Abrahamic Reflections on Randomness and Providence

Edited by Kelly James Clark · Jeffrey Koperski

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Contents

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List of Figures

PART I

Introduction

CHAPTER 1

Randomness and Providence: Is God a Bowler or a Curler?

Kelly James Clark and Jeffrey Koperski

1.1 How Does God Do It?

Most Abrahamic theists affirm divine providence, the doctrine that God brings about or allows everything that happens in the universe; moreover, they hold that God controls creation so that all things either are good or work together for good.

How, then, does God do it? How does God's providential guidance work? These are old questions, but the traditional answers did not have to face the modern scientific claim that nature is, to some degree or other, random. How then can God ensure that God's providential aims are met? This is the central question of this volume. We briefly present some of the issues in this introduction.

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1.2 The Bible Tells Me So

The earliest Judeo-Christian view of creation represents God as creating the heavens and the earth and all they contain in six days. God created the heavens and the earth and then God populated the earth with plants, birds and sea animals, and land animals and humans on six successive days. Then God rested.

But God didn't rest for long. God, according to early folk science, routinely acts in the world or acts on the world to directly or indirectly create and sustain the heavens and the earth and all that they contain. Increasingly sophisticated views emerged starting in the first millennium AD, allowing the doctrine of providence to comfortably evolve within a Greco-Roman framework for several centuries (Fergusson 2019, chap. 2).

1.3 Modern Science

The scientific and Darwinian revolutions would require Abrahamic theists to rethink God's activity in the world in at least two ways.

First, the discovery of the principle of inertia and the law of gravity would eliminate the need to postulate God's direct intervention or ultimate causation of the motion of the planets; as such, scientists would increasingly think of divine activity in the world as through God-created natural laws. God would not need to intervene in the natural order if events were already determined by the laws of nature, which God had ordained. A god that needed to tinker with nature from time to time, as Leibniz argued, would not be an omnipotent, omniscient creator (Leibniz and Clarke [1717] 1956, 11–12).

Second, the Darwinian revolution offered a compelling explanation for the development of plants, animals, and people in terms of natural selection. As such, scientists began to extend the notion of law into the biological realm. While one might think this a minor development, it was quite controversial at the time. It was commonly believed that while natural laws could explain the behavior of inorganic matter, they were in principle incapable of explaining the creation of plants, animals, and especially humans. While many religious scientists have increasingly come to understand God's creation in terms of God-ordained laws, many Abrahamic believers continue to believe that the origin of humans involves direct divine intervention. While such religious believers have easily accommodated the

Newtonian world-picture for the planets and weather, they believe their Scripture forbids the extension of creation by natural law to, at least, people.

In sum, western religious scientists have increasingly come to believe that God creates and sustains the world—from planets to people—through the laws of nature rather than through direct divine intervention. Where, then, does divine providence fit in?

1.4 Is God a Bowler or a Curler?

Let's paint a word-picture, in the broadest strokes, to see how religious thinkers divide in their basic understandings of providence: is God a bowler or a curler?

In curling, the captain slides his heavy stone down the ice and then calls out instructions to his sweepers who direct the stone to its final destination. The captain does his best to set the stone on the right path, but it reaches its final destination only through the intervention of the sweepers. Typically, in curling, the stone couldn't reach its intended destination without the intervention of the sweepers.

In bowling, on the other hand, the bowler rolls her heavy ball toward the pins trusting its arrival at its final destination to both her initial throw and natural laws like gravity and friction. After her roll, she sits back and watches without any additional interference. Ideally, in bowling, the ball reaches its intended destination without the intervention of the bowler.

No one, of course, holds that God literally acts like a curler or bowler. However, one's rough view of divine providence—the way God operates in the world—tends to look like one or the other, bowler or curler. Whichever way one leans, what are the theological implications for one's view of divine creation and providence given the developments of modern science, including evolution by natural selection?

God as Curler If one holds that God is like a curler, one typically holds that God created the heavens and the earth in the beginning, and that God guides some events by direct divine intervention. According to the curler view, God might have directly created, say, plants and fish and mammals days, months, years, or even millions of years after God's initial creation. God, on this view, intervenes into the world to create either life itself or at least the conditions for the creation of say, plants and fish and mammals (and, of course, human beings). Among contemporary curlers are young earth creationists and intelligent design theorists—views in which God intervenes throughout history. According to young earth creationism, the earth and its contents were created six thousand to ten thousand years ago through an initial series of direct creative activities (over the course of, on the most famous view, six days); on some views the Earth itself has attained its present state through a subsequent series of God-directed catastrophes—like floods and earthquakes. The key point for our discussion: young earth creationists, rejecting evolution, attribute the creation of every kind of plant and animal to direct divine activity. Intelligent design theory holds that the origin of life and some complex features of living things are best explained by an intelligent, intervening cause (not an unguided or undirected process like natural selection). Since complex biological systems (such as blood-clotting or the flagellum of the *E coli* bacterium or the human eye) have features that, they claim, could not have arisen through evolutionary processes, an intelligent designer must have inserted itself at each point to create such complex processes. God, on the curler view, does not create everything through natural law; indeed, many Abrahamic theists believe that God creates the most important things—including human beings—through direct, divine intervention.

God as Bowler If one holds that God is like a bowler, one holds that God creates by natural law. According to this view, God created the world perfectly *in the beginning*, including all the seeds of creation. While God creates everything in the beginning, including plants and fish and mammals, the plants and fish and mammals appear billions of years later through the operation of God-created natural laws. Contemporary theological bowlers tend to hold that evolution is the natural law through which God creates plants and fish and animals. One's view of the nature of God, the nature of God's creative activity, and the nature and integrity of God's creation determine one's views of how God creates: Does God create indirectly through natural law or directly through intervention? While these do not exhaust the options for divine action, proposals tend to lean one way or the other.

To be clear—both the bowler and the curler affirm that God creates and sustains the universe; moreover, both hold that God guides creation so that all things either are good or work together for good. But they disagree about *how* God is provident.

1.5 Randomness and Providence

Science has complicated the picture. The bowler metaphor fit nicely with physics prior to the twentieth century. In classical mechanics, nature and its systems were machinelike, strictly governed by deterministic laws. Just as one could understand the regular behavior of a clock through observations and experiments, one could discover the underlying laws and mechanisms at work in nature. And with enough knowledge, physicists believed they could predict exactly how those systems would evolve over time. Indeed, according to Pierre-Simon Laplace ([1814] 1902), an intelligence with sufficient computational capacity could predict the future state of every particle in the universe.

What about random events, like throwing dice or flipping coins? From the point of view of classical physics, randomness is only superficial. If one knew exactly how the dice were thrown, what sort of surface they would land on, and so on, then one could calculate precisely how the dice will land. Dice-throwing and coin-flipping are "random" only in the sense that the average person doesn't have adequate information about either the conditions or the natural laws to make the calculations. But given the laws of nature, they must land precisely as they do. With few exceptions, so-called random events in classical mechanics are merely events that are too complex for humans to predict in real time. In reality though, their behavior is just as mechanical and deterministic as a clock.

That, however, is not the sort of universe we inhabit. After the discovery of quantum mechanics, we now know that nature is not mechanical and that classical physics does not describe how things work at subatomic scales. Parts of the quantum world are truly random; they are indeterministic and intrinsically unpredictable. Let's consider one example.

Materials like uranium undergo radioactive decay. In other words, uranium atoms are unstable—they will break apart given enough time. While we can predict how long it will take for some lump of radioactive material to decay, we can't predict which atom will decay or when. Suppose we zoom in and pick one specific uranium atom in the lump and ask, "When will *this* atom decay?" According to the standard interpretation of quantum mechanics, there is no precise answer to that question. A quantum physicist can tell you the probability that that atom will decay in the next hour or year or decade, but nothing more. Decay events are intrinsically random. There is no hidden mechanism that causes an atom to decay. Not even God could predict when such an event will happen based strictly on a complete knowledge of the laws of nature.

Notice what this means for God's providential control. In a quantum world, no matter how precisely God sets the conditions at creation, the universe will develop in an indeterministic way—that is, it will develop in ways that not even God could predict. If randomness were limited to radioactivity, there might be ways for God to deal with it. Unfortunately, this is just one example of an entire class of quantum events. The upshot is that God cannot bring about a particular outcome merely by setting the initial conditions of the universe. How, then, can God providentially guide events except by intervening?

As we've seen, evolution showed there are laws of nature governing the biological realm, but Darwinism presents a new set of problems for providence. While random mutations play an important role, "randomness" has a different meaning in biology than in physics. In biology, randomness primarily is the denial that evolution is guided by any sort of purpose.

