to relate to global empirical contingency (2.2, 2.3), and perhaps also to global ontological contingency (2.4). First, a general argument for the equal status of contingency and necessity with respect to science will be presented (2.1).

2.1. Contingency and Necessity: Both Outside Science

Science works with a *methodological* principle of sufficient reason, the guideline that one should always seek further reasons. Science "could not abandon the presupposition that reasons can be given for the properties or patterns things are found to have, without surrendering its very character as a continuing and endless quest for such reasons, and for continually better ways of expressing these reasons" (Munitz 1974, 105).

However, this methodological rule should be distinguished from the *metaphysical* principle of sufficient reason, which states that there must be such reasons, whether we can find them or not. This latter

principle is outside the range of science, although it is supported by the instances when science has been successful in its search for reasons. Quantum physics might be interpreted as a branch of physics where the metaphysical principle appears to be not valid.

The methodological principle of sufficient reason implies that contingency is always outside science. Something which seems contingent might be shown by future science to be unavoidable, given certain circumstances. And science attempts to show that those circumstances are necessary as well. Science is a quest to remove contingency as far as possible.

But science is in its practice also at odds with complete necessity. In trying to explain everything science always traces properties or events or rules back to other events, boundary conditions, or laws. Certain rules are used in that process of explanation, laws of physics and logical and mathematical rules. Even if the chain does not go backwards in time, there is a chain of 'more fundamental' explanations—explanations which are based on laws and boundary conditions of wider applicability and greater simplicity.

Some cosmologists, like S.W. Hawking (1980), and some popularizers, like P.W. Atkins (1981) and H.R. Pagels (1985), have claimed that science is near the end of the chain, providing an explanation on the basis of the most simple principles. But it remains legitimate to ask, Why those principles? Scientific work on complete and unified theories is not wrong. But the claim that science offers the ultimate explanation, and hence that the universe could only have been the way it actually is, goes beyond science. The belief that we are close to a complete explanation could nonetheless be justifiable, due to the success of a specific program and the simplicity and elegance of the assumptions. The next section will consider the attempt to construct complete theories of the universe and hence to remove empirical global contingency. The conclusion of this section is that both contingency and necessity are terms outside science; science does not in its method opt for the one or the other.

2.2. Unified Theories of Everything and Global Empirical Contingency

Both the contingency of the initial conditions and the contingency of the laws governing the universe are actually disputed among theoretical cosmologists and physicists.

Boundary Conditions and Laws

In standard cosmology, based upon Einstein's theory of general relativity, it is possible that a three-dimensional space is finite but

without edges. Such a space is curved back into itself, just as the two-dimensional surface of the Earth is finite without edges. Time is different, even if the total duration is finite, in a closed universe from Big Bang to a Big Crunch. Time remains like a line with a beginning and an end.

The English cosmologist Stephen Hawking has in collaboration with James Hartle extended the idea of a finite space without edges to four dimensions, including something like time (Hawking 1982; Hartle and Hawking 1983). The 'time' variable becomes, of course, through such a procedure something quite different from our ordinary concept of time. This proposal does away with arbitrary boundary conditions for the universe; as Hawking stated, the boundary condition of the universe is that it has no boundary.³ This cosmology is just one of the many approaches at the frontier of research. However, some other approaches also lack contingent boundary conditions. For example, the Russian cosmologist Andrej Linde envisages an eternal universe which is like a foam of bubbles. Bubbles are more or less homogeneous regions like the observable universe. As Linde has it, all possible bubbles exist; the universe is a lunch at which all possible dishes are available (Linde 1983, 245). We will come back to the presence of all possibilities below. It implies, of course, that there is no choice needed for initial conditions—they all have been chosen.

Theoretical cosmology today needs particle physics and theories about space and time, and hence about gravity as an effect of the curvature of space-time. There is no satisfactory unified theory yet. However, there are certain proposals. There are three components in present arguments for complete theories: mathematical consistency, esthetics, and 'many worlds.'

Mathematical Consistency: The Problem of Infinities

Quantum physics is very successful. However, it has one problem, aside from its interpretation: it predicts an infinite mass for electrons. Humans would have an infinite mass as well, which is not in line with observations. Theoretical physicists have a trick, *renormalization*; they subtract infinity somewhere. This procedure can be defined rigorously and it works. The resulting mass is, of course, not a prediction of the theory but taken for granted. If the same trick would be needed over and over again the theory would be useless; it would not predict anything. A renormalizable theory is a theory which needs this trick only once, while producing finite results in all subsequent calculations. Quantum electrodynamics, the theory which describes electrons,

positrons, and radiation, is such a renormalizable theory. It has been tested and confirmed to a very high degree of accuracy.

Particle theories incorporating more of the known particles turned out to be plagued by infinities. The Dutch physicist G. 't Hooft showed in the early 1970s that only theories of a specific type were renormalizable. Since, all particle theories have followed this path: the Weinberg-Salam theory for the weak interactions, the quark theory, and the Grand Unified Theories (GUTs), which integrate nuclear and electromagnetic forces.

The requirement that infinities must be manageable in such a way is rather restrictive. And still it seems artificial, a trick to brush the problems under the rug. One step further would be a theory without problems, one which predicts *finite* results for all possible observations. Finiteness for a theory⁴ is, surely, a stronger restriction than renormalizability. And the restrictions become even more severe if the theory has to include gravity as well. There are, as far as I know, no theories for which it has been shown that they are finite in all circumstances. The best candidates today are superstring theories, and their number is quite small. Six theories satisfy the known conditions of consistency, and of those six, three are perhaps equivalent. More conditions for consistency, that is, finiteness, might reduce the number of consistent theories even more. "Ideally it will turn out that there is only one" (Schwarz 1987, 654).

It is assumed throughout that the laws can be formulated mathematically. There might be other assumptions taken for granted, like Tipler's assumption about continuity until the end of time for relativistic space-times (above, 163). Such assumptions might introduce an a posteriori component. But the claim that there is, independent of any observation, only a very limited set of mathematically consistent theories deserves to be taken seriously.

