

# *Human Nature in Theistic and Evolutionary Perspectives*

with Michael L. Spezio, "Social Neuroscience and Theistic Evolution: Intersubjectivity, Love, and the Social Sphere"; David Fergusson, "Humans Created According to the Imago Dei: An Alternative Proposal"; Thomas F. Tracy, "Divine Purpose and Evolutionary Processes"; Thomas Jay Oord, "The Divine Spirit as Causal and Personal"; and John W. Cooper, "Created for Everlasting Life: Can Theistic Evolution Provide an Adequate Christian Account of Human Nature?"

## DIVINE PURPOSE AND EVOLUTIONARY PROCESSES

by Thomas F. Tracy

*Abstract.* When Darwin's theory of natural selection threatened to put Paley's Designer out of a job, one response was to reemploy God as the author of the evolutionary process itself. This idea requires an account of how God might be understood to act in biological history. I approach this question in two stages: first, by considering God's action as creator of the world as a whole, and second, by exploring the idea of particular divine action in the course of evolution. As creator *ex nihilo* God acts directly in every event as its sustaining ground. Because God structures the world as a lawful order of natural causes, God also acts indirectly by means of creatures. More controversially, God might act directly within the world to affect the course of events; this action need not take the form of a miraculous intervention, if the natural order includes the right sort of indeterministic chance. In each of these ways God's purposes can shape evolutionary processes.

*Keywords:* creation; divine action; evolution; primary and secondary causation; providence; quantum physics

---

One of the leading strategies for reconciling Christian theology (and the Abrahamic theisms generally) with evolutionary biology has been to contend that evolution is God's way of making living creatures make themselves. This view has obvious attraction as a response to the claim that evolutionary explanations fully account for the appearance of design without any need for a designer. Part of the shock of Darwin's theory was that it came as a direct challenge to the then dominant version of the argument from design. In the decades before *On the Origin of Species* was published,

Thomas F. Tracy is Phillips Professor of Philosophy and Religious Studies, Bates College, 7 Andrews Road, Lewiston, ME 04240, USA; e-mail: ttracy@bates.edu.

the education of Anglican clergy routinely included thorough study of the writings of William Paley. Looking back later in life on his years at Cambridge, Darwin himself remarked that careful attention to Paley's *Evidences of Christianity* "was the only part of the academical course which, as I then felt and as I still believe, was of the least use to me in the education of my mind" (Darwin [1876] [1973], 61). Trained in this way, preachers confidently proclaimed that God's wise providence is everywhere illustrated in the marvelous suitability of each organism to its place in nature. Darwin's sweeping vision of biological modification through natural selection came as a profound challenge to this familiar theology of nature; it had the effect of putting Paley's God out of a job.

Some defenders of Darwin's new ideas quickly recognized, however, that theological anxiety could be lessened by immediately rehiring God for a higher level position, viz., as the author of the evolutionary process itself. This move to theistic evolution was made early in the nineteenth century debates; in the United States the Harvard botanist Asa Gray was a notable proponent of it in the 1860s, and although Darwin rejected Gray's approach, it remains a prominent option today (Gray [1876] [1973], 113–22). Part of the appeal of this view is that it encompasses evolutionary processes within the scope of God's creative will, and it does so while affirming the explanatory autonomy and integrity of the biological sciences; whatever the successes or failures, sufficiency or limits of evolutionary theory at any moment in its development, this account of God's relation to nature can be sustained without insisting that biology, for its own sake, needs to invoke God in its explanations.

If the idea of theistic evolution is left at this level of generality, however, it risks becoming merely a reassuring theological slogan, a promissory note not backed up by any conceptual hard currency. In order to give this view a more robust and specific content, we need to provide an account of how God might be understood to act in and through evolutionary processes. It will be helpful to approach this question in two stages. First, we need to consider God's action as creator and sustainer of the world as a whole. Second, we then can explore the idea of particular divine action in the world, specifically in the processes of evolution.