According to Neo-Darwinism, genetic mutations do not occur for the benefit of a creature or species; mutations, as such, arise independently of the needs of a species. They are random in that a given mutation could be useful (adaptive) in acquiring food, resisting pests, finding a mate, and so on, but the mutation did not occur *so that* a species could acquire food, resist pests, or find a mate. Indeed, mutations are more likely to be useless or even harmful (that is, maladaptive). ("More likely" because it is easier for a mutation to undermine a useful trait than for it to produce an adaptive one.) Death and destruction, then, seem required for evolutionary "progress." Not only did the dinosaurs go extinct, it is estimated that 99.9% of all the species that have existed have gone extinct. It is difficult to see, then, how all things work together for good.

But randomness plays a significant role in evolution even apart from mutations. Small contingent events can have dramatic effects over time. Consider some possible scenarios:

A) A creature has a mutation that provides it with camouflage in its environment. This advantage will likely be passed on to future generations. But then a natural disaster changes the species' environment in such a way that the coloration instead makes it easier to be seen by predators. The traits that come to proliferate in that species will now be very different.

B) A creature has a mutation that significantly improves its eyesight, but is eaten before it grows into an adult, thus preventing those genes from being passed on to later generations. As a result, a different species comes to dominate in that location.
C) The asteroid that struck the Yucatan peninsula 66 million years ago instead misses Earth entirely. The so-called Great Extinction, which changed the course of whole ecosystems, doesn't come to pass. As a result, pre-human mammals and, hence, humans never appear on earth.

The point is that there is a great deal of contingency in evolution. Chance, so it seems, plays the leading role in nature, not purpose, or design. Ecosystems are shaped by sudden changes to a local environment, or when otherwise favorable traits are selected out by a chomp, or by having/avoiding a natural disaster. While natural selection promotes—among other things—the survival of fittest, there is no guarantee that the fittest will survive and spread its genes within a given population. If mutations are random and their uptake in a species so radically dependent on countless contingencies, how could God guarantee the outcome of such a process?

Once all the randomness in the natural world is accounted for, one might wonder how one can believe in God at all, let alone God's providence. No surprise, then, that scientific randomness figures prominently in non-theistic worldviews. For example, biologist Douglas Futuyma claims that chance undermines belief in a creator: "By coupling undirected, purposeless variation to the blind, uncaring process of natural selection, Darwin made theological or spiritual explanations of the life processes superfluous" (1998, 5). And Harvard paleontologist George Gaylord Simpson asserts that "Man is the result of a purposeless and natural process that did not have him in mind" (1967, 345). Secular thinkers, who increasingly assert "chance" as a synonym for "naturalistic," allege that chance is by definition blind (thus, not divinely guided), and that chancy evolutionary processes preclude rational belief in God.

Any substantive claims about providence and randomness, on the part of believer and unbeliever alike, require serious, perhaps new, thinking about both providence and randomness.

1.6 Conclusion

If one accepts both contemporary physics and biology, how can one reasonably maintain that God intentionally created the heavens and the earth and all that they contain?

This book is the result of a three-year, Templeton-funded project, involving 36 Muslim, Christian, and Jewish philosophers, theologians, historians, physicists, and biologists, aimed at understanding how the world can be as science tells us *and* God be as the Abrahamic scriptures tell us. In particular, how can God providentially and reliably guide creation if reality is random? Is it possible to be both scientifically and religiously faithful without loss to either?

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PART II

The Problem(s) Stated

CHAPTER 2

The Many Faces of Randomness

Jeffrey Koperski

2.1 No Single Definition

While "random" is a familiar word, its definition is surprisingly hard to pin down. Some think of random events as lacking a cause or purpose. For others, the idea is bound up with improbability, indeterminism, or unpredictability. Making matters worse, the definition found in one discipline tends to conflict with those given in others. A statistician's random sequence has little to do with random mutations in evolutionary biology.

This chapter offers an overview of the terrain, looking at how randomness and closely related terms are used in a variety of disciplines. As will see, some are more relevant to the question of providence than others.

2.2 Purpose

Let's begin with purpose. Driving down the road is a purposeful act. A rock bouncing down a hillside and coming to rest in the road is not. It might just as well have landed in a ditch. Its precise path down the hill and

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where it lands is random. Many of the best examples of randomness are natural events like this: leaves blowing in the wind, water molecules bouncing off the side of a glass, or when the next meteorite will strike the moon. In contrast, artifacts are designed to mitigate the effects of random changes in conditions. A car might run over that rock in the road, but its tires and suspension are designed to minimize the risk of an accident. Perhaps a lack of agency or purpose is at least a necessary condition for randomness.

Not so, as we sometimes use random processes for our own ends. Consider games with dice or ping-pong balls in a state lottery. In both cases, manufactures ensure that no particular outcome has a higher probability than another. Random number generators in computers are designed to produce random-looking sequences. If randomness can be employed in a purposeful way, then the two are not mutually exclusive.

2.3 Probability and Statistics

Improbability was mentioned above. Perhaps probability theory could help to define randomness. Take a fair coin, flip it fifty times, and record the order of heads and tails. Call the following sequence S_1:

H H T T T H H H T T H H T T T T T H T T H T H T H
H H T H H H T T H H T H T T T H T H T H H H T H T

This seems like a typical random distribution of heads and tails. What is the probability of getting this sequence? For one toss of the coin, $P(H) = ½$ and $P(T) = ½$. So for fifty tosses, the overall probability for this sequence is $P(S_1) = (½)^{50}$, a small number. One might therefore think that small probabilities are indicative of random events, but basic probability theory immediately presents a problem with this. What if instead of S_1, the coin produces S_2, which is fifty tails in a row. Such a sequence is physically possible. One might think that $P(S_1) > P(S_2)$, but that is false. If the coin is fair, then $P(S_2) = (½)^{50}$, the same small number. Of course, S_2 doesn't *look* like a random sequence, so small probabilities alone do not seem to be a good indicator of randomness. At best, we might say that tossing the coin is a random *process*, but that process need not yield a random-looking *product* (Smith 1998, 149).

Turning to a related area of mathematics, "randomness" is well-defined in statistics, but it is a technical term that does not hew closely to everyday usage. Statistical randomness only applies to a sequence of events, not the way in which the sequence was produced. It would have nothing to say about the process, whether perfectly fair dice or ones that were obviously not symmetrical. Statistical randomness is a matter of patterns and pattern matching. A fully random sequence lacks any pattern or correlations. On this approach, S_1 would count as random but S_2 not at all. But these are extremes. Statistical randomness is a relative notion. Consider a third sequence, S_3:

H T T T H T T T H T T T H T T T H T T T H T T T H T
T T H T T T H T T T H T T T H T T T H T T T H T T T

Statistical tests would judge S_3 to be more random than S_2, but much less than S_1. This is because S_3 is a repetition of one H followed by three T's. The fact that one can specify such a pattern means that it is not completely random. In statistics, there are many well-known tests that detect degrees of correlation or patterns within a data set (e.g., the chi-square test). Mathematicians Andrei Kolmogorov and Gregory Chaitan emphasized the compactness of a description in defining degrees of randomness. To reproduce S_1, the best one can do is specify each data point individually, spelling out the entire string of events one by one. There is no shorter set of instructions. The fact that S_1 is *incompressible* in this way means that the sequence is random. S_2, in contrast, can be reproduced by two rules:

1. Print T
2. Repeat step 1 forty-nine more times

One need not mention all fifty points of data in order to reproduce S_2. That such rules exist shows that S_2 is not random. Finally, S_3 is slightly more random because it requires a less compact set of instructions to reproduce:

1. Print H
2. Print T
3. Repeat step 2 two more times
4. Repeat step 1 twelve more times

The relation between compressibility and statistical randomness can be rigorously defined and it plays an important role in communications theory. There seems to be little relevance here, though, to the question of providence. Some sort of pattern in nature could be evidence of divine action, although attempts to make such a case have not met with success.[1] Moreover, God could exert meticulous control over every natural process and yet make any sequence of events look random. In short, if the Kolmogorov/Chaitan compressibility is relevant to the question of providence, it is not clear how.

Let's return to the probability theory and consider a distinction. Probability can be understood in either an objective or subjective way. Physical symmetries, like those in dice or coins, ground objective probabilities. There is a fact-of-the-matter about the probability of rolling a 5 with a fair die. If two people disagree, at least one of them must be wrong. The correct probabilities in these situations are part of reality, independent of what anyone believes.

