

A Process Cosmology

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Alfred North Whitehead thought that the universe has always existed. Every actual event or occasion is conceived of as a synthesis of its past actual occasions. This means that every occasion whatsoever has its own past, ad infinitum. God's role consists in proposing aims for each creature, not in bringing the whole world into existence. He did not reckon with the Big Bang, which can be interpreted to be in harmony with creation ex nihilo, such that there is an absolute beginning to the world. Without settling whether the world does or does not require such a beginning, we can examine what would be required if it should prove necessary that there is a beginning. What modifications in Whitehead's metaphysics might be needed in that case?

A Process Cosmogony

Theologians have defended *creation ex nihilo* for centuries, while in recent decades science has come to affirm the BigBang. Many, if not most, scientists refuse to speculate about what might be ‘prior’ to the BigBang, arguing that we cannot know, certainly not empirically, what could have transpired then. Stephen Hawking, however, is willing to argue that it came into existence out of nothing, at least out of nothing material. Yet this does not require any transcendent creator. Initially, the world was extremely small. It did not obey the laws of ordinary physics, but the laws of quantum mechanics. I’m sure his extended argument is much more nuanced, but the gist of it was that some elementary particles simply pop in existence out of nothing, and this could be the origin of our universe.

Since spacetime, seen backwards, converges on a point, he argues that there could have been no time in which God could have created it. The argument that time and the world must coexist was anticipated by St. Augustine. He advanced it as a way of explaining how a purely nontemporal God could create a temporal world. God’s act of creation is nontemporal; only its result is temporal. Since I’ve argued elsewhere (Ford, 2009a) that concrescence, the act by which an actual entity creates, is temporal. Both act and its result are temporal. Besides, there’s no way in which a purely primordial God could influence the world. To be sure, the initial aim influences each occasion, but how could a purely nontemporal being specify that aim? We may suppose that each occasion in its hybrid physical prehension selects the appropriate aim, but how could this be, if the nascent occasion does not yet have any powers of selection, and must be guided by the aim it does not yet have in selecting that aim?

I mention Hawking’s argument to suggest that there could be a convergence of opinion among scientists and theologians that the world originated from nothing. Suppose that were to become the case. What would be its impact upon the process thinking of Alfred North Whitehead? He argued that since every actual event or occasion requires prior occasions, the world has always existed. His conception of God is quite different from the traditional one. God is not omnipotent, nor does God know the future. God influences each actual occasion through persuasion by supplying each with its initial aim. This essay means to be speculative: what modifications need to be made should it turn out there is a beginning to the universe? Otherwise it could mean that process thought is inadequate with respect to this crucial issue. It could mean that his philosophy would become increasingly irrelevant to the ongoing philosophical endeavor.

1. Some Preliminary Considerations

One issue in particular troubles process theists. They recognize and affirm the deep interconnectedness of the world and God. Does this mean that if the world comes into existence, that so

does God? If so, how would it be possible for God to come into existence out of nothing? To be sure, any consequent prehending of the world could only come into existence with the world. The primordial nature, being nontemporal, is exempt from these concerns. Yet how can the primordial nature create *ex nihilo*? This impossibility did not trouble traditional theists, who relied on an amalgam of Hebrew creation with Greek immutability. How this was possible was declared a mystery rather than a problem calling for considerable revision. I opt for a purely temporal God who has existed before the world (Ford, 2012). What does God then do prior to the world? God may be contemplating possible worlds, and possibilities within those world. In a way this is formally similar to the multiverse hypothesis. Yet that hypothesis assumes all these worlds actually exist, and we happen to dwell in one of the most sophisticated ones. That leaves to blind chance that our world exist rather than it arise as the result of a cosmic intelligent creator. The multiverse hypothesis, not making clear how those myriads of universes can come into existence, as well as ignoring Ockham's razor, seems to be primarily a device for avoiding any intelligent selection.