#### GOD'S ACTION AS CREATOR

The doctrine of creation has a long and complex theological history, and it is not uncommon to find it misunderstood or inadvertently caricatured in contemporary popular discussions. This happens, for example, in the threadbare but endlessly renewed controversy that juxtaposes "creation" and "evolution" as straightforwardly contrasting terms. We can access more interesting theological options by drawing upon a long-standing, though not uncontested, insight from the mainstream of the tradition: namely,

that the concept of creation is first and foremost about God's act of giving being to all finite things. Apart from this creative act there would be nothing other than the divine life itself; God does not simply give form to formless preexisting materials, wresting a cosmos from primordial chaos. Rather God's creative act is the absolute ground of the being of creatures; it is a "creation out of nothing." One important feature of this way of understanding creation is that it does not commit those who hold it to any specific position on questions about the beginning of the universe. It contends that all finite things depend continuously upon the creative and sustaining action of God, but this will be true whether the universe sprang into existence at a first moment of time or has always existed throughout an endless succession of times.

Further, this view has typically affirmed that creation is an intentional divine action, not an involuntary emanation, as in some forms of Neo-Platonism. God could exist without a world of created things, and the existence of such a world reflects God's loving generosity in giving being to creatures. For this reason, classical conceptions of creation also differ from most forms of process theism, according to which God-and-world together constitute a metaphysically fundamental structure of creative becoming that God shapes with unique scope and efficacy, but that God does not ground or originate. By contrast, the classical theological doctrine understands creation as a unique and entirely asymmetric relation in which God calls the world into existence *ex nihilo* and sustains it at every moment.

This understanding of creation has important implications for the way we conceive of theistic evolution. First, it entails that God acts directly in every event in the world's history. This divine creative agency both utterly transcends the activity of creatures and is radically immanent within the created world. God's action transcends created causes insofar as it is metaphysically prior to them as their source and ground. This action does not show itself *in* the world except through the existence *of* the world; that is, it does not merely bring about particular *changes* in the properties or relations of created things, but rather brings about the *creatures themselves* along with all their properties and relations. Precisely for this reason, however, God's action is radically immanent within the world; it is the immediate impartation of existence to each creature, an action that sustains created things at every moment in all of their activity, and so it is closer to them than they are to themselves.

#### GOD'S ACTION THROUGH CREATED CAUSES

The theological tradition that developed this view of creation almost always contended (contra "occasionalism") that God grants to finite things causal powers of their own, a set of specific capacities to affect and be affected by

other finite things.<sup>1</sup> The world therefore constitutes an ordered structure of natural (secondary) causes, a structure with an integrity of its own that the natural sciences seek to describe. This creaturely causality must be sharply distinguished from God's (primary) creative agency; creatures cause changes in other creatures, but they do not bring other creatures into existence, except in the sense that they cause the changes that constitute, for example, birth and death. When it is said that God "causes" the creature's existence, we must remember that in this case the term is used analogically, and that no creature ever "causes" in this sense.

By virtue of creating and sustaining creatures that stand in regular causal relations to each other, God can be said to act through their activity. This gives us a second sense in which divine agency is involved in events in the world, including the events of evolutionary history. Not only does God act *directly* in "causing" the existence of creatures, God also acts *indirectly* by means of the operation of created causes. We can make use of this idea of indirect divine action through secondary causes to elaborate a story about God's role in evolution. In establishing the causal laws and initial conditions of the universe, God sets the terms of the world's history from the big bang and inflation to the formation of stars and the production of heavy elements to the aggregation of these elements in planets and the emergence of life on earth to the eventual death of our sun and the dissolution of our planetary system. All of this can be regarded as series of divine actions carried out by means of the natural order that God has established.