Simplicity and Esthetics

There are variants of Einstein's theory of general relativity which are compatible with observations as they stand today. Nonetheless, they are not considered to be as good as Einstein's theory. These judgments are based on such criteria as coherence, simplicity, and elegance. Similar judgments are made with respect to more recent cosmological theories. Esthetic and metaphysical arguments are present in the criteria for theory evaluation. Even disregarding the requirement of consistency, accepting such criteria might reduce the number of possible initial conditions and laws within the not-too-distant future, perhaps even to only one package.⁵

All Possibilities Present

Linde imagines the universe as consisting of mini-universes, bubbles "of all possible types" (Linde 1983, 627). In Hawking's view all possibilities which are part of the quantum description of the universe are equally present. Tipler defends a third type of cosmology, but he too adheres to a many-worlds interpretation of quantum theories (above, 174). Tipler makes a distinction which seems useful: he opts for the actual existence of all classical possibilities represented in a quantum wave function, but allows for contingency on the set of all possible wave functions (176).

The actuality of all possibilities, in one way or another, implies that an explanation does not need to claim that certain features are the only possible outcome of the preceding processes. It is sufficient if those features are possible, for then they will be realized somewhere. Without this assumption we would be left with an incompleteness, as the theory would not specify which possibility is the actual one. However, the assumption is not a sufficient one to remove all contingency, since the presence of all possibilities is always the presence of all possibilities of a *certain theory*. The question remains: Why one theory and not another? This question might be answered by the appeal to consistency, in other words, finiteness, and to esthetic criteria like simplicity. The Teilhard boundary condition proposed by Tipler (an Omega point) and the Hartle-Hawking boundary (compactness) are such additional assumptions, defensible by reference to esthetic, metaphysical, and perhaps even religious criteria. As Tipler has it, all the contingency in quantum cosmology is in the boundary conditions which pick out the wave function which actually exists (178).

Diversity in Nature: The Many

There is one general objection against the expectation of a simple complete theory: our world is so complex. Could a complete theory be fair to that complexity, or would it only be complete due to a great amount of abstraction—leaving many of the particular characteristics of our world outside its scope? That has been argued by the English philosopher of science Mary Hesse (1988), and by the physicist Freeman Dyson (1988). The study of complex systems, for instance weather prediction, is also a respectable branch of science. Two catchwords in recent developments are *chaos* and *fractals*.⁶

Unity and Diversity, Perennial Problems

Dualities like unity and diversity, universality and particularity, the general and the specific, and the One and the Many, are present in

different fields of thought. Dualities, of course, pervade also other areas of life, like politics and family life.

The problem with 'complete theories' is not that they do away with contingency, and thus would make a transcendent God superfluous. The problem is that they might go with values which overemphasize unity and neglect the particular. Somehow both unity and diversity should be part of a satisfactory view of the world.

Three elements of the Christian tradition might be useful in this context. The particular person Jesus became understood as the Christ, with universal significance. The idea of the Trinity combines unity and diversity in God. And the doctrine of creation is helpful, as it locates the unity in the transcendent creator, while allowing for diversity in the created world.

Theologians should accept that there is progress in theoretical physics and cosmology towards a very limited number of encompassing unified theories. These theories are, however, not really threats to an emphasis on contingency, as they are only possible due to abstraction of features of particulars. The specific topic in the framework of such cosmologies is not contingency, but unity and diversity. Christian theology needs to express both unity and the value of particulars.

2.3. *Anthropic Principles and Global Empirical Contingency?*

Standard cosmology assumes what is called the Copernican principle: we humans do not occupy a privileged position in space. The last few years there have been rumors about something special for us, anthropic principles. R.J. Russell (1988) suggested the anthropic principles as thematization of global contingency. Others have used the underlying data, which I call 'anthropic coincidences', in arguments for the existence of God. I will argue that this does not work as argument either for the existence of God or for the cosmological significance of humans. The Weak Anthropic Principle is true but irrelevant. The stronger anthropic principles are themselves disputable metaphysical principles, not consequences of science. They, as well as the anthropic coincidences, might be used to express contingency, but they certainly do not support a strong statement about the contingency of the universe, and hence lack inductive apologetic value.

There are two basic types of anthropic principles, the Weak Anthropic Principle and the strong anthropic principles. They use the same data, which might be called *anthropic coincidences*.

The *Weak Anthropic Principle* (WAP) states that what we see must be compatible with our existence. We see a universe with planets,

since we depend on planets. We see a universe which exists for some billions of years, as it took billions of years to develop beings which are capable of thinking about the age of the universe. It has the nature of a selection rule: our observations are biased in favor of situations where we exist.

The *Strong Anthropic Principle* (SAP) can be stated as: "The Universe must have those properties which allow life to develop within it at some stage in its history" (Barrow and Tipler 1986, 21). This is not a statement about what we actually observe but about the class of possible universes.⁷ There are different ways to argue for this principle. One has been given by the physicist J.A. Wheeler when he related the existence of the universe to the existence of observers in the universe. This particular version has been called the *Participatory Anthropic Principle* (PAP).

Anthropic Coincidences and Weak Anthropic Explanations

1. The universe is enormous in size when compared to human dimensions, even when compared with the human enterprise that reaches the farthest: space travel. And its age is more than a million times a typical age of a human civilization. This might result in feelings of insignificance, as forcefully expressed in the story *The Restaurant at the End of the Universe* by Douglas Adams. He describes a terrible machine which destroys the soul by making one see the whole infinity of creation and oneself in relation to it. The effectiveness of this machine shows that "if life is going to exist in a universe of this size, then the one thing it cannot afford to have is a sense of proportion" (Adams 1982, 71).

However, other things being equal, the age and size of the universe might be related to our existence. We need certain types of atoms, like carbon and oxygen, which are produced in previous generations of stars. Biological evolution took another couple of billions of years to produce complex, intelligent, observing, and goal-seeking beings—us.