Process and Reality gives no hint of any origin for the universe. Every actual occasion has the same metaphysical character and prior conditions. Each prehends in the same general way. Moreover, every actual occasion requires other actual occasions for its physical prehensions. Without them there would be nothing to unify in concrescence. Thus for him there must be occasions all the way back, without beginning. There may be other cosmic epochs, but he speculated that these would be continuous with one another. The notion of a discontinuous epoch or epochs such as that postulated by the Big Bang in contemporary astrophysics was not considered. It was not prominent in his day. On the other hand, we might consider that continuity of relationships to be necessary for all those occasions within the web of our world. (This discontinuous cosmic epoch may or may not have other cosmic epoch.) If so, those on the edge of this world might have no past. If it has no past, this contingent feature would require a transcendent creator to bring it into existence. Metaphysical necessity would apply within the web of our world, but it could not be absolutely universal, since qualified by an initial cosmic contingency.

By its subtitle, *Process and Reality* is "an essay in cosmology". On the other hand, only a half-chapter (Whitehead, 1978, 96-109, hereafter PR) concerns "the more special possibilities of explanation consistent with our general cosmological doctrine, but not necessitated by it" (PR 96). I take it that for Whitehead, Cosmology is a metaphysical study of the necessary principles of the world, perhaps in contrast to another branch of metaphysics, (philosophical) Theology. Mine is not an essay of exclusively necessary principles, for the very existence of the world is here regarded as contingent. Besides a cosmological metaphysics and a contingent scientific cosmology, there could be an intermediate form of cosmology based on contingent non-empirical general concepts of the world. Cosmology, and particular cosmogony, need not be based only on necessary non-empirical or on contingent empirical claims. [Rem B. Edwards, *What caused the Big Bang?* (Amsterdam and New York: Rodopi Press, 2001) examines the leading scientific contenders for a theoretical explanation, noting that most are, like philosophy, non-empirical. Perhaps we should also classify these as contingent non-empirical accounts.]

In developing his cosmology, Whitehead's strategy was to determine the necessarily properties of an actuality, allowing that account to apply both to humans and to the merest puff of existence in outermost space, and all in between. This calls for a theory of diminishing degrees. This abstract account

must be sufficiently complex to apply to human existence, and then by diminishing degrees to all the rest. A cosmology describes in the most general terms the present state of affairs, while a cosmogony explores how we got there.

A cosmology does not help to explain how the world and its complex actualities could ever explain how they came into existence. A process cosmogony such as this begins with a much more general view of actuality. It minimizes what is necessary for actuality, and increases what is of contingency. If the more complex is temporally emergent from the less complex, its emergence is novel, never having existed before. All novelty is contingent, for were it necessary, it would have already existed. I seek to maximize novelty with respect to the types of actuality, in place of one necessary common structure for all actual occasions.

Whitehead's argument for a never ending world, as an a priori reflection, cannot be faulted. It may become increasingly inadequate, however, the more the Big Bang is seen to be the truth concerning the universe. Process philosophy runs the danger of being marginalized for many, just as scholastic thought was by the rise of modern science in the seventeenth century. To be sure, it is possible to accommodate the Big Bang with more orthodox process thinking by construing the world to be created out of a chaos rather than out of nothing. It is difficult to see how chaos or pure disorder could ever be empirically distinguished from nothing, but if chaos is conceived of in terms of actual occasions going all the way back, or leading to an infinite succession of cosmic epochs, it suggests a stable metaphysics for the world. That is one alternative. But I wish to explore the other alternative, which identifies the Big Bang with creation *ex nihilo*. [I have explored the opposite alternative, the denial of creation *ex nihilo* in "An Alternative to Creatio *ex Nihilo*," Religious Studies 19/2 (June 1983), 205-213.]

Is the notion of a prior nothingness conceptually impossible? If it were an absolute nothingness, yes. The maxim, that nothing can come from nothing certainly applies here. As Hartshorne argues, that there is something is necessarily true. Creation *ex nihilo*, however, presupposes that there is a Creator. That something is God. The nothing is the nothing of the world. It is another question whether the process God can bring a world into being from nothing.

In classical thought, God must possess all perfections. If so, the world cannot contribute any further value to God, and is ultimately worthless. If the world enriches God, then God without the world would be impoverished. This, however, could be a relative matter. God need not be absolutely impoverished if God were to exist by godself, but only in comparison with the existence of the world. For God was not impoverished during the more than ten billion years before the emergence of life, but only relatively so in contrast with the presence of life, let alone human life. The values of novelty and finite contributionism should outweigh any considerations of hypothetical impoverishment with respect to any comparison with future states. Any future possibilities do not have the ontological weight that present actuality might have.

