

Metatheoretic Shaping Principles and Open Theism

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Abstract: Scientific knowledge is often categorized as experimental or theoretical. There is, however, a third layer where philosophy of science and science proper overlap, the realm of metatheoretic shaping principles. For example, we assume that the causal regularities observed today will also hold tomorrow. Researchers are thereby relying on two metaphysical doctrines: the uniformity of nature and mechanistic causation. There are also the “explanatory virtues” of simplicity, testability, internal and external coherence, fruitfulness, and wide scope. My first goal is to categorize these principles and show how they’ve operated in the history of science. Particular attention will be paid to their suspension and rejection, even of widely held principles. My second goal is to consider how certain shaping principles impinge on open theology. Of particular interest will be naturalism (both metaphysical and methodological), reductionism, and realism. Surprisingly, differences within the open theology camp are more relevant to these issues than open theism itself.

1. Introduction.

Philosophers of science seldom have much influence on academia. Thomas Kuhn was an exception. The disaster wrought by *The Structure of Scientific Revolutions* continues to be felt, especially in the humanities. The irony is that Kuhn himself was not a conceptual relativist. (“But I am not a Kuhnian!” he reportedly once shouted at a conference on the sociology of science.) One of the positive effects of *Structure* was to help us see that science is made up of more than observations and laws. Scientists, like the rest of us, rely on a whole host of unarticulated assumptions about the world and how it ought to be studied. Our understanding of these *metatheoretic shaping principles* (MSP) has come a long way since Kuhn. Philosophers of religion have taken interest since this is where science typically influences theology and vice versa.

In what follows we will consider different categories of MSPs, how they change over time, and their relation to theology. All this will be working its way toward what open theism has to say about science and science about open theism.

2. The Structure of Science.

Any single Big Picture for the whole of science must simplify things to the point of distortion. Scientific knowledge is too diverse to be neatly fitted into one structure. In fact, there are enough tensions and outright inconsistencies in science to make any realist uneasy. With that caveat, let's consider a model that is useful as a first approximation.

Broadly speaking, science has three layers. Not surprisingly, we begin with observations and data—the realm of the experimentalist. Like a pyramid, this is the broadest layer in the sense that there are more data available than well articulated theories or models to place them in. Like the CIA, there may be lots of information coming in from all kinds of sources, but good analysis is still hard to find.

The second layer is more abstract, containing theories and laws. Towards the bottom of this layer, relatively close to the data itself, are statistical correlations and phenomenological models. As statisticians repeatedly tell us, establishing a statistical correlation is not the same as discovering a cause. We know that high cholesterol is correlated with heart disease, but drugs that lower cholesterol haven't dramatically affected the rate of heart disease in America. The complete causal story appears to be more complex than "high cholesterol causes heart disease." Phenomenological models are used to replicate patterns found within data. They are built in a "bottom-up" fashion in the sense that there are no first principles or laws of nature from which to derive them. With enough data, one can build a computer model that simulates the behavior of city traffic, even though there are no general equations governing traffic flow. Higher up in the second layer are more abstract laws of nature and mature theories: Einstein's field equations and relativity, Schrödinger's equation and quantum mechanics, and the nonlinear differential equations used in statistical mechanics, continuum mechanics, and chaos theory.

The least familiar and for our purposes most important layer is third, the level of MSPs.¹ This is the region where the philosophy of science and science proper blend into one another. There is no sharp line between the two. MSPs help determine what good theories, laws, and models look like as well as how one should proceed in their discovery and development. Philosophers of science have considered the role of these principles for more than a

¹ The name 'shaping principle' was coined by Del Ratzsch, to whom I am greatly indebted in this section of the paper. See especially chapter nine of Ratzsch, *The Battle of the Beginnings: Why Neither Side is Winning the Creation-Evolution Debate* (Downers Grove: InterVarsity Press, 1996).

generation and there are several ways to approach the subject. I will divide them into two categories. The first are metaphysical. These include,

- *Uniformity of nature.* This is uniformity across space and time. The laws of nature are thought to be the same now as they always have been, or at least since the earliest stages of the universe. The laws of nature are the same here as they are everywhere else in the universe. If this were not so, no sound inferences could be made about astronomical data.
- *Realism.* Mature theories in science embody discovered truths about reality. Theories are not merely social constructions. It would be a miracle if science could be as successful as it has been and not be more or less true.
- *Causal closure of the physical domain.* Every physical event that has a cause has a sufficient physical cause. Hence when neurophysiologists study particular brain events, they will never trace a causal chain that takes them away from the physical and to a nonphysical cause. (This principle is a close cousin to metaphysical naturalism: the success of the natural sciences indicates that nature is all there is.)