Subjective probabilities are different. Say that my neighbor believes there is better than a 50% chance that a Democrat will be the next President of the United States. This probability captures his degree of confidence about a future state of affairs. My provost, on the other hand, might say there is a 75% chance, and both would be right given that they are merely describing their own subjective degrees of confidence. While quantifying beliefs like this might not seem to have much practical value, *Bayes' Theorem* is a well-known rule for how one's subjective probability should be updated in light of new information (Joyce 2019). Bayesian probability theory has proven to be extremely useful, with applications everywhere from rational decision making to artificial intelligence. One of its key features is that although people's experiences will lead them to assign different probabilities to an event before data-gathering has begun (the so-called prior probability), values tend to converge as more observations are made. In other words, it doesn't seem to matter that people disagree about how likely an event is (i.e., their subjective priors differ). The correct application of Bayes' Theorem ensures that those differences will shrink as data accumulates.

The two interpretations of probability can help us to get a handle on the problem of randomness and providence. Subjective probability is useful for describing finite beings with limited experience. While people believe all sorts of weird things and so would rank their subjective degrees of belief accordingly, an omniscient being would hold every belief with

[1] Intelligent Design Theory is the most prominent example.

certainty—a probability of 100%. God's subjective probabilities do not change over time.[2]

The question then becomes how God's providential control can be squared with objective probabilities. If God wants a fair die to land on 5, in what sense is there only a $\frac{1}{6}$ chance of that happening?[3] From a God's-eye perspective, it seems as if the only real probabilities are 1 and 0. To some extent, physics backs this up. We use dice and coins in games to introduce a degree of uncertainty. With enough information, however, these events are perfectly predictable. The angular and linear momentum of the dice leaving your hand along, the strength of gravity, and the table's coefficient of friction determine the outcome of the dice. We do not have that information available and could not do the calculations before the dice came to rest even if we did, but based on the physics alone the outcome is in principle predictable. Dice are at best random for all practical purposes, but not fundamentally so.

There are other reasons for doubting that probabilities should be interpreted objectively. One is that perfectly good yet contradictory probability distributions apply to the same events. Say that a malfunctioning machine randomly fills soda pop bottles anywhere from one drop to completely full.[4] One could measure the bottles over the course of the day to calculate the probability that the machine will fill ¾ of a bottle. But what does it mean to be ¾ full? For a 20 cm tall bottle it could mean that the liquid reaches 15 cm in height. Note, however, that if the bottle has a total volume of 1 liter, then ¾ full could mean 750 ml. One way of determining ¾ full seems just as good as the other. While it might not be obvious, the measurement based on height will typically not be the same as the one based on volume. In other words, there is no one fact about when the bottle is ¾ full and so no one probability P(¾ full). Two different numbers will emerge depending on which units one chooses.

The problem is that the probability based on height seems just as real and correct as the one based on volume. Neither has a better claim to be *the* objective probability of interest. For the notion of objective probability to make sense, a unique probability distribution needs to exist, what physicists call a "natural measure." The reason many theorists favor subjective

[2] There are some possible complications here for open theism and God's beliefs about future contingents, but let's ignore that for now.

[3] Robert Koons takes up this question in Chap. 11 of this volume.

[4] This is based on an example in Sklar (1993, 119).

probability is that situations like the bottle are the norm and examples with a single probability distribution like dice are the exceptions.

If all probabilities are subjective, then probability theory isn't going to be of much help with the questions at hand. As we saw, an omniscient being would hold all beliefs with certainty. Even if the non-uniqueness problem can be overcome, it might still be the case that objective probabilities are only prima facie, like the dice example. Again, rolling dice are only random for all practical purposes. In terms of the underlying physics, the dice must roll precisely the way they do. Can all examples of objective probability be reduced in this way? To answer that question, let's turn from probability theory to natural science.

2.4 Physics

Physics provides many examples of randomness.

2.4.1 Statistical Mechanics

What we experience as air temperature depends on the average velocity of the molecules in the air around us. The higher the kinetic energy of the molecules, the warmer the air feels. Statistical mechanics is the area of physics that relates the aggregate behavior of particles to detectable properties, like temperature and pressure. Such averages are not directly calculated from the velocities of each molecule in the room. There are far too many molecules in even a cubic millimeter of air to track or simulate on a computer. Since no one can predict the evolution of a system with more than a dozen or so particles, physicists must resort to probabilities. The precise state of such systems fluctuates randomly.

2.4.2 Chaos Theory

Chaos poses some of the same challenges as statistical mechanics, but often for far simpler systems, like the tumbling of an odd-shaped moon[5] or a dripping faucet. Even the best supercomputers supplied with information from the most advanced measuring devices cannot accurately track the evolution of a chaotic system. There are two reasons for this. First, chaotic systems display *sensitive dependence on initial conditions* (SDIC).

[5] Namely Hyperion, one of Saturn's moons.

Even with a set of equations that perfectly models the evolution of the system, the slightest error in the initial conditions will explode exponentially fast. Since all physical measurements involve some error, there is no way to provide the model with initial conditions that are perfectly accurate and precise. Because of SDIC, state predictions based on less than perfect information fail for all chaotic systems. Second, digital computers have a finite amount of storage and memory. No matter how many digits they can store, most calculations will involve some amount of roundoff error. Much like the measurement errors in the previous case, these will cause state predictions of a chaotic system to fail in a relatively short time.

2.4.3 Instability and Singular Points

Think of a perfectly symmetrical sphere balancing on a knife edge. Say that the system exists in a vacuum and is isolated from all vibrations. In principle, the sphere could remain in place indefinitely. If the sphere were to fall at some point in the future, nothing in the laws of nature at present dictates which way it would fall. The relevant equations have so-called singular solutions that block any predictions about how the system will evolve. Physicists Joseph Boussinesq and James Clerk Maxwell, still working in the age of classical mechanics, hoped that such systems could provide insight into freewill (van Strien 2014, 175–76).

While the sphere example involves several idealizations, singular points pose real-world obstacles for mechanical engineers. If a locomotive were to come to rest in such a state, there would be no way to know which way the train would go when started again.

2.4.4 Norton's Dome

Consider another system from classical mechanics, in this case a point particle situated at the top of a frictionless dome. When the mathematics for this system is restricted to "well-behaved" force functions, the particle will remain in place until a new force nudges it along. So far, this is much like the sphere on the knife edge. However, what if we loosen the restrictions? Instead of ruling some solutions out by fiat, let's allow a wider range of functions.[6] In that case, the particle may move off the dome at some unknown time *without* being nudged. While this might seem impossible,

[6] Technically, those that are not Lipschitz continuous.

many papers have been written exploring "Norton's dome" (Norton 2008). What is not controversial is that, unless we simply choose to ignore such possibilities, the particle will move off the dome without perturbation at some finite time in the future. Moreover, there is no way to know when this will happen.

2.4.5 *Spontaneous Symmetry Breaking*

There are many different types of symmetry in physics. The simplest are spatial, like a pin balancing on its tip. The pin looks the same no matter from which side one approaches it. When the pin falls, the symmetry is broken. Other symmetries are purely mathematical, like those that give rise to conservation laws.[7] Still others are about physical processes like the formation of magnets. The atoms in a piece of iron have their own tiny magnetic poles. Above 770 °C, these poles are randomly oriented and so the piece of iron as a whole is not magnetic. As the metal cools below the Curie point, the magnetic poles of the atoms align, and a weak magnetic field emerges. At this point, the symmetry is broken. The magnetic field has a defined orientation in space. There is no way to know in advance, however, which direction this alignment will take place. It seems to be a random process.

There are many other examples of spontaneous symmetry breaking in condensed matter physics. It also plays an important role in particle physics, including the behavior of the recently verified Higgs boson. In each case, a system evolves from an unstable, symmetric state to a stable, asymmetric one. But the choice of asymmetric state appears to be random. Nothing in nature prefers one possibility rather than another.

2.4.6 *Quantum Mechanics*

The best-known examples of randomness in physics have to do with quantum mechanics. One is radioactive decay. Quantum mechanics can only be used to predict the probability of a uranium atom decaying within a designated time. While conditions must be right in order for decay to occur,

[7] For example, the fact that physical laws work the same way locally as they do in other galaxies is a type of symmetry related to the conservation of momentum. That they work the same now as they did in the past is associated with the conservation of energy. The precise relations were proven by Emmy Noether in 1915.

there is no hidden mechanism that causes a particular atom to decay precisely when it does. It "just happens." This is also true for quantum measurements and the collapse of the wavefunction, part of the famous Schrödinger's Cat scenario. This thought experiment restricts the outcome of a measurement to two states: the cat lives or the cat dies. There is a 50% chance for either. Once again, nothing in the laws of nature determines which will happen. All measurement events in quantum mechanics are to some degree random.

These examples show that randomness has been part of physics for centuries. Do they pose a problem for divine providence? Some might, but most do not. Let's work back through the list in a different order.