What if there were some absolutely basic principles such that God and the World necessarily require each other? Then for God to be everlasting, the world would have to be everlasting as well. If so, there would be no beginning to the world. In that case, however, 'world' might be very vaguely understood indeed. It could simply be the actual existence of something finite other than God. It certainly need not be our universe. Some world must then exist, but it need not be our own. It could even

exist in some other spatiotemporal dimension. Even so, our world could be created *ex nihilo*, having no relevant precedents.

Whitehead distinguishes between two natures of God. Note that it is only the consequent (or temporal) nature that requires a world which it couldprehend. The primordial (or nontemporal) nature could exist apart from the world, with the consequent nature coming into being with the advent of the world. To be sure, such a primordial nature need not contain the plethora of eternal objects which are only relevant to our world.

God must be temporal to create, and I have argued that Whitehead's God should be reconceived as purely temporal (Ford, 2012). Without the world, there could be no consequent nature. A purely nontemporal being, if conceived as only primordial, as the nontemporal actual entity, could not bring about temporal beings. Classical theology sought to reconcile divine nontemporality with creation *ex nihilo*, because it was committed to these two traditional doctrines, but only by appealing to an ultimate mystery. Since God created the world, and was deemed to be nontemporal, therefore a nontemporal being created the temporal world.

Robert C. Neville asserts that God determines the basic principles, rather than that they are necessary in themselves because they have no conceivable alternatives.¹ They need not be nontemporally determined, however, nor need they be decided out of pre-existing possibilities. Their determination is of a piece with the determination of the contingent cosmic constants. There are a handful of constants, necessary for the emergence of life, which pervade the universe, possibly even from its very beginning: constants such as the gravitational constant, or those associated with the valence of carbon, or the constant of cosmic expansion. Since these are numerical properties, they could easily have been otherwise. In that case, were these constants to have different values, life as we know it might well have been impossible. The determination of these constants, particularly billions of years before they would be needed, points to some divine intelligence. [I recommend the third chapter of Neville's *Theology Primer* (Albany: the State of New York University Press, 1991) for a succinct and accessible account of his central position. See his *Creativity and God* (New York: Seabury Press, 1980), pp. 46f for an important discussion on metaphysical first principles. -The principle that everything determinate requires an act of determination may well be construed as a version of the ontological principle, only that Neville applies it to nontemporal determination. For me, the determination should be temporal.]

Divine determination is clearly a manifestation of God's power, but it is not miraculous in the sense that it is an interruption or violation of natural law. The laws of nature are incrementally established by the successive acts of divine determination. Prior to each there are no natural laws to be violated.

Creation *ex nihilo* is often invoked to distinguish it from ordinary causation, which always has antecedents. I understand creation to be essentially concrescence, which brings new being into being. Such creation is an ongoing shared affair between God and the creature, although this permits the creative process to be actualizing itself without any beginning. Philip Clayton has shown, however, that even within a process context there are religious reasons for creation *ex nihilo*, although he does not speculate on any identification with the Big Bang. ["Open Panentheism and *Creatio ex nihilo*," *Process Studies* 37.1 (Spring 2008), 166-83.]

On the other hand, there is another major objection to any process creation *ex nihilo*. It would take unlimited power to bring about such creation, and such omnipotence is incompatible with freedom, the self-power of the individual actuality. This is an insurmountable obstacle, if God's power towards the world is ever the same. [See, e.g. Charles Hartshorne, *Omnipotence and Other Theological Mistakes*. (Albany: State University of New York Press, 1984).]

Yet what if divine power towards our world were variable? Suppose that while the Big Bang requires omnipotence (there being then no other power in existence), God might subsequently voluntarily limit divine power with the advent of creatures with greater and greater complexity and freedom. In fact, the evolution of the world might consist in the increasing donation of power to actual occasions. This is somewhat akin to nurturing children to become adults. As newborn, the child is practically helpless, but gradually acquires power (freedom) in the process of growth. God increases power in raising up at least some of the creatures over millions of years. This sharing of power leaves less for God, at least with respect to this world. If so, this combination of divine aims and individual self-power at present yields a situation best described in terms of divine persuasion. Traditional thinking tries to reconcile omnipotence with human freedom by placing them on different levels. Whitehead puts both on the level of creative actualization, such that the self-power of freedom could be a qualification of divine power. This "freedom" is generalized to apply to all creatures.