Others are more discipline-specific. For example, as historian Charles Gillispie puts it, “[N]o one has ever discovered conservation (of whatever) in some experiment. Rather conservation has always been assumed as a condition of objective science.”²

The second category of MSPs is epistemic and includes a wide variety of methodological norms.

- Reliance on repeatable, intersubjective observations. This is one of the principles that sets apart modern from medieval science.
- Standards of inductive logic and mathematical rigor. This includes the proper use of statistical methods and blind studies.
- Explanatory virtues. These are desiderata for good explanations including empirical adequacy, simplicity, testability, internal and external coherence, fruitfulness for future research, wide scope, and elegance.
- Methodological naturalism (MN). There are two ways of understanding this principle. Following Del Ratzsch, MN says that researchers must proceed *as if* metaphysical naturalism were true, regardless of whether it actually reflects their ontology. According to Alan Padgett, MN is the view that in “*natural science*, [one must] explain physical phenomena only on the basis of physical laws, principles, and properties.”³
- Conservatism. There are several related principles here, but the main one has to do with theory change. Conservatism says that as new discoveries are made, scientific theories should change as little as needed in order to accommodate them.

² Charles Coulston Gillispie, *The Edge of Objectivity* (Princeton: Princeton University Press, 1960), 385.

³ Alan G. Padgett, *Science and the Study of God* (Grand Rapids: Eerdmans Publishing Co., 2003), 79.

Few of these principles are exclusive to science. For example, conservatism is a general principle of change in any body of knowledge. One reason John Polkinghorne rejects panentheism is that it is a more radical change than is needed to correct the problems of Augustinian-Calvinist thought. That's an expression of conservatism.

Each of these principles is found in modern science. There are many others that have been diminished or set aside. One is that nature works only by contact forces, like the gears in a clock. Scientific explanations should therefore describe the mechanism responsible for the phenomena. This principle includes the rejection of Aristotelian causes other than efficient causation. It was also the one that Newton transgressed with his theory of universal gravitation. By giving a law without a mechanism behind it, Newtonian gravity was long faulted for relying on action-at-a-distance, something akin to telekinesis. Another diminished MSP is the Baconian view that laws must be inferred by enumerative induction from empirical observations. It is now clear that laws are often derived in a top-down fashion from first principles rather than exclusively from bottom-up generalizations.

These historical cases illustrate an important fact: MSPs are not set in stone but rather change over time, much like theories themselves. Some of the most interesting conflicts in science arise over such principles. The most famous example is the Bohr-Einstein dispute over quantum mechanics. According to Bohr's Copenhagen interpretation of quantum mechanics, nature is fundamentally random. The Heisenberg Uncertainty Principle is not merely a limitation on our knowledge; it is ontic—the way things really are. Einstein played the role of old-guard classicist in this dispute. He argued that Heisenberg uncertainty may put a strict limit on prediction, but our inability to predict does not mean there is no fact of the matter about the position and momentum of a particle. To Einstein, Bohr was advocating the overthrow of law-governed causal regularities as they had been understood from the beginning of the scientific revolution. History sees Bohr as the winner in this dispute, but only because Bohmian mechanics, which is fully deterministic, has failed to catch on. One wonders how all this would have turned out if Bohm's theory had been formulated in 1925, ahead of Schrödinger and Heisenberg.