Most physicists would dismiss cases like Norton's dome as physically impossible. While the mathematics might allow the particle to move by itself, not all solutions to the governing equations need to be treated realistically. Mathematical possibility is broader than physical possibility. Norton's dome is therefore nothing but an idealized thought experiment.[8]

As for instability and singular solutions, it's true that the sphere on the knife-edge will not move until perturbed in some way—the slightest vibration or the impact of a single air molecule. But if we knew what the perturbation was, then it would be trivial to predict which way the sphere will fall. Once *all* the physical conditions and influences are accounted for, the outcomes are completely predictable, much like the dice example mentioned earlier. Examples like this are only random in a superficial way.

A useful device for sorting out the other cases is what is now called a "Laplacian demon." Physicist Pierre-Simon Laplace discussed the idea of a super intelligence with perfect knowledge of the laws of nature and the state of every particle in the universe at a point in time ([1814] 1902, 4). With such information in hand, a Laplacian demon could calculate all future states of a universe governed by Newton's laws. For our purposes, we need to expand on this idea a bit. Let's give the Laplacian demon unlimited computational capacity and perfect knowledge of the state of any given system. If there is a truth about how events will unfold given the physical conditions and the laws of nature, the Laplacian demon would be able to accurately predict it. Such a being is clearly an idealization. (The observable universe contains a finite number of particles, which puts a

[8] I believe that this easy dismissal begs the question, but it is nonetheless the majority view. For more, see Koperski (2020, sec. 6.3).

limit on computational capacity. Plus, no physical measurements are perfectly precise.)

Even this improved Laplacian demon falls far short of omniscience. Laplace's idealized intelligence is not a model of divine knowledge, but rather a limiting case. It is more like a perfect computer that solves equations based on error-free information. This means that if a Laplacian demon could predict the outcome of an event, then surely God knows it as well.

With some further analysis, it turns out that only quantum mechanics would pose a fundamental challenge to a Laplacian demon. Classical statistical mechanics and chaos are just more complex versions of the dice example given earlier. Given enough information, a physicist could predict how a pair of dice will roll. Given unlimited computational capacity—no roundoff errors—and perfect measurements, a Laplacian demon could calculate the collisions in a many-particle system and track the evolution of chaotic ones.

The physics behind spontaneous symmetry breaking can be far more complex, but it also requires some sort of perturbation for a system to move from an unstable, symmetrical state to a stable, asymmetrical one. Like the sphere on the knife-edge, a Laplacian demon with complete knowledge of all the physical influences could predict how and when these symmetries would be broken, with one exception. In the examples involving the most sophisticated physics, the perturbations will sometimes be due to quantum fluctuations. Not even a Laplacian demon could predict when a given uranium atom will decay or whether Schrödinger's cat will live or die. The type of randomness involved is intrinsic and cannot be resolved with epistemic access to some underlying physics. Many in the science-and-religion literature refer to this as "ontological randomness" to emphasize that it is real and not merely perceived. The other examples involve "epistemic randomness," which is ultimately based on a lack of knowledge. This is why the Laplacian demon is useful. By definition, it has access to all the physical facts, even ones that are hidden to us, and so is not susceptible to epistemic randomness.

As Nidhal Guessoum points out, physicists do not use "epistemic randomness" to describe these events (private conversation). The more standard terminology refers instead to determinism. Take two identical systems, say two solar systems with the same sizes and orbits of planets and identical stars. Determinism says that if those systems have the same overall configuration at one point in time, then they will remain in perfect sync unless something interferes with one system or the other (Butterfield 2005). The relevant laws and state of the system at one instant determine the evolution of that system arbitrarily far into the future. Given that the same laws of nature govern both, if the two systems have the same overall state at one instant, the two will evolve in lockstep. Except for a few special cases (Earman 2007), classical mechanics is deterministic. This is the underlying truth that Laplace was trying to illustrate.

For the most part, quantum mechanics is also deterministic. The evolution of a system according to Schrödinger's equation would pose no challenge to a Laplacian demon. The reason that it cannot predict radioactive decay and the outcome of a Schrödinger's cat experiment is that those events are indeterministic. Two uranium atoms in identical environments will likely decay at different times. Two Schrödinger experiments with identical cats might result with one alive and one dead. The laws of nature and the initial conditions do not fix a unique set of future states for these systems.

This gets to the heart of the matter vis-à-vis randomness and providence. If a system is deterministic, then no matter how complex or chaotic it is, God would know its future states. Recall Clark's bowler analogy (section 1.4 of this volume). The physics of bowling is deterministic. Given the angular and linear momentum imparted to the ball, the pins must fall the way they do. A Laplacian demon would rightly predict which pins will remain. But what if quantum events were manifested at the level of our experience, and bowling involved some degree of indeterminism? In that case, no amount of skill, knowledge, or precision could guarantee that when the ball leaves the bowler's hands it will produce a strike. This illustrates one concrete challenge involving randomness. Can God providentially govern a universe that contains irreducibly indeterministic processes without intervening along the way? Is a world with quantum events in some sense risky for God?

There is one more thing to note about quantum mechanics. Not all interpretations are indeterministic. The orthodox, Copenhagen approach is, as well as others with a collapse of the wavefunction, such as the GRW interpretation (Ghirardi–Rimini–Weber). But Bohmian mechanics and the Everettian many-worlds interpretation are not. This means that quantum mechanics has not proved that some events are indeterministic. In the next century, most physicists might come to reject a collapse of the wavefunction and thereby restore determinism to quantum mechanics. In any case, of the many ways of understanding randomness, indeterminism appears to be one of the better candidates.

2.5 Biology

Another obvious place to look for randomness in science is evolutionary biology. Random mutations play a key role in Neo-Darwinian evolution. In what sense are they random? In part, the word is used to deny any sort of teleology or directedness in the process. In Lamarckian evolution—a theory which predates Darwin—changes from one generation to the next had a clear direction. Lamarck believed that nature responds to the needs of a species. According to this theory, giraffes evolved long necks because of their persistent stretching for leaves on tall trees over many generations. Likewise, the more elephant ancestors used their trunks, the more functional they became in their progeny.

Darwin explicitly rejected this sort of directed evolution. He believed instead that changes from one generation were random: some might prove useful in acquiring food, resisting pests, finding a mate, and so on, but most would be maladaptive. ("Most" because it is easier for a mutation to undermine a useful trait than for it to produce an adaptive one.) With the discovery of genetics, we can say more precisely that there is no directionality to genetic mutations with respect to the evolution of the species in which they occur. This is the sense in which mutations are random. How does it compare to those in physics?

The answer depends on the cause of a given mutation. Some mutations arise during cell division. Errors occur when genes fail to produce exact copies themselves. But such events need not be random in any deep sense. The underlying biochemical processes could be fully deterministic. There is only one causal pathway for a mutation given the interactions of the organic molecules involved. Other mutations are due to external sources, such as radiation. While the exact chain of events is more complex, it would be just as tractable to a Laplacian demon as the collisions of ping-pong balls in a lottery machine.[9] In short, the underlying processes responsible for random mutations are on a par with examples of deterministic, epistemically random events in physics.

[9] The radiation event itself would be indeterministic, as discussed in the previous section.

Philosopher of biology Alan Love discusses a less obvious type of biological randomness in the writing of paleontologist Stephen Jay Gould (Chap. 7 of this volume). Gould highlighted the role of contingency in evolution (1989, 48–51). Would the phylogenetic tree of life look different if evolution were restarted from the same initial conditions? In other words, if we could "run the tape again," would natural selection produce roughly the same set of species? Gould thought not. There is too much contingency involved to think that evolution would play out the same way again. The distant ancestors of any species would have been extremely lucky to survive and pass on their genes. Consider the earliest primate. Think of all the things that could have happened before it had a chance to reproduce. It could have been killed by a predator. It might have died from disease or starvation. Say that the asteroid that hit the Yucatan Peninsula 66 million years ago had missed the Earth by a few hundred miles. Dinosaurs would have continued to dominate for some time. As Gould put it,

> replay the tape a million times from a Burgess beginning, and I doubt that anything like *Homo sapiens* would ever evolve again. … Wind the tape of life back to Burgess times, and let it play again. If *Pikaia* does not survive in the replay, we are wiped out of future history. (1989, 289, 323)

The tree of life seems to have been shaped by this ever-present contingency. If crucial events had gone differently, our ecosystems would be populated with other species, and humans would not be among them.