There are at least two different ways of developing this view. The simplest version relies upon a deterministic picture of the natural order. In a causally complete deterministic system every event forward and backward in time can be deduced from the conjunction of (1) a statement of the relevant laws, and (2) a complete description of the state of the system at any moment. If God were to create a world of this sort, God would precisely specify every event in its history, and each of these events would be an indirect divine action brought about by means of the causal structures of nature. This is a familiar pattern of action attribution; we typically describe as an intentional action the effects we seek to bring about by setting in motion causal sequences in the world; for example, a motorist performs the action of stopping for a red light by stepping on the brake. Of course, our attempts to make use of the world's causal structures often go awry (e.g., the road may be slippery, so that the car slides into the intersection). But this will not be a problem for God, who can establish just the right causal conditions to produce all and only the effects that God intends. In such a world, the entire course of evolutionary history will be provided for in God's creative act. The emergence of rational moral agents, and indeed the existence of each of us here and now, can properly be described as an

intentional action of God. This conclusion is not in the least undercut if we acknowledge that this divine intentional action was carried out through a staggeringly vast series of natural causes developing over billions of years, rather than by a specific supernatural intervention in biological processes. Theology need not insist on the incompleteness of biological explanations in order to affirm that God's purposes are at work in evolutionary history.

Suppose, however, that we reject this thoroughly deterministic picture, as I think we should. In this case, the account of indirect divine action through the natural order will need to be more complex and qualified. A world whose history does not unfold entirely in a deterministic lockstep will include events that have necessary but not sufficient natural causal conditions. God's creative act structures the role of these underdetermined events, fixing the boundaries of permitted variation and the scope of their effects. But if God chooses to create such a world, and if the divine purposes are enacted exclusively by means of natural causes and agents, then there will be developments in the world's history that are *not* individually intended by God.

This has well-known advantages in considering the problem of evil. Suffering and loss due to the misuse of human moral freedom (understood in an incompatibilist way) will be permitted but need not be intended by God. A similar point must be made about the qualified sense in which God could be said to intend "chance events."<sup>2</sup> In saying that an event occurs by chance, we are asserting not simply that we are unable to predict it (call this "epistemic chance"), but also that it is underdetermined by its causal conditions in the natural order; under precisely those same conditions, at least two different outcomes are possible, and nothing in the world's prior history specifies which outcome will occur (call this "indeterministic chance"). God may so construct the world that chance events conform to well-defined probabilistic laws and have a limited range of causal consequences in the events that follow from them. A world of this sort combines law and chance, reliable structure, and the capacity for novelty. As the creator of such a world, God will delimit the range of possible developments within it, but at least some of these developments will be left up to chance, and not determined in God's plan of creation.

If biological evolution hinges in part on such events, then its course will not be fully predetermined by God's creative act; God will permit life to develop in novel directions not built in at the outset. We can imagine God designing the laws of nature (both deterministic and probabilistic) to produce an evolutionary process that explores a bounded space of possibility.<sup>3</sup> It might, for example, be structured in a way that makes highly probable the emergence of rational moral agents, but does not guarantee that any of these moral beings will belong to a primate species of the genus *homo*. On

this account, our coming to be within the natural order can be attributed to God's action, but not to God's specific intention.

#### PARTICULAR DIVINE ACTION

So far we have been considering God's action as the creator of evolutionary processes. I want to turn now to the second stage of the discussion, and comment briefly on the idea of particular divine action within the world. We have seen that God acts directly in every event as creator, and that particular events can be regarded as indirect acts of God. But it might be thought that this analysis at best generates only a modestly refurbished Deism, according to which God acts exclusively as creator/sustainer, and does not affect the course of events once the world's history is under way. All of God's purposes for creation must, on this account, be built in at the outset. In a theology of this sort the concept of providence is absorbed entirely into the doctrine of creation; we might say that God *enacts* history but does not *act in* history. How might we take a further step, and conceive of God playing an ongoing role in shaping the course of events in the world, including the history of life? Can we continue to entertain the idea that particular divine actions in the world might introduce new developments that would not have emerged had God not so acted?

Many modern theologians have given up on this idea, declaring it to be incompatible with the findings and/or the methods of the natural sciences. Bultmann (1958), Gilkey (1961), Kaufman (1972), and Macquarrie (1977) all make arguments to this effect. The most common defense of this view, which I have elsewhere called the scientific veto argument, quickly falls apart when we take a close look at it (Tracy 2012, 59–61). These thinkers typically assume that the natural sciences either necessarily presuppose or have somehow established the truth of universal causal determinism. Let me make three brief points in reply.