A more obscure example from the 18th century involved mathematician/physicists Leonhard Euler and Jean le Rond d'Alembert.⁴ Like Descartes before him, d'Alembert believed that mathematics was a highly specialized tool and that most of what we observe in the physical world is beyond its resources. Mathematics, he maintained, can only describe very simple systems. Even a plucked string was thought to be beyond the domain of differential equations. Euler was less strict. He argued that the mathematics of differential equations should be relaxed on occasion, even if it meant ignoring a fundamental metaphysical rule, Leibniz's Law of Continuity. The Law of Continuity says that "nature makes no leaps"; the change from one system state to the next is always continuous. Leibniz himself took this principle to be foundational for the development of mechanics. "Continuity being therefore a necessary prerequisite or a distinctive character of the true laws of the communication of motion, can we doubt that all phenomena are subject to it . . . ?"⁵ Nonetheless, Euler ignored Leibniz's law in his analysis of a plucked string and mathematical physics has successfully followed his lead ever since.

Another 18th-19th century debate over shaping principles is relevant to today's controversy about Intelligent Design. Geology in the 1700s was founded on *catastrophism*, the view that most geological structures are the result of large scale, system changing events such as floods and earthquakes. Both the temperature and surface of the earth were thought to have changed dramatically over time in the wake of these special events, including the Great Flood in Genesis. Among the supporters of catastrophism was Georges Cuvier, the founder of comparative anatomy and vertebrate paleontology. A rival view, *uniformitarianism*, is attributed to Scottish geologist James Hutton and later entrenched by Charles Lyell in his *Principles of Geology* (1830). They taught that geological data should be understood in terms of ongoing forces and mechanisms: the slow rise of mountains and underground cooling of magma, rain and erosion, runoff and sedimentation. They then posited the continuous action of the same mechanisms back through time. In his *Theory of the Earth* (1795), Hutton stated, "In examining things present, we

⁴ This episode has been well documented by mathematician/historian Clifford Truesdell and philosopher Mark Wilson. Clifford Truesdell, *An Idiot's Fugitive Essays on Science* (New York: Springer-Verlag, 1984), 80-83; Mark Wilson, "The Unreasonable Uncooperativeness of Mathematics in the Natural Sciences," *The Monist* 83:2 (April 2000), 298-301.

⁵ Quoted in Timothy Crockett, "Continuity in Leibniz's Mature Metaphysics," *Philosophical Studies* 94 (1999), 120.

have data from which to reason with regard to what has been; and, from what has actually been, we have data for concluding with regard to that which is to happen thereafter.”

There were two key motivations behind the change from catastrophism to uniformitarianism. One was the similarity between fossilized and living creatures which supported continuity between the past and the present. Gradual sedimentation also seemed to be a good explanation for the correlation between types of fossils within specific geological strata. The second came from other shaping principles that had taken hold in the sciences. In particular, catastrophists were faulted for violating Baconian inductivism.⁶ Unlike the slow, ongoing processes of Hutton and Lyell, ancient catastrophes were unobservable and thought to be beyond the reach of proper science. (Ironically, Walter Alvarez and David M. Raup, the leading supporters of the asteroid impact hypothesis as a major cause of mass extinction, attribute the stiff resistance they faced in the 1970s to uniformitarianism.⁷)

There are two important conclusions to be drawn from all this. First, like everything else in science, MSPs can be trumped in particular circumstances and sometimes rejected outright. Treating them as inviolable principles (as Judge Jones did in the Dover, Pennsylvania, Intelligent Design case) is false in terms of the history and philosophy of science.⁸ Second, MSPs both influence the development of theories and are themselves influenced from below. In fact, influences flow from each of the three layers of the pyramid structure to every other layer. New observations and anomalies obviously force changes to theories. And although too much can be made of the theory-ladenness of observations, it is also true that theories affect the way one evaluates new data. Whether an observation is significant depends on what theories one already accepts. Finally as we saw in the Einstein-Bohr debate, both observations and theories can put pressure on MSPs.⁹ Unlike textbook introductions of the so-called scientific method, there is no royal road to knowledge, scientific or otherwise. And even if there were, one could

⁶ Del Ratzsch, *The Battle of the Beginnings* (Downers Grove: InterVarsity Press, 1996), 13-16.

⁷ David M. Raup, *The Nemesis Affair* (New York: W.W. Norton), chap 2.

⁸ Jeffrey Koperski, “Two Bad Ways to Attack Intelligent Design and Two Good Ones,” *Zygon* (forthcoming), section 3.