In most ways, evolutionary contingency does not pose any new problems for divine providence. The Yucatan asteroid and many of Gould's other examples are no more unpredictable or indeterministic than those in statistical mechanics or chaos theory. There is, however, a possible exception. Say that the first primate had been eaten by a carnivore before reproducing. Was this event foreseeable? The answer is tied up with the difficult question of free will. Many theists hold that humans have a robust sort of free will that is not compatible with determinism.[10] A Laplacian demon, therefore, could not predict one's free choices. And while some, like Descartes, did not believe that animals have free will, theists generally believe that high-functioning animals do as well. *If* the predator in question had the free will to

[10] Philosophers refer to this as *libertarian free will.*

pursue our primate ancestor or some slower-looking prey, then that decision would be indeterministic. No amount of knowledge about the relevant laws and conditions would allow one to predict which choice the predator would make. At best, there is an objective probability that the creature would make one choice rather than the other.

Does God know what choices a free creature will make? This is a contentious issue. Most theistic philosophers would answer "yes," but there is little agreement about *how* God knows this. They do agree, however, that if God has exhaustive foreknowledge, the way in which God knows our future choices is nothing like the prediction of a Laplacian demon. In contrast, open theists deny that that there is a definitive fact-of-the-matter now about what a free creature will choose. There is simply no truth "out there" to be known, and so the answer is "no," God does not know the outcome of free choices.

Going back to Gould's notion of contingency in evolution, does predation by higher animals pose a challenge to divine providence? Maybe. If open theism is right and God does not precisely know the outcome of free choices, and if prehistoric predators had free will—both of which are questionable—then that sort of contingency would make a particular view of providence more difficult.

Of the many concepts in mathematics and the natural sciences that are related to randomness, few seem to pose a problem for divine providence. The main challenge comes from indeterminism. It is difficult to see how God could exercise providential control over nature without intervening if events are indeterministic. Quantum fluctuations shortly after the Big Bang might have produced an uninhabitable universe. Free will choices at key points in history might have led to a world with far more suffering, or, if the predation example is correct, one without *Homo sapiens*. In either case, God could not guarantee how events would unfold in the future from a given set of conditions at creation.

There is clearly a conceptual tension, then, between some forms of randomness and providence, one that I have not sought to resolve in this essay.

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CHAPTER 3

Randomness and Providence: Defining the Problem(s)

Aaron M. Griffith and Arash Naraghi

3.1 Introduction

Traditional monotheistic religions (Judaism, Christianity, and Islam) all express a commitment to God's providence (from the Latin *providere*, to foresee or to provide for) over the created world. While different conceptions of God's providence are found in and among these traditions, they each affirm that God governs and controls the whole of creation, including the lives of individuals, with perfect power, goodness, and knowledge. However, the created world appears to be full of randomness. Many events are unpredictable and lack a discernable pattern, purpose, or cause. From the sub-atomic level, to the human social world, to the formation of galaxies, creation seems to display randomness that cannot be explained simply by human ignorance. Such randomness appears to be part of the very

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fabric of the world itself. Indeed, our best contemporary science—quantum mechanics, for example—seems to indicate that some events are in principle unpredictable.

Such randomness is prima facie incompatible with God's providence over creation. The tension is easy to appreciate. Random events seem not to be controllable and not part of any plan, much less any good plan. But God's providence consists in his ability to control and foresee the unfolding of events in such a way that they lead to a good and meaningful goal. If this tension is genuine, it would be a serious worry for traditional Abrahamic monotheism. If the world is ungovernable, then we have reason to doubt that God is provident, and hence to doubt that God exists. For God's providence is tied up with his other essential attributes: omnipotence, omniscience, omnibenevolence. Moreover, the challenge posed by randomness for the believer is that it calls into question the purposiveness of events as well as God's ability to fulfill his promises. Trust in God's plan and care for his creatures looks to be eroded by randomness in the world.

As compelling as this problem might initially seem, we argue that it is difficult to formulate an uncontroversial version of the problem of randomness for God's providence given the various empirical and theological variables at play. This chapter is primarily an attempt to locate the numerous choice points (empirically and theologically) that could generate a tension or incompatibility between randomness and God's providence. We begin by outlining different ways in which ontological randomness can be understood. We then consider various conceptions of God's providence, which differ with respect to the nature of God's foreknowledge, power, and purpose for creation. With these variables on the table we go on to develop a number of arguments for thinking that randomness is incompatible with God's providence and consider some replies from different conceptions of providence.

3.2 Ontological Randomness

'Random' is a label applied to a number of importantly different phenomena. These include outcomes of games of chance, sequences of numbers lacking a pattern, coincidence of independent events, methods for sampling populations, radioactive decay, quantum indeterminacy, genetic mutation, and chaotic non-linear systems (Bradley 2012). The sort of randomness we are concerned with is ontological rather than epistemological. Ontological randomness is randomness in being itself, irrespective of human cognition and its limits. What appears to us to be indeterminate, unpredictable, or purposeless is there in the world itself, not merely our understanding of the world. We distinguish two broad forms of ontological randomness: one in terms of indeterminism and another in terms of purposelessness. We think this distinction can help capture the common uses of 'randomness' found in the literature.

3.2.1 Randomness as Indeterminism

The first form of ontological randomness is defined in terms of indeterminism. A random event, in this sense, is the outcome of an indeterministic process. That is to say:

Indeterministic Randomness: Event E is random$_I$ iff E occurs and E's occurrence is not determined to be part of a unique future, that is, both E and not-E are outcomes compatible with the way things are up to E's occurrence.

Indeterminism has implications for predictability: if an event E is the result of an indeterministic process in the above sense, then there is no way to *predict with certainty* that E will occur.[1] Being the result of an indeterministic process explains why E's occurrence could not have been predicted with certainty on the basis of a complete description of events up to E's occurrence.

It is important to distinguish two readings of Indeterministic Randomness. On the one hand, a random$_I$ event may be indeterminate in the strongest possible sense, that is, one that is indeterminate with respect to any factors *whatsoever* up to the event's occurrence. Such events are not determined by either physical or 'metaphysical' or 'supernatural' causes, for example, God's direct action in the world. On the other hand, a random$_I$ event may be indeterminate with respect to *physical* factors. Such events may, therefore, be determined by metaphysical or supernatural

[1] To predict E, as we'll understand it here, is a matter of knowing that E will occur on the basis of complete knowledge of the world prior to E's occurrence and the relevant laws. Moreover, if an event E is predicted, then E occurs. Although all indeterministic events are unpredictable in this sense, we do not assume that all unpredictable events are indeterministic. Chaotic systems can involve events that are all causally determined despite the system's unpredictability due to extreme sensitivity on initial conditions. See Bradley (2012, 78).

factors despite their lack of physical determination. Call random$_I$ events that are entirely indeterministic, 'metaphysically random$_I$' and events that are indeterministic with respect to physical factors, 'physically random$_I$.'

Metaphysical Randomness$_I$: Event E is metaphysically random$_I$ iff E occurs and E's occurrence is not determined to be part of a unique future by anything whatsoever, that is, both E and not-E are outcomes compatible with all factors up to E's occurrence.

Metaphysically random$_I$ events would be, as Clark (2014) puts it, "in principle unpredictable."

Physical Randomness$_I$: Event E is physically random$_I$ iff E occurs and E's occurrence is not determined to be part of a unique future by any physical factors, that is, both E and not-E are outcomes compatible with the laws of nature and the state of the world up to E's occurrence.[2]

Random$_I$ events cannot be predicted with certainty. Of course, inability to predict with certainty is not incompatible with ability to predict *with high probability*. Random$_I$ events have an objective probability of occurring less than 1 and greater than 0. There may be antecedent factors that make such an event more likely to occur. Knowing the antecedent factors that make the event more or less likely may allow us to predict its occurrence with high probability.

Given this, it is worthwhile articulating a notion of randomness$_I$ in which random events are not predictable in the sense that they are events whose occurrence cannot be predicted with high probability. Not only would such an event be the result of an indeterministic process, but there would also be no connection between the probability of the event and other prior events. Such an event would be *arbitrary*:

[2] If a physically random$_I$ event is determined by something non-physical, for example, God's direct activity, then, it would not, in a strict sense, be random$_I$. Our inability to predict such an event would simply be due to our ignorance of the metaphysical cause of the event and hence be an example of epistemic randomness. On the other hand, if the whole of reality is physical, then all physically random$_I$ events would thereby also be metaphysically random$_I$.

Arbitrary Randomness$_I$: Event E is arbitrarily random$_I$ iff E occurs and E's occurrence is not determined to be part of a unique future and the probability of E's occurrence is completely independent of the occurrence of any event prior to E's occurrence.