First, suppose for the sake of argument that the natural sciences have a methodological commitment to seeking sufficient natural causes for each event within their domain of inquiry. It is a further, and unwarranted, step to conclude that there *always* are such causes to be found. This would require that the world is a *closed* system, immune to any causal factor that is not a part of the natural order. This is not, of course, a claim that falls within the scope of the sciences—it is not a matter of physics but rather of speculative metaphysics, and it is a view that is incompatible with any robust theism.

Second, in the context of the theology of creation that we have been considering, there is no basis for ruling out in principle the possibility that God might act in the world to alter otherwise deterministic natural processes. This would be a miracle in the familiar Humean sense of a "violation" of a law of nature. Contemporary theologians have grown wary

of miracle claims, and there are good reasons for this. The rise of the natural sciences has deeply shaped modern expectations about the forces at work in the natural world, and this has changed our habits of explanation, pushing aside final causes in favor of efficient causes. But it is important to recognize that these misgivings about miracles are primarily epistemic, as Hume's elegant argument makes clear (Hume 1748, sec. 10). It is not that the sciences have somehow shown that miracles *cannot* occur, but rather that we usually do not have adequate evidence for the claims made about them. In any particular case we might conclude on evidential grounds that God has not in fact acted directly to alter the ordinary course of nature. But if we affirm that God creates and sustains the world *ex nihilo*, we must grant that it is within God's power to do so; the creator can bring about events that exceed the causal capacities of created things. An additional theological argument would be needed to establish the conclusion that God is debarred by the divine nature or by a chosen policy from acting in this way (e.g., by arguing that interventions of this sort would violate a principle of divine consistency or justice).

Third, it is one of the ironies of modern theology that while theologians have cited scientific determinism as a reason to abandon the idea of particular divine action in the world, natural scientists have increasingly been prepared to give up causal sufficiency in some of their explanations. The great biblical scholar and theologian, Rudolph Bultmann, contended that the tightly woven network of natural causes depicted by the sciences leaves "no room for God's working" in the world (1958, 65). By contrast, some of the most vociferous scientific critics of theology have argued that the inherent chanciness of nature makes it implausible to hold that evolution might realize God's purposes (Monod 1971; Dawkins 1986). I think that both views are mistaken, and that the presence of chance in nature, rather than precluding divine purpose, may instead open up an additional way to conceive of God's providential guidance of the world's history.

#### DIVINE ACTION IN AN UNDERDETERMINED WORLD

We have already considered one way of reconciling indeterministic chance with the realization of divine purposes: God as creator establishes the role of chance in the processes of nature, and thereby shapes the array of possibilities explored in the unfolding history of the created world. The outcomes of these underdetermined processes will not, we saw, be intended in every detail by God; the world's future will include branching pathways that are constrained but not precisely determined by God's creative will. We now turn to a second possibility: namely, that God might act in the world to determine some or all of the events that are left underdetermined by the causal structures of nature. This takes a step beyond the view that God's action in the world is always carried out through the operation of natural

causes. God does in this case act *with* natural causes. But God does not act entirely *by means of* them; rather, in this instance God's action brings about an event that has necessary but not sufficient causal conditions in the natural order. This direct act of God in the world does not interrupt an otherwise complete series of natural causes, because (*ex hypothesi*) the outcome is underdetermined by its natural causal conditions. We have, then, direct divine action in the world without Humean miracles, and this might provide another means by which God shapes the direction of the world's history.

A story of this sort about God and chance depends upon empirical claims that cannot, of course, be settled by theology itself. If for its own purposes a theological proposal enlists the sciences at this point, two conditions must be met. First, it must be plausible to offer an indeterministic interpretation of the relevant scientific domain. Second, it must be possible for these indeterministic processes to make a difference in the developing course of events.