⁹ This mutual interaction view of the three layers has some things in common with Larry Laudan’s reticulated model of scientific justification. While some take this to be an anti-realist view (since it looks like a coherence theory of justification), it can be understood realistically if we grant that the actual practice of science is a messy business. For a critique of Laudan, see J.P. Moreland, *Christianity and the Nature of Science* (Grand Rapids: Baker, 1999), 186-189.

not use such a method in order to *derive* the right shaping principles. Any candidate for *the* scientific method rests on some notion of what it is to be good science, a notion which is itself grounded in MSPs.

3. MSPs and Theism.

One of the distortions of the three layer model is that it appears to be self-contained. Science of course influences and is influenced by many strands of thought. MSPs in particular are subject to pressures from metaphysics and epistemology, which are themselves influenced by theology.¹⁰ Let's now consider some of the tensions between MSPs and theism. Note that this is not a matter of logical entailment. Views held in theology, metaphysics, science, and the philosophy of science have "family resemblances" in the sense that some positions tend to fit together more naturally than others. If one is a Christian, then that person is probably not going to be a Marxist, even though there have been movements trying to wed the two.

A. Reductionism. This MSP comes in many varieties. One is *ontological reductionism* whereby the entities at one level of reality are thought to be nothing but composites or states of entities at a more fundamental level. Minds and mental states are nothing but brains and brain states; brains and brain states are nothing but neurons, nerve fibers, and their states, and so on all the way down to molecules, atoms, and fundamental particles, whatever they happen to be. Ontological reduction is thus similar to materialism but with the addition doctrine that there are no emergent properties. There is an obvious tension here with theism in that a theist has at least one member of his ontology that is not made up of particles. Many Christian theists also believe in immaterial entities other than God, viz. angels and souls, all of which are incompatible with ontological reduction.

Theory reduction is a distinct, epistemological MSP having to do with our ability to form bridges between recognized theories. We should expect, on this view, that as science progresses higher level theories will be explained in terms of more fundamental theories. Macro events and laws should become explicable in terms of

¹⁰ A naturalistic turn in theology was a factor in the move to uniformitarianism mentioned above. Lyell explicitly lumped in ad hoc appeals to floods, earthquakes, and the like with the theology of demons as an explanation of moral failures. See Owen Anderson, "Charles Lyell, Uniformitarianism, and Interpretive Principles" *Zygon* 42:2 (June 2007), 452-3.

those at a lower level, much the way thermodynamics has been reduced to statistical mechanics—or so the story goes.¹¹

Many theists reject theory reductionism because of the implication that ultimate explanations are only found in physics. If theology is a matter of knowledge rather than mere value, then that knowledge cannot be reduced to scientific theorizing. Some readers may be surprised to find that most *secular* philosophers today also reject theory reductionism. While they believe that nothing exists beyond the natural order, they do not expect that our theories will one day line up in a neat, reductive hierarchy. These so-called *nonreductive physicalists* believe that we will always need independent theories in biology, psychology, etc.. The world is too complex to navigate otherwise.

B. Methodological Naturalism. MN arose in the 17th century as a doctrine akin to separation of church and state. Those in the humanities did not want scientists getting involved in matters outside of their expertise and natural philosophers did not want clergy and kings looking over their shoulders.¹² In 1660, Charles II set the parameters for the Royal Society of London to be, in the words of Robert Hooke, “to improve the knowledge of natural things, and all useful Arts, Manufactures, Mechanics, Practices, Engynes and Inventions by Experiments (not meddling with Divinity, Metaphysics, Moralls, Politicks, Grammar, Rhetoric, or Logick).”¹³

While theists have mixed opinions about MN, many accept it for similar reasons. There are areas of knowledge beyond science and scientists are ill-equipped to deal with them. Metaphysics, theology, and ethics are outside of their professional competency. Theistic scientists should therefore use MN even though they are not metaphysical naturalists.

This is an attractive view, one held by many contributors to this volume, and I may well be persuaded someday that it is correct. At present, there are three countervailing arguments for why theists should be wary of MN.

¹¹ The truth is a bit more complex. While there are several ways known to philosophers of science whereby one theory can be reduced to another, there is no sense in which thermodynamics has been fully reduced to statistical mechanics.