Turning this description upside down, it is argued that intelligent observation by natural beings is only possible after some billions of years, say ten billion. Thus, such beings can only observe a universe which is at least ten billion years old. Along this line, WAP offers an 'explanation' for the observed age of the universe. Such a universe must then also have a size of ten billion light years in all directions.

2. We happen to experience our world as having three spatial dimensions as well as one time dimension. Anthropic reasoning seems to rule out other dimensionalities. Two-dimensional beings would fall apart if there would be a canal running through the body, say for

digestion or blood circulation. In higher dimensional worlds planetary orbits would be unstable.

A survey of, and contribution to, similar arguments for various aspects of the initial conditions and the laws applying to our universe is Barrow and Tipler 1986.

Evaluation of the Weak Anthropic Principle

The Weak Anthropic Principle is in itself *true but devoid of relevance*. Take the following (simplified) example:

1. Assume that we know that life depends on liquid water.
2. We observe the existence of life, for instance ourselves.
3. WAP then predicts that our environment, our planet, will have a surface temperature between 0 and 100 degrees Celsius. This explains the temperature at our planet.

This is no explanation. There is no reason to call the WAP a 'principle'. It is the common use of evidence: we observe A (life, 2), we know that A and B go together (1, life needs liquid water), and hence C (3, the environment must support the presence of liquid water). This does not explain why, in my example, there are living beings and planets with the right temperatures, nor does it explain why A and B go together. The anthropic reasoning only repeats the first assumption: the two go together. The argument is not wrong. But it is devoid of relevance.

The existence of a paper explains some knowledge about the world, since it points to an author with certain ideas. But that does not justify the retrograde reasoning for the events, as if the existence of the paper explains the birth of the author, or even the origin of his/her ideas. There is a fundamental difference between an explanation for one's knowledge and an explanation of the phenomena.

WAP with Many Worlds

The Weak Anthropic Principle may explain observations if it is combined with the assumption that there are 'many worlds', regions which are different with respect to the relevant property. It does not explain the existence of the worlds, or of the observers, but as a selection rule it expresses that the observers will observe a 'world' with this particular property. The interesting issue, however, is not the selection rule (WAP), but the existence of the many worlds, hence the metaphysical view about the actual and the possible. If one has an extremely large number of monkeys typing for some time there will be one typing flawlessly one of Pannenberg's books—as well as many more typing a book *almost* flawlessly. However, this does not explain

the typing monkeys (the many worlds), nor the possibility and probability of the event.

The Strong Anthropic Principles

The strong anthropic principles state that any possible universe *must* have the properties for life (or for observing life). This is a statement about the class of all possible universes. This leads to an explanation of properties of the universe in terms of purpose: a property that is necessary for life is necessary for a universe. However, it does not need to refer to a purpose beyond the universe or the significance of life; the relation between livability and existence might have a natural basis and life might be a kind of side-effect.⁸

Strong anthropic arguments have some *disadvantages*.

1. Properties of possible universes which are not actual are untestable. If the possibilities are actual as other domains within a single universe, these domains are larger than the observable universe. If all possible universes co-exist in a fuzzy reality, as the Many Worlds Interpretation of quantum theories holds, any observation is in a *specific branch*, and does not give access to the other branches. Strong anthropic reasoning cannot rely on testable consequences about the class of possible universes (or of domains within a universe). Its appeal must be based upon the coherence of the view which it supports.
2. *Anthropic arguments are quite restrictive in their predictions about possible universes, if 'life' is taken to be 'life as we know it'*. However, life is in its richness only partly understood. This is even more the case for consciousness. To explain properties of the universe by reference to life or consciousness is like the lame and the blind guiding each other. Besides, other forms of life might develop in zillions of years in completely different stages of the universe, or other forms of life might be possible in other possible universes.
3. SAP explanations are also vulnerable to the future development of scientific theories. Subsequent theories have, in general, fewer and fewer unexplained parameters. As we saw above, some scientists are searching for a complete theory, perhaps even one without any arbitrary parameters—without invoking any reference to the necessary existence of life. If they succeed the set of consistent possible universes would contain only one element.
4. If applied at a small scale, for example by asserting that 'planets must have the properties which allow for the development of life in some stage of their history', a strong anthropic principle is surely wrong. But the example shows the nature of the SAP. It is like the

old teleological arguments: everything must have a function, and therefore the moon must be populated, as the ancient philosopher Plutarchus argued (Raingard 1934).

If one makes the metaphysical assumption that the existence of humans, or at least of embodied consciousness, is the purpose of universes, the Strong Anthropic Principle follows. We would be the purpose of it all, the universe would be for our sake. However, one could also understand the Strong Anthropic Principle by assuming a creator who likes complex toys. In such a view a universe would not exist for the sake of life, or for some destiny of life, but for the sake (glory) of God.

To conclude on SAP: its truth is disputable, and its interpretation ambiguous.

A version of strong anthropic reasoning which seems more based on science is the *Participatory Anthropic Principle* (PAP), which was introduced by Wheeler (Wheeler 1977; 1982; Patton and Wheeler 1975). It builds upon the interpretation of quantum theories. Quantum theory describes a superposition of states. However, we do not observe such superpositions. One of the proposed solutions for this tension is that the act of observation makes reality definite. But what is an observation? A measurement apparatus would still be, in principle, subject to a quantum theoretical description in terms of a superposition. Some, including Wheeler, have pursued this line to the moment where consciousness comes in. PAP assumes that it is observation by conscious beings which gives reality to all the preceding stages. If this interpretation is applied to the universe and if the universe is subject to a quantum-theoretical description, the conclusion is that a universe needs to develop conscious beings who observe the early universe. Otherwise it would not come into existence.

This view is based upon a sound knowledge of quantum theory, a disputed, but not necessarily wrong, interpretation of quantum mechanics, and a preference for the question of the origin of the universe above the question about the difference between an observer and an observed system. Unclear are the characteristics needed to qualify as an observer. "Was the world wave function waiting for millions of years until a single-celled creature appeared? Or did it have to wait a little longer for some more highly qualified measurer—with a Ph.D.?" (Bell 1981, 610). Besides, it suggests that regions of the universe where there are such observers are different from regions where there aren't. Although that need not imply observable differences, it still seems a bit odd.