This notion of sharing power in creation is made possible by Whitehead's introduction of the distinction between being and becoming. Freedom is vested in the becoming of an actual occasion. Other theories of creation see God as the sole creator of a being, which then may or may not have its own freedom. It is not a necessary part of its original actualization.

The usual theories of divine self-limitation have been criticized on the grounds that if God limits divine power, God can reassert it at any time, such as for miracles understood as exceptions to the laws of nature, or for the end-times. I am proposing a permanent self-limitation, for a temporary one is not necessary for God. Provisional self-limitation assumes that only omnipotence is appropriate to a perfect being. I hold that the sharing of power enriches divine power. Later modifications in self-limitation, although a needed concession for fallible creatures, would undercut the perfection of the original divine decision. Thus the particles of the world, once created, retain their nature at least for this cosmic epoch. The further complexities of life and mind build on the foundation of these particles.

The overarching purpose of creation thus consists in the relinquishment of power to the creatures. After all, any world God could unilaterally create could be perfectly imagined. It would not be worth creating. It would not provide any novelty for God. Divine creation is perfected by making each introduction of power permanent, so that it is henceforth inherited by occasions from other occasions. On this early level creation may be considered as a gradual deism of successive divine acts. What God unilaterally creates, God leaves alone. Earthquakes, volcanoes, hurricanes, tornadoes, once initially formed (doubtless for very good reasons), are left to their own devices. What the lawyers call "acts of God" are precisely those which are not, except with respect to their origin millions of years in the past.

Freedom evokes a dialectic between spontaneity and commitment. We humans make few lasting commitments, partly in order to allow for later spontaneity, partly because we cannot anticipate the future well enough to make perfect commitments. If driven to the extreme, our fear of commitment may result in our making only insubstantial, ephemeral, inconsequential acts. In contrast God's acts determining the

structure of individual occasions, particles, living occasions, and enduring minds should be perfectly permanent. To violate these structures by subsequent decisions would undercut the original divine decisions. God plays for keeps.

This gradual donation of power starts already with the most primitive elements. It accompanies the evolution of organisms, and even of matter. Whitehead called for the evolution of matter, not just the evolution of plants and animals:

Nature exhibits itself as exemplifying a philosophy of the evolution of organisms subject to determinate conditions. Examples of such conditions are the dimensions of space, the laws of nature, the determinate enduring entities, such as atoms and electrons, which exemplify these laws. (Whitehead 1967 [hereafter, SMW, 93).

He contrasts his theory of events with materialism:

... a thoroughgoing evolutionary philosophy is inconsistent with materialism. The aboriginal stuff, or material, from which a materialistic philosophy starts, is incapable of evolution. (SMW 107)

Only if you take *material* to be fundamental, this property of endurance is an arbitrary fact at the base of the order of nature; but if you take *organism* to be fundamental, this property is the result of evolution. (SMW 108)

Nevertheless, there is no theory for the evolution of matter in *Process and Reality*. Nor is there any theory for other emergent stages, even though this was a staple of evolutionary cosmologies of his day, such as those by Samuel Alexander or Lloyd Morgan. I suspect this was due to his single minded concentration on the most general and necessary features of actual occasions. Life and mind are contingent affairs. Before there was life there could be no life. Life could not be a perfectly general feature of all things. Before there was matter, there was empty space, and possibly before that nothing. Consciousness is recognized as contingent, and these other stages should be so considered. Despite the fact that such stages of evolution are not mentioned, each occasion has the potentiality for emergence, for each in its own way as an instance of creative concrescence. It is an instance of the creations which constitute evolution.