¹² Nancy Pearcey, private correspondence.

¹³ Robert Proctor, *Value-Free Science?* (Cambridge: Harvard University Press, 1991), 33.

1. MN has *metaphysical* ramifications that when coupled with scientific realism, theists cannot hold. Most theists are scientific realists of some variety or other. But notice, if one takes scientific theories to be at least approximately true (realism), and if MN is required to form those theories, then true scientific theories will of course be naturalistic. What if the actual explanation for some phenomenon is supernatural? No matter. Under MN, the best naturalistic explanation *is* the best scientific explanation, and via realism, we take that explanation as true. Given that there is little if anything that science does not purport to explain, MN plus realism implies that nearly every phenomenon has a true, naturalistic explanation, at least in principle. As science continues to claim more ground, from evolutionary accounts of ethics to psychological explanations for religious belief, we end up with something very close to *metaphysical* naturalism.¹⁴ This is precisely why atheists point to the success of science as a key reason for accepting naturalism across the board.

2. MN limits the explanatory resources of science. Given the limitations placed by MN, science is sometimes pushed into odd corners. Consider the discovery of finely-tuned cosmological constants, including each of the coupling parameters for the four fundamental forces. Most agree that this discovery requires an explanation. Under MN, when physicist Brian Greene explains fine-tuning by positing a vast multiverse of possible universes each with different values for these constants, he's doing science. When astronomer Owen Gingerich explains the very same observations by means of design, he's doing religion. This is at best an artificial dichotomy. As the SETI project and archeology show, design is an explanatory concept already used in science. Nonetheless, the only scientifically acceptable explanation of fine-tuning at present is an undetectable multiverse. Cosmologists must therefore pursue this hypothesis to win grants, publish papers, and get tenure, *even if supernatural design happens to be the right answer*. This shows that MN is in conflict with realism. In order to hold scientific realism, one must believe that theories are generally reliable indicators of truth. But if there is a choice between naturalism and truth, MN forces science to choose the former. Once science is limited to a certain kinds of entities, it can no longer follow the data wherever it leads. It is forced instead to beat the data until it offers a naturalistic confession.

¹⁴ Del Ratzsch presents a similar argument in "Design Theory and its Critics: Monologues Passing in the Night," *Ars Disputandi* 2 (2002), section 3. If one adds a closure principle such that science is able to reach all truth, then MN, realism, and closure logically *entail* metaphysical naturalism.

Another problem for MN is that no one knows what sort of explanatory resources science will need in the future. One can bet that we will never need to use design, but that's a prediction, not a discovery or an inference from established truths. Many of the expectations of late-19th century physicists were dashed by general relativity, quantum mechanics, and chaos theory. Instead of limiting our explanatory resources, we should adopt the attitude of naturalist extraordinaire W.V.O. Quine. "If I saw indirect explanatory benefit in positing sensibilia, possibilia, spirits, [or] a Creator, I would joyfully accord them scientific status too, on a par with such avowedly scientific posits as quarks and black holes."¹⁵

3. *MN is superfluous.* Contrary to the conventional wisdom, MN has not rescued science from supernatural design.¹⁶ Historical confrontations between naturalistic and design hypotheses were settled using other MSPs, the most prominent being simplicity in the form of Ockham's razor. Ratzsch sums up this point in a recent paper.

Despite the popularity of such claims, I have not seen the slightest hint of even a presumptive example within the last several *centuries* where some design-friendly theory has challenged a "proper" scientific theory and managed to displace it, or even a case where some scientifically improper design theory which has ("unfortunately") already been in place within science has itself survived the challenges of legitimate science, thereby destroying legitimate scientific progress.¹⁷

Ratzsch argues that MN is almost always a placeholder in these debates for some other shaping principle. Many critics of ID begin with MN but then seamlessly switch to complaints about predictability and fruitfulness. The latter two *are* well-established MSPs that can be defended in their own right, but neither is equivalent to MN. In short, MN could be dropped without loss since the work it supposedly does is carried out by other MSPs.