The Participatory Anthropic Principle might easily be picked up in a metaphysics which gives 'mind in the universe' priority over matter.

Anthropic Principles and Divine Design

If one takes the anthropic coincidences seriously but rejects the 'explanations' based upon the Participatory or the Strong Anthropic Principle, one might opt for a theistic explanation: The universe exhibits those coincidences which allow for life because it was designed that way by a creator. In such discussions two ideas are juxtaposed: either design, and hence God as an explanation, or many worlds with a WAP explanation for the properties of our world. John Polkinghorne, a professor of theoretical physics who became an Anglican priest, called the ideas about other worlds metaphysical speculations. He holds the theistic explanation to be of equal intellectual respectability and of greater economy and elegance (Polkinghorne 1986, 80).

This inductive-apologetic defense of God's reality does not work.

1. The argument assumes that the anthropic coincidences are here to stay. However, these features which apparently point to design might find ordinary scientific explanations in future theories. That has happened for the traditional design arguments based on intracosmic adaptedness. The inflationary scenario already led to some erosion of anthropic coincidences.
2. Besides, the apologetics need a low plausibility of a plurality of worlds (domains, universes) on which the Weak Anthropic Principle would work as a selection principle. As Montefiore, the Anglican bishop of Birmingham, states, "it is infinitely more complex insofar as it postulates an infinite number of universes" (Montefiore 1985, 38). This is a widespread objection against theories which work with a plurality of 'worlds'. It appeals to a philosophical rule of economy, ascribed to William of Ockham: one should not introduce more entities than necessary to explain the phenomena.

This is a misapplication of the economy rule. The many worlds are not introduced 'by hand'. Take, again, the example of planetary systems. The standard theory explains planets as remnants of an original cloud which collapsed to form a star. This theory works well for our solar system and fits with our knowledge about stars and their formation. It seems more complex, more ad hoc to reject the possibility of other planetary systems, although perhaps not observed, than to accept their existence. It would need an addition-

al rule if one would accept this theory of planetary formation and reject the possibility of other planetary systems.

It is simpler to accept a theory that also makes predictions beyond the observable domain than to draw a line. The issue of simplicity is not about the number of entities predicted by a theory but about the structure of the theory. Does a theory need more separate rules to have those entities or to exclude them? Some cosmological theories are more simple if one allows for the existence of many domains. Simplicity is not a simple count of entities: one creator or many universes.

This is not to conclude that belief in a Creator is wrong, nor that all possibilities of a theory should exist. But this way of doing the apologetic job does not work. We need to take more seriously the idea of more worlds as well as the possibility of more complete scientific theories.

2.4. *Global Ontological Contingency and the Universe as Grace*

Even the ontological contingency, the mystery of existence, has been disputed by some cosmologists, but this one seems nonetheless unassailable.

Hawking and Hartle interpreted their own proposal for the wave function of the universe as giving the probability "for the universe to appear from Nothing" (Hartle and Hawking 1983, 2961). Similar claims have been made for other quantum theories of gravity, for instance by Vilenkin.

I maintain that they do not describe an 'appearance out of nothing' if the nothing is taken to be as absolute as imaginable.⁹ It is possible to interpret the Hartle-Hawking proposal in the sense of *creatio ex nihilo* (creation out of nothing), if that is understood not as a cosmogonic (temporal) description but as a view of the universe as being sustained by God at every moment.

The notion of appearance is a temporal notion. The nothing arises in the Hartle-Hawking theory through a timeless kind of calculation, which does away with a reference to an earlier state as an initial condition. Expressions like 'tunneling from nothing' are of a mixed nature, and not suitable to describe the basic idea of this theory. Tunneling connotes a temporal process, while the 'from nothing' applies to a kind of time-independent actuality.

The 'nothing' which has a precise meaning in the context of this proposal is not an absolute 'nothing' in a more philosophical sense. There are serious problems when one tries to combine the language of

mental events which have the property of becoming and physical events without that property? Unless one also holds that there is no becoming in the mind—but why is the illusion so persistent? If one opts for an objective, mind-independent view, one needs to face the question whether that can be made part of the physical description.

This question of the flow of time is often mixed up with the issues of order, a linear order relation, and asymmetry between the past direction and the future direction. However, an order relation seems necessary, but is not sufficient—we do not perceive anything flowing along the line representing the real numbers; a present is necessary for the notion of a *flow* of time. Besides, time asymmetry is *neither sufficient nor necessary*. In an asymmetric process all moments qualify as potential presents; there is no way to single out a present as our present. And in purely reversible systems, say a frictionless pendulum, we still have the impression that there is a present position, which immediately is superseded by another present position.

Events in the past seem necessary and fixed in memories, while events in the future seem contingent. It has been attempted to use this modal difference to formulate a distinction between the past of the present moment and its future and hence an objective notion of the present. Reichenbach (1971) appealed to quantum mechanics, where the present is the moment processes become determined. However, Grünbaum (1971) showed that every moment of time satisfies Reichenbach's definition. It does not single out a unique moment as the present present. The modal distinction between past and future cannot "be reformulated into a physical discourse so as to allow a physically significant distinction between past, present and future" (Kroes 1985, 200).

Physics seems unable to catch the present:

In my opinion, it is doubtful whether the attempts to construct an objective theory of time flow have any chance of success. In studying physical reality, physicists concentrate upon reducible phenomena, and they eliminate all that makes the phenomenon unique. In particular, they abstract from the fact that an event takes place 'here' and 'now'. But whereas physics generally tries to describe the universal aspects of the phenomena, the goal of an objective theory of time flow is precisely to get hold of the unique: such theory must single out a unique moment of time as the present which separates the past from the future. Therefore, it is in principle questionable whether an objective theory of time flow is feasible. (Kroes 1985, 208)

The Whole of Time/Timelessness

One could compare a universe to a film—each single picture representing a three-dimensional universe at a certain moment. Either one can take the perspective of the viewer who sees all the pictures subsequently *in time*, and hence sees action, movement, “evolution”; or from the perspective of the manufacturer, who handles *the whole film* as a single entity, for instance in selling or storing. The film still has a ‘story’, but there is no movement, no action or ‘evolution’.