2. The Initial Creation

If the BigBang is contingent, yet God is necessary, what is the status of God “prior” to the BigBang? The traditional response is that God is nontemporal, which applies to the primordial nature apart from the consequent nature. That solution has its own problems, particularly how there could be the creation of anything temporal. Since I argue that propose that we conceive of God as purely temporal, yet everlasting, God exists prior to the world. Then God could be entertaining possibilities for the world, and possibilities within the world.

Space is conceived as a plenum of occasions (PR 77). Insofar as these occasions occupy regions of space which have no particles or more complex actualities, those regions are considered ‘empty’. Such occasions exist now, particularly in interstellar and intergalactic regions, and have existed all along. If

there is an absolute beginning to the world, however, the first generation of such occasions has the peculiar feature of having no past.

If so, having a past would not be an essential property of these occasions. They would have the capacity to be influenced by the past, were there any past, but they would not require a past. If so, the question whether there is a past or not would be an empirical question. Their other characteristics would be minimal. They need only have a hylomorphic structure, whose ‘matter’ consists of creative activity, and whose form individuates that creativity. Subjectivity, in its most attenuated instance, is the present activity of an actuality, contrasted with all external influences. Thus subjectivity is an actual instance of creativity, made possible by its form. This form is constituted by the initial aim provided by God. This is creation *ex nihilo*, but divine creation also extends to all occasions, not just to the first generation.

Divine influence by means of initial aims is formal causation, usually understood in process circles in terms of persuasion. From my perspective, however, persuasion is only one kind of divine causation. Persuasion (and coercion) presuppose subjectivity developed to the point of purposeful decision. It also depends upon the scope of possibility involved. Possibility is generally a cluster of relevant eternal objects (Ford, 2007). Then the initial aim can be reduced to unity by concrescent decision:

This basic conceptual feeling suffers simplification in the successive phases of the concrescence. It starts with conditioned alternatives, and by successive decision is reduced to coherence. (PR 224)

If only one eternal object were provided at the outset, however, no creaturely decision would be possible. The same eternal object would characterize both the outset and the satisfaction. This could approximate the exercise of divine power in creating our world *ex nihilo*. Such divine activity is best described as determination, since as the foundation of subjectivity it cannot depend upon any prior subjectivity. Initial aim is always partly determinative, even when it is partly persuasive. Divine determination should not be considered coercive, for coercion as well as persuasion presupposes purposeful decision, which we shall see first emerges on the level of living occasions. Several acts of divine determination are needed for the development of such mature subjectivity.

Actualization, as we have seen, requires creativity other than the infinite creativity of God. I have argued that God as future activity instantiates creativity infinitely, in contrast to present finite creaturely instances. The past and the nontemporal have no creativity (Ford, 2000)..

Form, to be actualized in the world, must be other than that same form in God. Finitization of creativity enables form so to exist outside God, since the form of the initial aim specifies a finite region of creativity. Thus form and creativity are the preconditions for the subjectivity of prehension and concrescence. If aim is needed for subjectivity and prehension, it cannot very well be derived from any hybrid physical prehension, the special prehension Whitehead proposes for this. The aim is required at the very outset to determine the occasion’s spatiotemporal standpoint: “The problem dominating the concrescence is the actualization of the quantum in solido. The quantum is that standpoint in the extensive continuum which is consonant with the subjective aim in its original derivation from God “(PR 283).

God can be conceived as the infinite creativity of the future, in contrast to the present creativity of finite occasions. If so, the specification of creativity by aim may be seen to be the pluralization of divine creativity to constitute finite instances of present creativity. See (Ford, 2000).

Were God absolutely omnipotent, that is possessing all power, there could be no finite power. To be sure, if there were no world, God would possess all power. But it is ironic to conceive of God's power as omnipotence, if God's purpose in creating the world appears to be giving away that power gradually to the creatures. That donation of power can never become complete, for each creature must receive its subjectivity from divine determination.

The determination of the first generation even qualifies the initial omnipotence, to the extent that these occasions exercise any self-power. Since the first generation can have no past actualities, there would be nothing to unify. Although such an initial aim would be very narrowly determined, particularly if it is to include the all-pervasive cosmic constants (which then could be inherited by all other occasions), nevertheless such determination must allow some alternative activity for its creativity. These alternatives need not be differentially valued, however, since each is just as good as another. Thus their aimless activity would be entirely random.