Many physicists hold that there is ontological randomness at the quantum level (especially those holding to the Copenhagen interpretation of quantum mechanics). They think that Bell's Theorem provides strong evidence that some quantum events—for example, determining whether an electron passing through a beam splitter has an up-spin or down-spin—are *in principle* unpredictable rather than unpredictable because of our ignorance of hidden variables. Such quantum events appear to be examples of randomness$_I$. They are not predictable with certainty, though they may be predictable with high probability. These physicists deny that such events are arbitrarily random$_I$, for the occurrence of these events are not arbitrary but rather have a certain probability of occurring and are governed by statistical laws.

Libertarian free will might also be thought to involve randomness$_I$. Free actions, according to the libertarian, are the results of indeterministic processes: their occurrence or non-occurrence is compatible with the state of the world immediately prior to their occurrence. They are not predictable with certainty on the basis of knowledge of the world up to the time of their occurrence. However, most libertarians want to avoid calling free actions random because it connotes arbitrariness. We think they may still accept that free action involves Indeterministic Randomness as long as it does not involve Arbitrary Randomness$_I$.

3.2.2 Randomness as Purposelessness

The second form of ontological randomness is defined in terms of lacking a purpose. Events with a purpose are brought about for a reason or play a role in realizing some goal, non-accidentally. Peter van Inwagen holds that an event is a 'chance' event if it is "without purpose or significance; it is not a part of anyone's plan; it serves no end; it might very well not have been. 'Why did that happen?' the only right answer is: 'There is no reason or explanation; it just happened'" (1988, 50–51). One way to capture this idea is to sever the connection between the probability of the event and its contribution to a purpose or goal. An event does not serve a purpose if there is no connection between the probability of the event's occurrence and its contribution to that purpose. Hence, *Purposeless Randomness*: Event E is random$_P$ iff E occurs and the probability that E occurs is completely independent of its (non-) contribution to any purpose.

Since the examples we will consider below concern specific purposes or goals, it is helpful to have a relativized notion of randomness$_P$, that is, a notion of randomness with respect to some particular purpose or goal:

Relative Randomness$_P$: Event E is relatively random$_P$ with respect to some purpose P iff E occurs and the probability that E occurs is completely independent of its (non-) contribution to P.

If E is random$_P$ with regard to purpose P, then E's occurrence is not for the sake of P. According to evolutionary biology, mutations are random in the sense that they do not occur for the sake of the fitness of the individual (or species). Mutations may have genetic causes and be more or less predictable, but their purpose is not the survival of the organism. So, at least with respect to the fitness of organisms, such mutations are examples of Relative Randomness$_P$.

Having defined two general categories of randomness—randomness$_I$ and randomness$_P$—it is worth noting that the two categories cut across each other. Some random$_I$ events also lack a purpose, that is, they are random$_P$. Arbitrarily random events, for example, 'just happen' and so are not produced for the sake of anything else. But other random$_I$ events may have a purpose. If there is libertarian free will, then there are events, for example, an agent's freely chosen action, that are the result of an indeterministic process but occur for the sake of some purpose, that is, whatever goal or intention the agent had in mind. Moreover, it is possible for an event to be purposeless while still being the result of a deterministic process, that is, non-random$_I$. Such an event may be the result of a deterministic process despite not serving any purpose. In sum, some but not all random$_I$ events are random$_P$ events and some but not all random$_P$ events are random$_I$ events.

It should be noted that we will not argue for the actual existence of any examples of ontological randomness. So, we do not take a stand on whether the mathematical equations used to represent quantum states is best interpreted according to the Copenhagen (indeterministic) or Bohmian (deterministic) interpretations. And we do not insist that genuinely free actions are libertarian free actions. Ours is a conceptual project exploring the compatibility or incompatibility of ontological randomness and God's providence. The question is, is it possible for God to be provident in a world containing ontological randomness (whether or not such randomness is actual)?

3.3 Divine Providence

Scott Davison writes, "In the most basic sense, a person is provident over something if and only if that person exercises control over it, based upon knowledge, for a good purpose" (1999). Davison's gloss identifies the key elements in traditional monotheistic accounts of providence, namely, God's power, God's knowledge, and God's goodness with respect to his creation. Many proponents of the doctrine agree on this much. But in the details of the doctrine we find substantial disagreement about how it should be articulated. Three broad approaches to divine providence can be distinguished: Super Meticulous Providence, Meticulous Providence, and General Providence.

3.3.1 Super Meticulous Providence

Under this heading we include 'Theological Determinism,' which is the view that "God unconditionally decrees every event that occurs in the history of the world" (Vicens 2014). God determines that all events happen as they do, either by directly causing them to happen or by initiating a sequence of events such that each event is necessitated (Judisch 2012). What is common to Super Meticulous views of providence is that nothing happens that is not intended or permitted by God. Each event that happens has a purpose and plays a specific role in God's ultimate plan for creation. This plan is wise and loving in execution and realization. On Super Meticulous views, God has complete and detailed knowledge of the actual past, present, and future. This includes foreknowledge of what creatures will freely do.[3] This is the most exacting form of 'risk-free' providence, for quite literally nothing is outside of God's control; God's plan will be

[3] Proponents of Super Meticulous Providence will be determinists and hence endorse a compatibilist view of free will. They may also attribute to God knowledge of the conditionals regarding what creatures would freely do in various circumstances. However, they will deny, as the Molinist holds, that such truths are true independent of God's will (Flint 1998, 86).

realized exactly as God intends, with no chance of failure or alteration. Super Meticulous views of providence are found in Calvin and Edwards in Christianity, among the Ash'ari theologians in Islam, and among Hasidic thinkers like Mordechai Yosef Leiner in Judaism. Although controversial, we include here Aquinas' view on which God works through secondary (created) causes, concurring or cooperating with them to bring about each new event and state of the world in time.

3.3.2 Meticulous Providence

Like Super Meticulous views, Meticulous Providence depicts God's relation to creation as 'risk-free.' While nothing is outside of God's knowledge, God allows some level of genuine agency, autonomy, or indeterminism in his creation. In Islam, versions of Meticulous Providence are defended by Mu'tazili theologians and some philosophers such as Farabi (tenth century). In Judaism, Maimonides appears to be an advocate of Meticulous Providence (1904, 161, 285–287). In Christianity, Molinism is a prime example of Meticulous Providence. According to Molinists, God ordains all events to happen. For some events, God is the ultimate sufficient cause, while for others, God casually brings about circumstances under which events will take place (even if not with necessity) (Rhoda 2010, 283). What is crucial for Molinists is that God has 'middle knowledge' of contingently true conditionals concerning which events will non-deterministically occur in a given set of circumstances. Call these 'counterfactuals of indeterminism' (cf. Flint 1998, 40). Among these are 'counterfactuals of creaturely freedom' (Flint 1998, 46), which are contingently true conditionals concerning what creatures will freely do when put in certain circumstances. Meticulous Providence allows for indeterminate events in creation but insists that God knows (and promotes and permits) the outcomes of such events. If God has middle knowledge, then prior to creating he can decide which world to create among the feasible alternatives[4] and know with certainty how things will turn out in each alternative. Defenders of Meticulous Providence hold that God's plan is

[4] According to Flint (1998, 51ff.) feasible worlds are those that God can actualize, where that is determined by the complete set of counterfactuals of creaturely freedom God knows to be true. If God knows the counterfactual (C → A) is true, then he cannot actualize a world—such a world would be 'infeasible'—in which circumstance C obtains, yet action A is not performed.

loving and that nothing can happen that will jeopardize God realizing his plan (though they may disagree amongst themselves about how specific God's plan is).

3.3.3 General Providence

Adherents of General Providence deny that God determines (directly or indirectly) all events to happen. They also deny that God has knowledge of certain things, precisely because there is no knowledge of such things to be had. For example, according to Open Theism, God has exhaustive and complete knowledge of the past and present but not of the actual future, since there is no actual future according to most Open Theists.[5] There are some events, for example, the freely chosen actions of human beings, of which God has neither foreknowledge nor middle knowledge. God may know with certainty that some events will occur, such as those that are necessitated by the present and the laws of nature. But Open Theists hold that many future events are indeterminate and may hold that God only knows that future events have a certain probability (less than 1 and greater than 0) of occurring. On this view, God's governance involves his reaction or response to his creatures' actions that, in some cases, he does not foreknow or have middle knowledge of. Hence, God's plan is general insofar as the details of the plan are not specified in advance but filled out as God interacts and responds to his dynamic creation. The success of God's plan is dependent upon the actions and choices of created things, some of which God does not intend or foresee. While God is infinitely resourceful and knowledgeable about the past and present, he only knows the probability that things will turn out as he intends.