There is a similar feature of physical descriptions, which allows for two descriptions.¹² General relativity, the theory behind Big Bang cosmology, has as its most fundamental entity a four-dimensional space-time. That level of description is like having the whole film: all moments are equally present, there is nothing like flow or movement. It is often possible to decompose such a four-dimensional description in a description of three-dimensional spaces evolving in time (Misner, Thorne, and Wheeler 1973).

Physical theories as different as Newton’s mechanics, thermodynamics, and quantum theories have been formulated in terms of phase space and trajectories. Each trajectory represents a complete possible ‘history’ of a system. At this level of description, the theory is not about an evolving system, say the movement of a particle, but about whole histories.

Light takes the fastest path from a source to a receiver. In a homogeneous medium this is a straight line. However, if there is, for instance, a transition from air to water, the fastest path is not straight but broken. One very useful description is in terms of all possible paths, in combination with a selection rule (principle of least action) that indicates which path is actually taken. As before, the physical description works with complete ‘possible histories’. Such principles of least action are very pervasive in physics. This idea has been incorporated in the path-integral formalism, which is extensively used in contemporary field theory (particle physics). It seems as if the more ‘holistic’ pictures of theories about whole histories imply *determinism*—one can only sell complete films once they are complete. However, selling is an action in time, and hence once again brings in the other type of description. The timeless perspective, without claiming to have the final perspective of one’s world at a certain moment of time, does not imply determinism. This can be explained as follows:

A universe picture is, according to McCall (1976), a complete description of a history of a universe, including past, present, and future. Assuming that the past is fixed and the future is a set of possibilities, a universe picture at a certain moment is like a tree: one stem

(fixed past) and many branches (future possibilities). The present of a universe picture is the point where the branching begins. McCall hopes to formulate an objective flow of time in terms of such trees, as later trees are subtrees of earlier trees. That, however, does not single out a unique tree as corresponding to the present (Kroes 1985, 203f).

One can talk about the whole set of trees, hence possible universe pictures, without implying that the future is determined or even already should have happened—as is necessary for having the complete film. Of course, having the 'last' tree of a series—which would consist only of stem without branches—would mean that everything were fixed relative to the present defined by that tree, but then everything is in the past. Talking about systems in terms of such trees provides a language for talking about complete histories without implying determinism. Determinism is, of course, a feature of some basic physical theories which can be formulated in this 'complete-history' way, like classical mechanics, general relativity, and Tipler's cosmology. But that does not warrant the reverse argument, that such a timeless description is necessarily tied up with determinism.

Both the difficulties in giving a physical expression of the flow of time and the presence from a timeless perspective aside from the description from within time imply that one cannot appeal to modern cosmology and physics for support of the claim that we live in a dynamic, evolutionary world. However, the conclusion need not be only negative; the existence of two descriptions might also offer opportunities to express certain theological concerns.

3.2. *Theology: Time and Timelessness in Relation to the Present*

Almost all current theologians who take science seriously opt for a dynamic picture. When the physical view of time is discussed, there is a strong emphasis on the flow of time and the asymmetry of time. The whole of time has been discussed as a problem, where theology should hope for the right outcome. This is especially true for process theologians (such as Griffin 1986), but also for others (for instance Russell 1984).

Philosophical theology and theoretical science take some distance from commonsense experience. At that level both descriptions might be useful. They allow for different clusters of associations, and thereby help one to see the world differently. The precise meaning of all the terms is dependent upon the further system in which the ideas participate.

A description *within time* takes history and evolution as basic. This resonates with a theological emphasis on *Heilsgeschichte* (salvation history). *Creatio ex nihilo* is most easily associated with questions about ultimate origins, cosmogony. *Creatio continua* deals with God's relation to the processes of change, especially to the emergence of novelty. Contingency is primarily about events; future events might still be contingent. Necessity seems reflected in the laws, which are the same for all moments in time, and in the unavoidability of a temporal dimension. Value is easily related to the future; decisions will be judged by their consequences. The eschaton, say the Kingdom of God, is closely related to the future. God's relation to the world is most easily formulated in terms of immanence or temporal transcendence (e.g., before the world, luring towards a better future).

The perspective that incorporates the *whole of time* might be understood as a view *sub specie aeternitatis*, a 'bird's-eye view' of the whole of history. *Creatio ex nihilo* is not about origins, but about the *ground* of everything. (For an atemporal understanding of *ground* one could think of the role of axioms in a mathematical system. They are not prior in a temporal sense, but they are the ground of the system.) *Creatio continua* might express God's *conservatio*. However, it is stripped from the emphasis on change and novelty, which it has in the other perspective. 'Novelty' is not a concept that fits in this timeless perspective; it belongs to the other language. Time is explicitly seen as part of the created order. Contingency is primarily the ontological kind: Why is there anything at all? Besides, the contingency of the laws is more explicit: Why this package and not another? The events are less seen as contingent: they are all necessary relative to the whole of history. Value must be understood as being there for every event, just by being part of the whole web—or perhaps even more primitively, just by being. Eschatology is less connected with the future, and more with God's transcendence. Transcendence is less easily understood as temporal (before and after the world); rather it is a radical *beyond*—as if in a completely different dimension.

Each of these two views is in danger of missing something essential. The perspective incorporating the whole of time might result in a conservative, status quo-affirming, understanding of eternal values—and thus divert the attention from the concrete contexts of injustice and suffering to the 'other place' of an eternal and timeless faith. The other, evolutionary, view is in danger of subsuming the present suffering and injustice under the future happiness, and thus of becoming an optimistic expectation of 'another time'.