A number of proposals have been made that try to meet these two conditions.<sup>4</sup> In my view, the most promising ones make use of indeterministic interpretations of quantum mechanics. Notoriously, quantum theory can be interpreted in a fascinating and perplexing variety of ways, none of which conform to the expectations of "common sense" at the macroscopic level. This interpretive pluralism reflects in part the irreducibly probabilistic character of the quantum formalism, which describes various properties of atomic and subatomic matter (e.g., the position, momentum, and spin-orientation of an electron) as a statistical mix of incompatible values. The wave equation that describes this odd "superposition" of properties evolves continuously over time, but this does not allow us to predict which state will be observed when we conduct a measurement on the system. Instead, the best we can do is to describe the probability of finding each of the possible outcome states. The transition from a probabilistic mix to a determinate outcome cannot be explained by the quantum formalism itself, and it is here that an indeterministic interpretation becomes possible. It seemed to Einstein and others that this must be a merely epistemic limitation; there should be precise values for these properties determined at every moment by hidden variables that are yet to be added to quantum theory. John Bell (2004) later demonstrated that any conventional (local realist) deterministic hidden variable theory will yield a different set of predictions for an Einstein-Podolsky-Rosen type experiment than the outcomes predicted by quantum theory. When it became technically possible to conduct the relevant experiments on entangled two-particle systems, the quantum predictions were confirmed. Deterministic interpretations of quantum mechanics can nonetheless be offered, but they involve significant departures from classical determinism;



for example, David Bohm's ingenious reconstruction of quantum theory introduces guidance equations, or "pilot waves," that maintain non-local instantaneous connections at space-like distances (Bohm 1952, 1980).

In considering whether quantum theory might have some bearing on a theology of divine action, we cannot avoid venturing into the tangle of competing interpretations being offered by physicists and philosophers. One of the leading current approaches has the potential to be helpful in carrying forward the theological strategy I sketched above. The familiar "Copenhagen" family of interpretations accepts the completeness of quantum theory, and treats the transition from the superposition state to a determinate outcome as a discontinuous event (a "collapse" of the wave packet) that does not have causally sufficient conditions.<sup>5</sup> This meets the first condition we noted above: it presents an indeterministic interpretation of a fundamental scientific theory.

Does this interpretation of quantum processes also meet the second condition, viz., that it provides a means by which nonmiraculous direct divine action could affect the course of events? That will depend upon the causal consequences of quantum transitions. Their primary effect, of course, is to accumulate in patterns that constitute the properties of macroscopic objects. It is often said that this is the only result of quantum events; these chance transitions disappear into deterministic regularities at higher levels of organization in nature. We know, however, that small numbers of quantum transitions can have significant macroscopic consequences; precisely this is what occurs when we make measurements on a quantum system in the laboratory. So the question is whether there are structures in nature that amplify quantum events in a comparable way.

Once again, this is a question for the sciences, not for theology, and it raises overlapping issues in a number of scientific fields. It is safe to say, however, that there are a number of good examples of natural amplification. The processes involved in vision, for example, involve the collapse of the superposition state of photons as they impinge on the retina. Other biological processes also register and express the outcomes of quantum interactions; for example, exposure to ultraviolet light, X-rays, and some of the products of radioactive decay can result in tissue damage and mutation in living organisms. This brings us back to the consideration of evolution. One of the sources of evolutionary change is mutation in the germ-line of living things, and some types of mutation involve quantum processes. The scientific questions that arise here are complex; there are different kinds of mutations, they can be caused in a variety of ways, and they have widely diverse effects as a result of their interactions with other genes and with the environment. It is clear, however, that chance transitions at the quantum level can play a role in genetic mutation, that mutation can

have consequences for the organism assembled on the basis of this genetic material, and that exposure to selective pressures in the environment can increase or diminish the frequency in a population of organisms with traits linked to this mutation. These biological processes have the potential to amplify quantum chance, and they might provide yet another means by which God acts within evolutionary history (Russell 2008, 212–25). In order to develop this idea we would need to pay close attention to the ongoing scientific discussion of how mutations occur and how they figure in evolutionary development; these processes are linked in complex interactive networks that are only partially understood. The wider theological point, however, is that (1) God might select from among open potentialities built into the causal structures of nature established by God's creative action, and (2) God might do so quite without disrupting or overriding those structures.