These positions represent the main approaches to characterizing God's providence. However, a variety of other theological considerations are at play in specifying the nature of God's providence. First, there are important questions about the specificity of God's providence. Does God act in creation only generally, for example, by governing through the laws of nature, or by specific divine actions at particular places and times? Is God's

[5] See Hasker (1989), Pinnock, et al. (2010), Sanders (1998), and Rhoda (2007). It's not clear whether there are any proponents of open theism among historical Muslim or Jewish theologians. Abd al-Jabbar (eleventh century) and Gaylan ed-Dimaski (eighth century) may hold views closest to open theism in Islam. In Judaism, Ibn Ezra (twelfth century) and Levi ben Gerson (fourteenth century) may be proponents.

providence primarily aimed at maintaining the order of creation as a whole or also aimed at promoting the flourishing of individual creatures? Second, there are questions about God's causal interaction with the created world. Does God's intervention in creation involve suspending or breaking the laws of nature? What is the nature of these laws? Are they mere regularities or are they necessary connections between universals or are they probabilistic? Third, there are questions about God's relation to time. One view is that God is in time and his eternality consists in his existing at every time from the past through the future with no beginning or end. A rival view is that God exists timelessly, that is, God transcends time, existing not at any temporal location but in a timeless state (cf. Craig 2009, 145). Advocates of (Super) Meticulous Providence adopt different positions on this question. Answering the question about God's relation to time helps answer the question about *how* God knows the future, for example, by prediction, by direct acquaintance, by perception, or by timeless apprehension. Open Theists deny that God exists timelessly and typically adopt 'tensed' views of time, such as those on which the future is non-existent or at least indeterminate, for example, presentism or growing block theory.

We take no stand on which view of providence is correct or which views are 'orthodox.' These seem to be the main views of providence on offer and we only intend to consider their compatibility or incompatibility with ontological randomness.

3.4 The Problems

The basic structure of the problem that randomness is supposed to pose for God's providence can be stated as follows:

(1) There are instances of ontological randomness.
(2) If God is provident, then there are no instances of ontological randomness.
(3) Therefore, God is not provident.

If one thinks that God could not but be provident (given his choice to create), securing (3) would allow the defender of such an argument to draw the stronger atheological conclusion,

(4) Therefore, God does not exist.

We will concern ourselves with arguments seeking to establish (3) but leave it open that such arguments could be further developed to deduce (4) from (3).

Like the problem of evil, randomness might be used to generate an evidential, rather than a logical, problem for God's providence. Such problems might take the form of an inductive argument, a probabilistic argument, or an inference to the best explanation argument that have the conclusion that it is unlikely that God is provident. We formulate the problems below in terms of logical incompatibility for the sake of simplicity but recognize that suitable evidential versions of the problems can be developed.

We also assume, for the sake of argument, that there are in fact instances of ontological randomness such as those discussed in Sect. 3.2. So we assume that (1) is true or likely to be true. The arguments we consider below constitute ways of defending premise (2), pitting specific forms of randomness against specific aspects of God's providence, especially his power, knowledge, and perfect goodness. In discussing these arguments, we evaluate how effective they are against the different conceptions of God's providence presented in Sect. 3.3.

3.4.1 Power

God's providence involves his power insofar as God exercises control or governance over the unfolding of creation. The first argument contends that randomness is incompatible with God's control of how the created world unfolds:

Argument from Control: Suppose that there are ontologically random events, in the sense of randomness$_I$. If there are such events, then nothing and no one, including God, has control over whether such events occur. Such events are not determined to be the case and so not predictable; they just happen. If there is pervasive randomness in the world, then God lacks control over much of the world's unfolding. If God lacks control over how much of the world unfolds in this sense, then there is no way for God to guarantee that his plan for the world comes to fruition. But such a guarantee is required for God to be provident. Therefore, the existence of pervasive randomness$_I$ entails that God is not provident.

The *Argument from Control* assumes, in the first place, a strong form of randomness, namely, metaphysical randomness$_I$, which entails that random events are entirely indeterministic. The argument does not show, however, that God's providence is incompatible with a weaker form of randomness, for example, physical randomness$_I$, which defines a random event as one that is indeterministic with respect to any physical factors. Such randomness is compatible with being determined to occur by some transcendent cause like God's direct activity. Some (see Byl 2003 and Jaeger 2015) have noted that there can be no empirical confirmation that an event is random$_I$ in the stronger sense because no amount of empirical inquiry could reveal that an event is entirely indeterministic.

Does the argument, therefore, show that metaphysical randomness$_I$ is incompatible with God's providence? It would if God's providence is taken to entail that the world is deterministic. Some versions of Super Meticulous Providence, for example, Theological Determinism, have this feature. But Meticulous and General views of Providence both countenance indeterminism. The Molinist, for example, can allow that there are events that are the result of entirely indeterministic processes but insist that God knows prior to creation which events will indeterministically occur in a given set of circumstances. Open Theists already deny that God has exhaustive knowledge of the actual future on account of the indeterminacy of free human action. Presumably, they would also allow for non-human indeterminacy. The indeterminacy of metaphysical randomness$_I$ appears to pose no special problem for Open Theists.

The central move in the argument is to connect randomness with lack of control. Random$_I$ events may be uncontrollable in the sense that they 'just happen,' that is, by not being determined to happen. But as we noted in Sect. 3.2 above, it is important to distinguish the genus, indeterministic randomness, from the species, arbitrary randomness$_I$, for it is only the latter that 'just happen' in the sense that the probability of the event is completely unconnected to antecedent states of the world. Random$_I$ events that are not arbitrary may still be governed by statistical laws and have their probability determined by what precedes them (as well as the natures of the entities involved in these events). Consequently, God may know the likelihood of random$_I$ events that are not arbitrarily random$_I$.

The notion of 'control' operative in the *Argument from Control* is unspecified. Certainly, God would have control over a world of random events in the sense that he could remove his sustaining activity and let the world go out of existence.[6] Power to employ such a 'nuclear option' is, however, not what defenders of God's providence have in mind when they attribute to God control over creation. The argument assumes that God is, as it were, at the mercy of the outcomes of random processes, unable to intervene. But on many views of providence God controls creation not simply through the general laws and the initial state of the world, but also through direct action at specific times and places.[7] Hence, even if a random$_I$ event 'just happens,' God need not sit idly by if such an event is not part of his plan. If God foresees a random$_I$ event will occur (or knows it has a high probability of occurring) he may preemptively intervene to diminish or neutralize its causal effects. The point is that the above argument assumes that God's control over the world is exhausted by the laws and mechanisms he put in place at the initial creation.[8]

Next, the argument relies on 'pervasive' randomness$_I$ to generate a problem for God's control. It is difficult to assess how much randomness$_I$ would be required to wrest providential control from God. In the first place, we would need to know what sorts of events are taken to be random$_I$: ordinary physical events involving inanimate objects or human choices that may determine one's eternal destiny? God may tolerate large amounts of randomness$_I$ in matters that make no difference to his ultimate plan, for example, the shape of a stone smoothed by flowing water over millennia, but not in events central to his plan, for example, the course of human history. Even if randomness$_I$ is pervasive with regard to events central to his plan, the worry only has bite if God is unable to mitigate or compensate for randomness$_I$ that results in effects counter to his plan.

Second, for 'pervasive' randomness$_I$ to generate a problem for God's providence we would need to know at what level of reality randomness$_I$ pervades, for example, the quantum, chemical, biological, psychological, or social levels. Then we would need to know whether and how randomness$_I$ at one level influences events at another level. Even if the quantum

[6] See Davison (1999) for a taxonomy of different forms of control relevant to providence.

[7] The literature on 'special divine action,' that is, whether God intervenes in creation at specific times and places, is vast and can't be adequately addressed here. Pollard (1958), Russell (2008), Bartholomew (2008), Murphy (2009), and Polkinghorne (2005) hold that indeterminacy at various levels of reality provides God an entry point for providential action in the world. See Saunders (2002), Koperski (2015), and Jaeger (2015) for critical discussion.

[8] This is not to say that there are no challenges for thinking that God's intervention in the world is pervasive and constant. See van Inwagen (2006, 120) and Swinburne (2004, chapter 8) for discussion.

level displays pervasive metaphysical randomness$_I$, higher levels of reality may not display the same randomness$_I$. Some physicists contend that macro systems do not display the kind of uncertainty and indeterminism observed at the quantum level because quantum effects are 'washed out' as systems interact with each other. To make the argument compelling, its defender needs to identify a form of randomness$_I$ that pervades certain created phenomena whose activity plays a crucial role in God's plans.