They both gain strength, from a theological perspective, if they are tied to the present. The present is the place in which the temporal and the atemporal intersect critically. One might well relate the two clusters of associations to two types of Biblical literature. The *prophetical* literature is in the middle of time, influencing what is going on. *Wisdom* literature reflects on the way things are, will be, and apparently always have been. However, they need each other. Prophetical criticism appeals to God's otherness or transcendence—that is, its Archimedean perspective to criticize the present.

This atemporal transcendence, and the correlated view of the whole of time, might be useful as an understanding of God. A view *sub specie aeternitatis* is not one that can be attained definitely. But it can express the aim of "an understanding of the affairs of men which is not relative to the outlook of an individual, community or age", not even "relative to the outlook of mankind" (Sutherland 1984, 88). The idea functions like the transcendental regulative ideas of reason, as directing the understanding towards a certain goal. The unattainability, the transcendence, is essential. It is sane to allow for self-questioning in relation to a perspective other than one's own. If this 'other perspective' would be accessible, like a list of eternal values, it would become an expression of insanity, of fanaticism without self-questioning. "What is at stake in this argument is not the *content* of faith, but, as Kierkegaard stressed, the manner of appropriation of faith. Faith must be appropriated in a way which distinguishes it from fanaticism. For that it requires the idea of the eternal which transcends even one's most cherished views" (Sutherland 1984, 110).

The statement that God is eternal can be understood in two ways:

- God is everlasting, hence God has an unending duration.
- God is timeless, has no duration.

Pike discusses the second option in his *God and Timelessness* (1970). Pike concludes that the concept of timelessness has almost no scriptural basis; it arises from Platonic influence. "I shall not conclude that the doctrine of timelessness should not be included in a system of Christian theology. Instead, I shall close with a question: What reason is there for thinking that a doctrine of God's timelessness should have a place in a system of Christian theology?" (Pike 1970, 190).

Timelessness might have a place for two reasons.

1. Time is part of the created order. This is Augustine's view of *creatio cum tempore*, and seems a reasonable interpretation of most contemporary cosmologies. Hence, it is not meaningful to talk about God as everlasting as if there was time *before* the creation.

2. The presence of a timeless description, where the whole is a unit including all moments, suggests that it is possible to talk about the relation of God to this whole—and not God at one moment to the universe at that moment, differentiating moments in God.

God's transcendence as timelessness does not exclude that there is an order, and perhaps even a flow, within God which could be labelled God's time.

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4. Science and Theology: About God's Presence or God's Absence?

In the introduction I distinguished between a metaphysics which thematizes God's presence and one which thematizes God's absence. If God's presence is the starting point, the divine reality is somehow "showing through" in our ordinary reality. A religion along this line could be called mystical; the aim is to establish contact with that divine reality. It suggests the possibility of an inductive apologetic argument from science to theology.

The theme of God's *absence* suggests a contrast between the divine and ordinary reality. It therefore leads to a *prophetic* emphasis: judgment (it is not as it should be ideally) and appeal to conversion (change this world by orienting ourselves to the divine reality).

These two approaches result in different questions in the dialogue with the sciences. The 'mystical' approach would be more interested in the intelligibility of the traditional metaphysical attributes of God in the context of contemporary understanding. Tipler's paper is a clear example. When he raises the question whether his God of the Omega Point is *the* God, Tipler takes necessary existence as the criterion par excellence (159). The 'prophetic' approach might emphasize the *function* of any understanding of God: whether it allows humans to perceive their own reality more critically, and to do something about it whenever it is judged to be on the wrong course.

If the reality of God is somehow complementary to ours, the divine complement is expected to be reflected in a cognitive incompleteness of any understanding which leaves it out. Consonance is expected between the way the divine reality is and the way the world is. If descriptive consonance is lacking for a specific theology and a specific scientific understanding of the world, one has to doubt either the theology or the science. Although they espouse different theologies, it seems that it is primarily this approach which is followed by those who emphasized a 'critical realist' understanding of science and

of theology, like Barbour (1974), Peacocke (1984), Soskice (1985), and Polkinghorne (1986).

As argued above (section 2), contingency does not provide a basis for an argument for the existence of God. Science is neutral with respect to contingency and necessity. Contingency is not ruled out by complete theories, but it is not supported by anthropic coincidences either. Generalizing, there are good reasons to doubt whether a cognitive argument on the basis of science for the necessity of a divine reality can be based upon contemporary science. Even the global ontological contingency allows for different stances, either taking the universe as a simple brute fact or ascribing it to a transcendent cause. There is no support from science for a divine reality which is somehow present as complement to our world.

As the cognitive inductive argument fails, one could appeal to revelation, or inner experience, or anything outside the public discourse. However, such a fideistic option is not attractive for those who want to do their theology in dialogue with science. Theology, as Pannenberg defends, poses universal claims, and should defend these in the public sphere (see Chapter 2 of this volume).¹³

Theologians seem to be caught between the ambiguity of inner-worldly evidence, as the information provided by the sciences does not offer a decisive clarity about the existence of God, and the need for a public account for one's convictions. I suggest that, instead of trying to resolve the ambiguity within the scientific realm, 'the God hypothesis' might be introduced precisely in that context.

It seems that modern science shares in the ambivalence of modern life-experiences: we would like to have meaning, but do not really find it. In the face of the apparent meaninglessness and irrationality of the world, there seem to be three possible positions.¹⁴

First, some argue that the meaninglessness is only apparent. If one would open one's eyes, meaning would be perceived as really there. Such a position seems to me a major current in the New Age movement; the "crisis is essentially a crisis of perception" (Capra 1983, xviii); we are on the brink of a reenchantment of the world (Berman 1981). Although with a different metaphysical view, those who defend the complementary nature of the divine reality also suggest that meaning is really there; the absence exists only in a narrow, reductive perspective on the ordinary world. Others accept the world as meaningless; religion is perceived as a great denial of this pointlessness.

Might it not be possible to argue a third course between those two positions by introducing the hypothesis of a transcendent God as a conjecture about meaning for this world without denying the reality

of its irrationality. This leads to a theology which starts from the experience of God's absence. This corresponds to an understanding of the divine reality as, primarily, different from our ordinary world. Philosophical theology becomes primarily reflection upon injustice in this world, upon values, upon activities against injustice, and upon ways to live with failures and losses. The confrontation with the natural sciences seems less relevant for such a theology with its human-centered, and perhaps even political, emphasis. However, such theologies too go with metaphysical views.