For various reasons then, theists should follow Quine when it comes to MN. If the best explanation for some phenomenon is design, even supernatural design, that would still count as a scientific explanation. Popular and legal opinion is unfortunately blowing in the opposite direction. Robert Pennock, an expert witness for the

¹⁵ W.V.O. Quine, "Naturalism; Or, Living Within One's Means," *Dialectica* 49 (1995): 252.

¹⁶ 18th-19th century debates over flood geology might be an exception. There were certainly theological tensions between uniformitarians and catastrophists.

¹⁷ Delvin Ratzsch, "Intelligent Design: What Does the History of Science Really Tell Us?" In *Scientific Explanation and Religious Belief: Science and Religion in Philosophical and Public Discourse*, eds. Michael Parker and Thomas Schmidt (Tübingen, Germany: Mohr Siebeck, 2005), 138.

plaintiff in the Dover case, not only argued in favor of MN but claimed that it is simply another name for the scientific method.¹⁸ While this would have been an amusing gaffe in an undergraduate paper, it is deplorable coming from a professor of philosophy. One wonders, if Darwin did not need MN in order to defend against supernaturalism, why does Pennock?

4. MSPs and Open Theism.

As we have seen, there is a tension between theism and MSPs such as ontological naturalism, MN, and reductionism. What about open theism? Are there any special conflicts with this view? The answer is ‘yes,’ but the list is surprisingly short for reasons to be discussed below.

As we saw earlier, Einstein was a champion of universal, law-governed causation in nature. Since quantum mechanics allows for purely stochastic events, it violates universal causation. Einstein therefore took an *anti*-realist approach toward it. Quantum mechanics works as far as it goes, he thought, but it is not a true and complete theory. Open theists will have a similar attitude about certain theories, but for rather different reasons. Unlike Einstein, open theists reject universal, deterministic causation. They will therefore lean towards anti-realism when it comes to theories that seem to entail that the future is fixed.

The reason for this is that open theists are strong *libertarians* when it comes to freewill: in order for me to be free at this moment, I must have it within my power to make choice A rather than choice B. The future is open, not fixed. Many theists, especially those with an Augustinian/Calvinist background, have a *compatibilist* view of freewill. They believe that the future *is* fixed, God has exhaustive foreknowledge of that future, and yet humans have freewill of some kind or other. Compatibilists can take deterministic theories realistically while open theists cannot.

Prime examples are the theories of special and general relativity. Both treat space and time not as separate physical entities but rather as an integrated four-dimensional space-time or “block universe.” Points in the block universe represent place-times from the Big Bang forward. From a purely physical point of view, what we think of as the past and the future are equally real. There is no privileged, moving slice within the block universe that is “the

¹⁸ Kitzmiller v. Dover, 400 F. Supp. 2d 707 (M.D. Pa., 2005), 83.

present.” This conflicts both with our commonsense view of the passage of time and with libertarian freewill. If all of the points in the block universe have determinate properties, then nothing one does now can change the physical facts elsewhere in the block, including what we think of as the future. Einstein himself understood all this quite well.

There are several anti-realist stances an open theist might take towards relativity. One might be an instrumentalist about all space-time theories. On this view, the equations in both special and general relativity work, but their usefulness is not dependant on their being true. While this might seem initially implausible, consider that many of the theories in the history of science once enjoyed some measure of success even though they have been superseded. (Ptolemaic models of the solar system not only worked well for centuries but were *more* accurate than the ones first posed by Copernicus.)

There are also more selective forms of anti-realism available to the open theist. One follows from the maxim that entities in physics ought not be automatically hypostatized. Although ray optics entails that certain convergences of light rays (caustics) are infinitely intense, applied scientists dismiss this result as a nonphysical artifact. Ray optics is still extremely useful, but no one interprets its caustics in a fully realistic way.¹⁹ Similarly, one might hold that the field equations of general relativity are approximately true, but deny that future space-time points have ontological weight. In other words, there is no four-dimensional space-time manifold.²⁰ Instead of

¹⁹ A closely related option is to take an anti-realist view of spacetime as an object in itself. Substantialists take spacetime to have an independent existence, a thing in which physical objects like stars are located. Several philosophers of physics have argued that spacetime should be understood in a relational rather than substantial way (see David Woodruff’s piece in this volume). On this view, spacetime is not a substance but rather a set of relations between possible physical objects. (Cf. brotherhood is not a thing, but rather a relation between certain males in a family.) The relationalist believes in physical objects, but not in a reified block universe. Leibniz argued much the same way against Newton’s substantial view of absolute space. For more on this and its relation to the famous hole argument, see Paul Teller, “Substance, Relations, and Arguments About the Nature of Spacetime,” *The Philosophical Review* 100 (July, 1991) and John Earman, *World Enough and Spacetime* (Cambridge: The MIT Press, 1989).