#### CONCLUDING CONSIDERATIONS

Let me conclude by offering three clarifications about what I am *not* saying. First, I am not contending that evolutionary explanations will inevitably fail unless God is brought into the story. *If* the deep structures of nature include indeterministic chance, then some events do not in fact have causally sufficient natural conditions, and scientific explanation will fall short of completeness at these points. But this is a conclusion that the sciences (reasonably interpreted) reach on their own, and it is only secondarily a matter that theology, for its own purposes, seeks to incorporate into its understanding of the created world. The options I have sketched here provide strategies for a theological interpretation of evolution (i.e., for a theology of nature), rather than moves in natural theology, for example, a design argument.

Second, for this same reason I am not offering a “God of the gaps” argument, at least as that phrase is usually understood. Divine action at the quantum level would, to be sure, involve both God and gaps. But it is important to distinguish between (1) an apologetic theology that seizes upon what the sciences currently do *not* know, and then proposes to close those epistemic gaps by appealing to divine action, and (2) a theology that takes seriously what the sciences claim to have discovered about the world, and then grapples with the theological implications of this putative scientific knowledge. If our best current physical theory suggests to many interpreters that the causal structure of the world is “gappy,” then it is important for theology to reflect on the creator's relation to these gaps, whether we conclude that God “fills” them with direct divine action or leaves them as chance events (and thereby, *contra* Einstein, really does play dice with the universe).

Third, and most important, I am not arguing that the only way God can shape the world's history is by acting in gaps in its causal structures. On the contrary, God acts always and everywhere as the transcendent creative ground of the world's existence, and God's purposes are realized in and through the operation of created causes in the natural order. These are the fundamental forms of divine action. In addition, we should not rule out the possibility that God might choose to act directly within the world to bring about particular effects that exceed the causal powers of created things (e.g., Humean miracles). Finally, if God creates a world that integrates law and indeterministic chance, then God might also act directly to determine some or all of what the natural order leaves determinable, and thereby directly affect the course of events without miraculous intervention. There are, therefore, multiple ways in which we can conceive of God acting in and through evolutionary processes so that, as Asa Gray suggested, these processes enact God's creative purposes.

This, of course, is not the end of the difficulties that arise for theology in its encounter with evolutionary biology. To the extent that we succeed in giving an account of how God might act in and through the course of evolutionary history, we heighten the urgency of questions about God's relation to the suffering and loss that is an integral part of that history. As we gain somewhat greater clarity on the puzzle of divine purpose and evolutionary processes, we bring more sharply into view the profound conundrum of divine goodness and evolutionary evils (Murray 2008; Southgate 2008; Tracy 2012).

#### ACKNOWLEDGMENTS

This paper was presented at a colloquium in Florida in February 2012 in honor of the 80th birthday of Owen Gingerich, and funded by the generous support of the John Templeton Foundation. Six other papers from this colloquium and an introduction were published in *Zygon: Journal of Religion and Science* 47(4), December 2012 and one in 48(1) March 2013. Special thanks are due Celia Deane-Drummond and Willem Drees for helpful suggestions in the editorial process.

#### NOTES

1. I discuss occasionalist arguments and strategies of reply in Tracy (2010, 221–37).
2. This suggests the possibility of a “free process” response to natural suffering, parallel to the free will reply to the problem of moral evils. John Polkinghorne (1998, 94) contends that God builds into the natural order a capacity for spontaneous self-formation, and that out of respect for this creaturely power God chooses not to intervene in the course of events. The key challenge facing free process defenses is to explain *why* we should think that possession of the power of being (partially) self-making, and the exercise of this power without divine interference, is an intrinsic good of such value as to be worth having even at the cost of all the natural evils to which it gives rise.