The origination of the world required the generation of space to provide a place for the occasions of the world to dwell. More precisely, the expansion of space consists in the increase in the number and/or size of the occasions pushing the boundaries of spacetime outwards.

If so, then space would be severely contracted at the beginning. In accordance with the principle of the conservation of matter/energy, all the mass of the universe is understood to be concentrated in this moment. This can be accommodated within a process perspective by supposing that the original occasions are the ancestors of all other occasions, whether particulate or 'empty', are present in that moment. These occasions would be exceedingly small, possibly even infinitesimals. Each successive generation could be larger, leading to the expanding universe as we know it.

I distinguish sharply between spacetime and time without space. While spacetime has a definite beginning in the Big Bang, time might extend into the past indefinitely. Augustine had argued to the contrary, that time was created with the world. If so, God would be outside time, on the grounds that its creator cannot be subject to time. That view would be appropriate to Greek ideals of perfection as immutable, but it is less satisfactory for a process understanding of God.

I see time as created, but not with the creation of the world, if it were to have had a beginning. Before the world began, time pertained to the self-creation of God. More precisely, it is the measure of creation, both of the creative process and its product. Physical time, the time of empirical investigation, is the measure of occasions as superjective beings. But there is also time as subjectively experienced, analyzed in terms of concrescence (Ford, 2009a). If so, time is derivative from creating, and hence ultimately derivative from God. Before there was a world of spacetime, there was time as the measure of God's creative activity, possibly refining different alternatives for possible worlds, and different possibilities for this world (Ford, 2007).

3. Other Occasions of 'Empty' Space

Except for the first generation, 'empty' occasions prehend the past, including particles insofar as they come to exist. What they prehend (e.g. of gravity or of light) they transmit unchanged. There is no impress of their individuality on these influences. Their invisibility affords the transparency making the distant perception of objects possible. These primitive occasions prehend by virtue of the creative rhythm of many to one, whereby the many past occasions are prehendened as one.

Their aims are very narrowly specified with respect to their inner activity. This should not be considered coercion, for that presupposes some kind of freedom or self-power which is being curtailed.. Instead of 'coercive' and 'persuasive,' it has been suggested that we might use 'determinative' and 'contributive'. On the contrary, their aims promote a modicum of self-power, enough to sustain their actuality over against the divine. Since one purpose of divine creating is to enhance creaturely freedom, the strategy of building particles on 'empty' space, atoms on elementary particles, then molecules, macromolecules, living cells, plants, animals with minds, including humans, are ways of increasing creaturely freedom.

Although their nature is determined by their subjective aim, the most elementary of occasions possess spontaneity e.g. with respect to their motion. This self-determination is evidence by Heisenberg's uncertainty principle. Since one position is as good as another, these alternatives are equally valued.

Since these occasions have a past, their existence is compatible with there being no beginning to the universe. Each has a past, and that past occasion could have a past, ad infinitum. Except for first generation occasions, all our speculation concerning the origination of primitive occasions and more complex actualities is independent of the issue as to any beginning to the universe. They apply in either case.

There could be universes arranged in serial order linked together by such occasions, conceived as cosmic epochs. The model of expansion and contraction could mean that each contracting epoch could reduce all order to pure chaos (understood as composed of only primitive occasions), from which the new epoch could arise). The current scientific consensus, however, seems to be that there is a single expansion which will last forever. For it seems that the rate of expansion will not be overcome by the attractive force of gravity based on the total mass of the universe. There is also some evidence that the rate of expansion is accelerating, which we might expect if the number of primitive occasions increases the further out we go.

Yet it is also possible that our universe may be entirely disconnected from any other. In that case, our universe could originate as if it were *ex nihilo*, for it would lack any effective past. Whether there are any other universes probably will never be determined, at least empirically. There could possibly be purely theoretical reasons, but one should be rejected. It postulates perhaps an infinity of other universes, while the universe we happen to inhabit supports consciousness and intelligent life. All these universes are actual, and do not need any divine agency. This postulates an enormous expansion of the world just in order to deny theism. By applying Ockham's razor, we can reduce these actualities to possibilities, requiring a cosmic intelligence to specify which one should become actual.

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