²⁰ Technically, this requires the denial that spacetime is essentially a four-dimensional, semi-Reimannian manifold. While splitting spacetime into space-plus-time is unproblematic in special relativity, it is a more difficult task in general relativity. See J. Brian Pitts, “Some Thoughts on Relativity and the Flow of Time: Einstein's Equations given Absolute Simultaneity” (2004), <http://philsci-archive.pitt.edu/archive/00002760/>.

taking the block universe as a bit of metaphysics entailed by Einstein's field equations, it is merely a convenient device for generating predictions.²¹

One might also be a narrow anti-realist about relativity in the same way Einstein was vis-à-vis quantum mechanics: it's incomplete.²² On this approach, the open theist is either betting that (i) a successor theory to general relativity will reintroduce an objective flow of time, or (ii) additional physical structure will be discovered that will allow for a non-ad hoc way of foliating (slicing) the space. On the first option, general relativity is understood as a stepping stone to a more realistic theory without a block universe, something like the way the Rutherford model of the atom was a step toward modern atomic theory. Since quantum mechanics and general relativity are formally inconsistent, a successor theory is certainly forthcoming. On the second option, the block universe is sliced into 3-dimensional (spacelike) hypersurfaces where each slice is ordered along a temporal axis. This can be done in many different ways. The problem is in finding a sound physical reason for preferring one foliating scheme over another. At present, general relativity lacks any such foliation and does require this additional structure.

Open theists will also tend to be anti-realists about any theory that entails determinism in its many forms since this conflicts with libertarian freewill. Strong reductionist programs in neuroscience imply psychological determinism: our mental states, including the will, are fixed by or identical to brain states. Bohmian mechanics, as we saw earlier, is a deterministic version of quantum physics. Hence open theists side with Bohr rather than Einstein. God may not play dice, but he has ordered the cosmos in such a way that persons can act as free agents.

We have found only two MSPs that conflict with open theism: universal, deterministic causation and global scientific realism. Why is this list so short? There are three reasons. One is that there just aren't many relevant differences between open and classical theism when it comes to science. The disagreements don't matter when it comes to shaping principles. The second is that the logical connections from theology down through the

²¹ Nobel laureate Steven Weinberg has argued that if anything, naive realism about spacetime has hindered the progress of physics. See his *Gravitation and Cosmology: Principles and Explications of the General Theory of Relativity* (New York: John Wiley & Sons, 1972): vii-viii.

²² Philosopher Arthur Prior held such a view of special relativity. See his "The Notion of the Present," *Studium Generale* 23 (1970): 245-48.

three layers of science are weak. Consider an analogy from politics. Being a Christian influences one's political views, but not in a straightforward way. We all agree that loving our neighbor is a Christian principle. Does that mean government-run health care and more support for the poor? Yes, unless that support creates a ward-of-the-state mentality that undermines the escape from poverty, in which case, no. Does Christian love mean stepping in militarily to protect the oppressed? Or does it mean passive resistance and aid to the victims? There are Christians on both sides. This same kind of underdetermination is present in theology and science. Should open theists support creationism, intelligent design, or theistic evolution? So far as I can tell, open theism is compatible with each. Here and elsewhere, which view one prefers depends on other matters.

Third and most important, open theists are split over the nature of divine action. On one side are those who accept divine intervention in the natural order. On this view, miracles and answered prayer are often understood as God's direct action within the cosmos. The other side is a more process-leaning camp with principled arguments for noninterventionism, the view that God seldom interferes with his own natural laws. This is an old debate reaching back through Leibniz and Newton into the medieval distinction between primary and secondary causation.²³ Whether a given MSP is in tension with open theism often depends on which side of this divide one falls.