3. On the “shape” of this possibility space, and on the striking phenomenon of convergence in evolutionary history, see Simon Conway Morris (2003).
4. See, for example, the various positions presented by the contributors to the series of volumes on divine action that was jointly published by the Vatican Observatory and the Center for Theology and the Natural Sciences. The specific volume on quantum mechanics is Russell et al. (2002), and my essay in that volume (“Creation, Providence, and Quantum Chance”) presents an extended discussion of the ideas sketched here.
5. Rather than there being a “Copenhagen interpretation,” this expression refers to a collection of views that have their roots in the work of Niels Bohr and Werner Heisenberg. Heisenberg in particular is noted for his indeterministic understanding of the measurement event. See, for example, Heisenberg (1971).

## REFERENCES

- Bell, John. [1987] 2004. *Speakable and Unsayable in Quantum Mechanics: Collected Papers on Quantum Philosophy*, 2nd ed. New York: Cambridge University Press.
- Bohm, David. 1952. “A Suggested Interpretation of Quantum Theory in Terms of Hidden Variables, I & II.” *Physical Review* 85: 166–93.
- . 1980. *Wholeness and the Implicate Order*. London: Routledge & Kegan Paul.
- Bultmann, Rudolph. 1958. *Jesus Christ and Mythology*. New York: Charles Scribner’s Sons.
- Darwin, Charles. [1859] 1966. *On the Origin of Species*. Cambridge: Cambridge University Press.
- . [1876] 1973. “Autobiography.” In *Darwin and Darwinism: Revolutionary Insights Concerning Man, Nature, Religion, and Society*, ed. Harold Y. Vanderpool. Lexington, MA: D. C. Heath and Company.
- Dawkins, Richard. 1986. *The Blind Watchmaker*. New York: W. W. Norton.
- Gilkey, Langdon. 1961. “Cosmology, Ontology, and the Travail of Biblical Language.” *Journal of Religion* 41: 194–205.
- Gray, Asa. [1876] 1973. “Darwiniana” (excerpt). In *Darwin and Darwinism: Revolutionary Insights Concerning Man, Nature, Religion, and Society*, ed. Harold Y. Vanderpool, 113–22. Lexington, MA: D. C. Heath and Company.
- Heisenberg, Werner. 1971. *Physics and Beyond: Encounters and Conversations*, translated by Arnold J. Pomerans. New York: Harper & Row.
- Hume, David. [1748] 2007. “Of Miracles.” *An Enquiry Concerning Human Understanding*, ed. Stephen Buckle. Cambridge: Cambridge University Press.
- Kaufman, Gordon. 1972. *God the Problem*. Cambridge, MA: Harvard University Press.
- Macquarrie, John. 1977. *Principles of Christian Theology*. 2nd ed. New York: Charles Scribner’s Sons.
- Monod, Jacques. 1971. *Chance and Necessity*. New York: Knopf.
- Morris, Simon Conway. 2003. *Life’s Solution: Inevitable Humans in a Lonely Universe*. Cambridge: Cambridge University Press.
- Murray, Michael J. 2008. *Nature Red in Tooth and Claw: Theism and the Problem of Animal Suffering*. Oxford: Oxford University Press.
- Polkinghorne, John. 1998. *Science and Theology*. Minneapolis, MN: Fortress Press.
- Russell, Robert John. 2008. “Special Providence and Genetic Mutation: A New Defense of Theistic Evolution.” In *Cosmology: From Alpha to Omega*, 212–25. Minneapolis, MN: Fortress Press.
- Russell, Robert John, Philip Clayton, Kirk Wegter-McNelly, and John Polkinghorne. 2002. *Quantum Physics: Scientific Perspectives on Divine Action*. Vatican City State: Vatican Observatory and Berkeley, CA: Center for Theology and the Natural Sciences.
- Southgate, Christopher. 2008. *The Groaning of Creation: God, Evolution, and the Problem of Evil*. Louisville, KY: Westminster John Knox Press.
- Tracy, Thomas. 2010. “God and Creatures Acting: The Idea of Double Agency.” In *Creation and the God of Abraham*, ed. David Burrell, Janet Soskice, William Stoeger, SJ, and Carlo Coglioti, 221–37. Cambridge: Cambridge University Press.
- . 2012. “Scientific Vetoes and the Hands-Off God: Can We Say that God Acts in History?” *Theology and Science* 10(1): 55–80.