The preceding proposal might be misunderstood as one more in the anti-realistic camp. It portrays God as a merely subjective notion, useful in some language games and dispensable in others. However, I hold our knowledge to be unavoidably hypothetical, but nonetheless purporting to refer to something real. This view differs from that of the 'critical realists' not because it does not intend to be critical or to be about a reality; but because it accepts that there is no warrant for an approximate correspondence between our conjectures and the reality they purport to describe. If evil is really evil and injustice in this world is not illusory, any proposal for meaning is just that: a proposal, a conjecture about the possibility of a better world, or this world better, 'dreaming of peace'. The constructive nature is not only a limitation of our knowledge; it reflects the nature of the theological enterprise in an imperfect world.

If one accepts the ambiguity of science one cannot avoid that God's reality remains a conjecture. However, once this assumption is introduced, one should explicate and develop its meaning in an intelligible way, and hence in terms which fit our contemporary scientific understanding. We construct our metaphysical understanding of God.¹⁵ Its adequacy will be judged by its harmony with the scientific understanding of the world and by the way it is a suitable metaphysics for the primary existential reason for the introduction of the hypothesis God: it should provide a framework which makes it possible to live and act in an imperfect and unjust world. Such a metaphysics should allow for a theology which is primarily prophetic, aimed at critical relativizing of the present status quo and evoking a response. Such a theology needs a difference between what is possible and what is actual. The future is one which we make, not one which is definitely enfolded in the cosmic process. Theological adequacy requires an emphasis on the present, instead of some 'other time' or 'other place', and on evocation instead of the promise of a happy ending. The present is where we live, and where our acts can make a difference; to make a difference assumes that the future is not determined.

God can be understood primarily as transcendence related to the present. It is in the present that the inner-cosmic temporal dimension (our acts with respect to the immediate future) is confronted with the atemporal. God is atemporally transcendent, a metaphysical principle of contrast, of otherness, but God is such in relation to each present. There are, at least, three aspects of such an understanding of God.

1. God would be the location of values, which provide the basis for judgement. Locating the values in God seems fitting for three reasons, aside from fitting the prophetic criticism of the present state as not being according to God's vision. (a) Values are abstract, and in that sense eternal. They bring the non situational into the moral deliberations concerning a specific situation. (b) God is perfect and just, the fundamental nonmoral and moral values understood to be sought for in eschatology. (c) God is beyond our grasp. We cannot appropriate the ultimate values as if we know them exhaustively. Fanaticism which does not allow for the possibility of being wrong does not fit.
2. God would be the locus of possibilities. The past is that which was; however, in God there is the contrast of that which could have been. The future will still be one course among the many possibilities; the possibilities metaphysically precede the actual single future. This assumes that there are the alternatives for our actions, and hence that an understanding of theology as being after judgment and evocation is meaningful.
3. God is also transcendent as the source of reality, as its eternal ground. This latter component is not an affirmation about a remote destiny but about our present lives. Affirming the goodness, despite evidence of imperfection, may contribute to the overcoming of anxiety.

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5. Questions Concerning Pannenberg's Approach

The thought of Wolfhart Pannenberg on the issues of contingency and time, as well as on method and God's presence and absence, is extensive. The following are some very rough impressions, which might well be mistaken. Hence, the questions might be understood more as a request for further clarification than as a definitive criticism.

Pannenberg seems to relate science and theology cognitively in two ways, which could be labelled inductive and deductive. Both reflect his interest in the universality of theological claims.

1. An inductive-apologetic approach is most clearly present in his anthropological writings.¹⁶ Secular anthropology needs a religious dimension. This dimension correlates to an external reality.
2. Deduction from theology to claims about the world is more explicit in discussions about physics and biology. For example, "the theological affirmation that the world of nature proceeds from an act of divine creation implies the claim that the existence of the world as a whole and of all its parts is contingent" (Pannenberg 1993b, 34). It is this stance which allows for "theological questions to scientists" (Chapter 1, above). It also bears upon the nature of science. "If the God of the Bible is creator of the universe, then it is not possible to understand fully or even appropriately the processes of nature without reference to that God." (38)

God is cognitively necessary; the sciences are incomplete (the inductive approach) and must be incomplete (deductively seen from theology). If "nature can be appropriately understood without reference to the God of the Bible, then that God cannot be the creator of the universe, and consequently he would not be truly God and could not be trusted as a source of moral teaching either" (38).

The question is how this relates to the discussion of contingency as given above. How about the equal absence from physics of contingency and necessity, as Pannenberg asks what modern physics has to say about contingency (1993b, 35). How about his response to the search for complete unified cosmological theories? How about the ambiguity of the contingency as reflected in the anthropic coincidences? And how about the global ontological contingency? Is God an explanation for the universe, as Swinburne has it? Or is the statement that God created the universe not explanatory, but rather intended "to keep our consciousness alive to the mysteries of awesome majesty that we might otherwise ignore", as Misner (1977, 95) maintains? These questions are not merely about contingency. They bear on the distinction made above between a mystical and a prophetic metaphysical scheme, to which we will return below.

Another question concerns Pannenberg's view of time and the whole of time. He seems to argue from the primacy of eternity, or the whole of time, or the infinite, to the primacy of the future (1993b, 43f). The argument needs for its cogency the idea that it is the future which makes the whole complete; past and present are already available.

Pannenberg makes the transition from 'whole' to 'future', hence from the timeless level of description to the description from within time, for instance when he refers to "future wholeness" (1993b, 43),

and concludes to a priority of the future (1993b, 43). This seems unclear and deviating from the physical understanding of time.

If one focusses on the evolutionary picture, one has a past and a future with respect to any assumed presence. However, past and future are equally 'not-present'. Completeness is not achieved by moving towards the future, as with each change in present there is also a change in the 'not-present'.