To illustrate, let's again consider MN. Most of the contributors to this volume and its companion accept MN except when it is used as leverage for ontological naturalism. They agree that science can and should only refer to secondary causes. Since, on this view, God seldom if ever intervenes in nature, science doesn't miss much by limiting itself to naturalistic explanations. The minority view, in contrast, is that the direct action by God in the natural order is an empirical and contingent matter. God has intervened directed in the past, especially in the apostolic age, and continues to do so now. "Elijah was a man with a nature like ours, and he prayed fervently that it might not rain, and for three years and six months it did not rain on the earth. Then he prayed again, and heaven gave rain, and the earth bore its fruit" (James 5:17-18, ESV). *Prima facie*, Elijah's prayer was answered in such a way that what would have occurred by way of normal meteorology did not, and this change was due to God's activity. Putting my cards on the table, I have no theological qualms about this type of divine action. God directly

²³ Thomas Aquinas himself argued that God prefers to work through providence and natural law rather than miraculous intervention. See *Summa Theologica* I, q.22, a.3; q.103, a.6; *Summa Contra Gentiles* III, 76, 77, 83, 94.

acts within the realm of what we normally think of as science. Whether there is any evidence of this direct action should be open to empirical investigation.

Whatever else one might say about science and shaping principles will likewise depend more on this divide within open theism than open theism itself. How excited should one be about chaos and quantum mechanics? For noninterventionists, the ontologically random events in quantum mechanics provide a place where God might work without overriding the laws of nature. (The outcomes are not law-governed in deterministic way.²⁴) Finding a scientifically acceptable causal joint within which God might act is an important advance in the noninterventionist program. For others, this pursuit is not very interesting. If God isn't limited to working within indeterministic gaps, then the search for *the* causal joint of divine action seems misguided from the start. The same is true when it comes to the question of ontologically emergent properties in chemistry, biology, and elsewhere. While emergence fits nicely within a process theology framework, if that picture doesn't attract you, then neither does emergence. That isn't to say that one must adhere to process thought in order to believe in emergent properties. Rather, if one isn't committed to process oriented ideas, then one doesn't have a rooting interest one way or the other when it comes to emergence.

5. Conclusion.

As we have seen, open theists are split about many of the same issues that divide Christian academics in general. There are too few metaphysically and theologically distinctive doctrines held by the entire group. Consequently the conceptual relation between open theology and science, including MSPs, depends more on these intramural differences than openness itself.

To make any real progress, the two sides will have to be less ecumenical. Process-leaning noninterventionists should pursue their research and see where it leads. They need not speak for all open theists nor have to defend their distinctive views at every turn. The same goes for those with contrary beliefs about

²⁴ This proposal gets more attention than it merits. Let's say that God had decreed the mass extinction of dinosaurs by way of the asteroid that crashed into the Yucatan peninsula. Assuming that a sufficiently large asteroid were heading towards the earth to begin with, it would have taken 100 million years of quantum tweaking to get the desired impact (David Jones, "Daedalus: God Plays Dice," *Nature* 385 (1997), p.122). Given the time scale required in order to bring about some event, there simply isn't much that God can do through the collapse of the wavefunction. As I have argued elsewhere, chaos theory isn't much help ("God, Chaos, and the Quantum Dice," *Zygon* 35, no. 3 (2000): 545-559).

metaphysics and divine action. Open theism is a relatively young research program. Each branch should have room to develop. A time for pruning will come, no doubt, but that time is not now.

Finally, we saw in Section 2 that MSPs change over time due to a wide variety of influences. Many of these are within the pyramid structure itself, but some are outside of it. Theology is one such influence. If religion is merely the realm of value, faith, and purpose, in contrast to the concrete knowledge of science, then this influence should be resisted. Faith can only interfere with reason. If, however, theology is also knowledge-seeking, then theists need not abandon their views if they happen to be in tension with contemporary science. If one has a justified belief in an open rather than determined future, then one should hold on and see if physics will one day catch up. In any case, the science-theology “dialogue” should be a two-way street, rather than, as is tacitly demanded, the dictation of scientific authority to the softer discourse of faith.