Completeness is only achieved, within the context of physical understanding, by moving to the other level of description, in which all times are equally present at once. However, this level of description is atemporal; it is meaningless to consider such wholes as future wholes; they just are the entities of the theory, and hence of reality as described by that theory.

I would suggest that it might be possible to maintain the notion of anticipation of completeness in every present as an expression of the relation between the two descriptions (cf. Tipler, 1988). It appears not in line with physics to understand the completion as anticipation of something future. Anticipation becomes an expression for the way the complete history, past and future with respect to that present, is related to that present.

A third, more general, cluster of questions concerns the general nature of the program. Does Pannenberg fit into my division between a 'mystical' approach to the relation between science and theology which emphasizes God's presence in the world as described by the sciences and a 'prophetic' one which emphasizes God's apparent absence, or at least the ambiguity of the data? Is he, as appears from his quest for a religious dimension in secular understanding, opting for an understanding of God as a complement to, and present in, our reality? This seems to fit with his description of God as the 'all-determining reality' and with the (apparent?) determinism from the future, hence the determinism towards a 'happy ending'. That might be an understanding of God's trustworthiness in promises, and hence comforting. But how does Pannenberg avoid the theological dangers of such an approach: the danger to the sharpness of evil, injustice and imperfection, and hence of judgment, and the danger that we fail to hear a call for conversion, for doing whatever we can do against injustice and evil?

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Notes

1. In Drees (1990, 136–141) I dealt more extensively with some of these issues, while offering an analysis of Pannenberg and Tipler. As made clear there, the apparent similarity with respect to the emphasis on the future does not survive close scrutiny. Whereas for Pannenberg the future safeguards contingency and freedom, for Tipler the future excludes them.
2. 'Global' is cosmological; not restricted to our globe, the Earth.
3. The Hartle-Hawking proposal has been discussed in relation to theological ideas by Isham (1988) and Drees (1988; 1990, 51–57).
4. It need not imply finiteness for the universe described by the theory; finiteness is only required for all possible outcomes of observations.
5. This suggests that observational falsification of such a complete theory would mean falsification of either the esthetic assumptions or the assumption of mathematical formalizability.
6. For a popular introduction, see Gleick 1987.
7. Hawking used 'strong anthropic principle' for the idea that there are many universes or regions with different laws and 'weak' for different initial conditions. But he also used 'strong' in relation to purpose: "the strong anthropic principle would claim that this whole vast construction exists simply for our sake" (Hawking 1988, 126). This seems confused. The distinction between laws and initial conditions is unessential. The distinction between an anthropic principle working as a selection effect on observations of laws and conditions and one which expresses a claim of purpose seems useful, but misses the specific nature of the SAP as well. SAP, as introduced here following previous authors (Barrow and Tipler 1986), does not in itself express purpose; the limitation on possible universes might have another explanation, for instance in the process of origination.
8. This seems the position taken by the cosmologist Roger Penrose. He suggests as an explanation for the isotropy and homogeneity of the universe a new law of physics which would imply that initial singularities must have certain properties. As he sees it, the universe is much more homogeneous than necessary for our existence—and hence an anthropic 'purpose' could have been realized in a vastly 'cheaper' way (Penrose 1981).
9. There is one sense in which the Hartle-Hawking theory can clearly be understood as creation from 'nothing'. Ordinary calculations in physics often assume a state at one moment and laws to calculate the state at another moment. In such situations we might say that the second state arises out of the first state. There is in the Hartle-Hawking theory a timeless level of calculation. In such calculations there is no reference to any state other than the 'resulting' state. As states are compact, they are the

only boundary present in the calculation. The theory gives a precise meaning to the notion of 'nothing' as absence from other boundaries in the calculation.

10. The problem seems to express itself technically as the normalization of the wavefunction of the universe, as well as the interpretation of the resulting probabilities.
11. Tipler (170–180) seems to deny this distinction between mathematical and physical existence. Existence is defined by Tipler as the experience of people, perhaps simulated people, of their own existence. The experience of existence is, as I am willing to concede to Tipler, the same for real existing entities and for their perfect simulations. The issue is the identity of indiscernibles as a rule, and the identification of a universe with its perfect simulation as the case of application. Even if we cannot tell them apart, they still are different, if imaginary, considered 'from the outside'—and therefore they are conceptually different.
12. All the features mentioned in the text appear also in Tipler's article, especially in his discussion of the *aeternitas* as exemplified by the Omega-point (168), and his exclamation 'there is no time!' when he discusses quantum cosmology (176). Time turns out to be variation along a trajectory (176). The classical trajectories that turn out to have a significant probability correspond to the shortest path in the example about light. One could say that time is a phenomenological construct.
13. Those who take a purely logical approach to the relation between theology and the natural sciences, like Plantinga (1974) or Brom (1982; 1984), defend only the logical possibility of combining certain beliefs; they fail to defend them as reasonable or even compelling.
14. An article by Hans Kippenberg, University of Groningen, on Max Weber's ideas about the disenchantment (*Entzauberung*) of the world and possible rational answers, functioned as the context of discovery.
15. Mary Gerhart and Allan Russell have presented a method in science and in theology, as well as for the interaction between the two, which is similar to what I intend (Gerhart and Russell 1984).
16. "Man's chronic need, his infinite dependence, presupposes something outside himself that is beyond every experience of the world. Man does not simply respond to the pressure of his surplus of drives by creating for his longing and awe an imaginary object beyond every possible thing in the world. Rather, in his infinite dependence he presupposes with every breath he takes a corresponding, infinite, never ending, otherworldly being before whom he stands, even if he does not know what to call it. . . . Our language has the word 'God' for this entity upon which man is dependent in his infinite striving" (Pannenberg 1970, 10).
17. "The aim is to lay theological claim to the human phenomena described in the anthropological disciplines. To this end, the secular description is accepted as simply a provisional version of the objective reality, a version that needs to be expanded and deepened by showing that the anthropological datum itself contains a further and theologically relevant dimension." (59)

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