The most familiar argument of this kind concerns randomness in the evolution of life on earth:

Argument from Biological Evolution: Evolutionary theory is our best science regarding the development of life on earth. According to evolutionary theory, species evolve by a process of natural selection involving mutations that are random in the sense that they do not occur for the sake of the fitness of individuals or species. The very mechanism that drives the development of life on earth operates 'blindly' or 'unconcerned' with the existence and well-being of human beings (and of every other species for that matter). Consequently, if God only relies on the mechanisms underlying evolution to populate the earth, God cannot control what species are produced. Hence, when God created the earth, there is no way for God to guarantee (though God could have knowledge of the probability) that human beings—much less particular individual persons—would emerge from the evolutionary process. Therefore, our best scientific accounts of the development of life on earth, if true, entail that God was simply fortunate to have created a world in which human beings emerged. Being fortunate in this sense is incompatible with providential control.

Suppose evolution involves metaphysical randomness$_I$, for example, it involves some mutations that are the result of entirely indeterministic processes at the quantum level that "reverberate 'upwards' into biological structures" (Wessling and Rasmussen 2017, 985). If that is the case, then Super Meticulous Providence faces a problem insofar as it is generally incompatible with metaphysical randomness$_I$. Meticulous and General views of Providence do not face this problem, as we've seen. However, General Providential views like Open Theism do face the problem that if natural selection involves mutations that are metaphysically random$_I$ then God will not have full knowledge of how the evolutionary process will unfold and hence diminished ability to direct the evolutionary process. He may know how things could go or how likely they are to go a certain way, but he may not know with certainty that humans (or anything much like us) would be produced by evolution.[9]

The *Argument from Biological Evolution* assumes that it was part of God's plan to create human beings in particular, rather than creatures like us in certain respects, for example, finite, conscious, rational, free, and embodied creatures. Super Meticulous Providence would seem to share this assumption insofar as it depicts God as intending and determining every event to occur for a reason. The question is whether God would or could issue a general decree like this: 'let there be finite, conscious, rational, free, embodied beings who can be in a relationship with me.'[10] Such a decree would be general in that it doesn't specify the exact nature of the creatures that satisfy this description. There is reason to think, however, that Super Meticulous views of Providence cannot have God issue general decrees like this. Suppose God issues a decree such as "let there be X creatures, or Y creatures, or, Zs, or … so long as they are finite, conscious, free, and embodied, etc." Such a decree would be realized so long as Xs, Ys, or Zs, and so on were produced. But if God did not also determine which *particular* kind of creatures are produced, then there would be events that undetermined by God, namely, those leading to the production of those creatures. That is incompatible with the commitment to God's complete deterministic control over creation of Super Meticulous Providence.

Meticulous Providential views depict God as choosing among a range of feasible worlds to actualize. Prior to creation, God could actualize a number of worlds, some in which human beings exist, others in which different creatures, like us in certain important respects, exist. But after the choice to actualize a certain world is made, there is no possibility or potential that the evolutionary process would produce anything other than what that world specifies it contains. Hence, for the Molinist, God could not give the general decree *for a particular world* given that each world is completely specified and individuated prior to actualization (in part because of its unique profile of true counterfactuals of indeterminism). Nevertheless, the Molinist rejects the claim that God is 'fortunate' to have created a world with human beings. However, he is 'fortunate' to have a feasible world like this one to actualize on account of the independence of the truth of the counterfactuals of indeterminism from his will.

[9] See Clark (2014) for discussion of this issue.
[10] van Inwagen (1988, 48ff.) contains a similar discussion of God's general decrees.

General Providential views seem to have the best chance of pursuing the response being considered. God can issue the general, open ended decree ‘let there be Xs, Ys, or Zs …’ because there are no facts of the matter about what creatures will be produced in an indeterministic world at the initial creation. Depending on how indeterministic events unfold—which God does not know ahead of time—*this very world* will produce Xs, Ys, or Zs, and so on. Hence, Open Theists can adequately resist the charge that God’s plan for this world had to involve the creation of human beings rather than some other creatures.

3.4.2 Knowledge

The following argument seeks to show that there is an incompatibility between randomness and God’s omniscience, which is traditionally taken to be entailed by his providence:

Argument from Unpredictability: Suppose that there are metaphysically random$_I$ events. If such events occur, then no one, including God, can know prior to their occurrence that they will occur. Therefore, no one, including God, can know prior to their occurrence that metaphysically random$_I$ events will occur. Therefore, God does not have complete foreknowledge in a world in which metaphysically random$_I$ events occur. Therefore, God is not omniscient.

The *Argument from Unpredictability* assumes that God’s foreknowledge is a matter of predicting future events. But few views of providence depict God’s foreknowledge as a matter of prediction, where prediction of event E is a matter of knowing that E will occur *on the basis of complete knowledge of the world prior to E’s occurrence and the relevant laws.* Simple foreknowledge views attribute to God knowledge of future events, not by prediction[11] but by direct apprehension of or acquaintance with actual concrete events. Molinists, likewise, deny that God foreknows by prediction. God’s providential control over creation

[11] Aquinas (1912, I, 14, 7) says that God’s foreknowledge is not ‘discursive,’ that is, “God does not derive his knowledge by deducing conclusions from other things that he knows” (Wierenga 2018). See Hunt (2009) for defense of simple foreknowledge, the view that God has exhaustive knowledge of the actual future but not middle knowledge.

consists in his free knowledge and his middle knowledge of what undetermined events will take place in certain circumstances. Moreover, if one adopts a timeless view of God, then one denies that God believes anything *at a time* (insofar as God lacks any temporal properties whatsoever). Rather, God has a complete atemporal grasp of all temporal events 'at once' or 'simultaneously' (Zagzebski 2017). God's atemporal knowledge of an event is not dependent on there being a chain of events determining the event to occur; God could know that the event occurred even if the event were undetermined by prior events (and even if it were random in the strongest sense, metaphysically arbitrarily random$_I$). For God's knowledge is not dependent on prediction or foreknowledge if God is timeless.

The argument also presupposes that an adequate account of God's omniscience requires him to have complete knowledge of the actual future. But Open Theists deny that there is any knowledge of the actual future for God to have because they think there is no actual future (and thus no truth regarding the actual future) to be known. This, they hold, is consistent with God's omniscience. Moreover, Open Theists think that it is a benefit of their account that there is no knowledge of the actual future for God to have. This makes room, they contend, for free human action and the autonomy of creation and consequently for genuine divine responsiveness and relationship. The point here is that the unpredictability of random events need not pose a challenge to God's omniscience—on any view of providence—without the widely rejected assumption that God foreknows (if he foreknows at all) by prediction.

But there is another way in which randomness may be incompatible with God's omniscience, understood as including exhaustive foreknowledge of the actual future. God's foreknowledge is thought to be infallible. That is, if God believes something of the future, then he could not be wrong about it. A plausible view about the past is that it is fixed such that whatever is past is necessary as of the present—'now-necessary' or 'accidental necessity.'[12] With these assumptions we can formulate an argument for thinking that God's foreknowledge is incompatible with metaphysical randomness$_I$.

[12] Ockham introduced the terminology of 'accidental necessity.' This is the sort of necessity that the past is supposed to have because it is closed or fixed. See Adams (1987) for helpful interpretation of Ockham on this issue.

Argument from the Fixity of the Past: Suppose e is a metaphysical random$_I$ event. Hence, e is the result of an entirely indeterministic process and e is one outcome among a set of possible outcomes whose occurrence has an objective probability of less than 1 and greater than 0. Let 'E' be the proposition 'that e will occur.' Assume that yesterday God infallibly believed E. By the necessity of the past, it is now-necessary that God infallibly believed E. Suppose that necessarily, if p is now-necessary and p entails q, then q is now-necessary. Necessarily, if yesterday God believed E, then E. Hence, it is now-necessary that E. If it is now-necessary that E, then e will occur with probability of 1. Therefore, e will occur with probability of 1. If e will occur with probability of 1, then e is not metaphysically random$_I$. This contradicts our original supposition. Therefore, if e is metaphysically random$_I$, then God cannot foreknow that e will occur.

Readers familiar with the freedom and foreknowledge debate will recognize this argument as a version of the argument for theological fatalism.[13] Some of the responses available to compatibilists about freedom and foreknowledge are available to compatibilists about foreknowledge and randomness. For instance, one could deny that there are any future contingent truths like E. That is the route Open Theists take. Consequently, they have a straightforward (but not uncontroversial) way to respond to the argument. Super Meticulous views of providence are in a more difficult position insofar as they deny that there are any non-determined events. That is, the mere supposition that there are events that have an objective probability of less than 1 and greater than 0 is incompatible with Theological Determinism.

Those who deny Molinism but affirm God's foreknowledge have at their disposal the Ockhamist response to draw a distinction between 'hard' facts about the past (those solely about the past) and 'soft' facts about the past (those that are partly about the future) (see Plantinga 1986). One response to the freedom and foreknowledge question is to reject the principle that to be free one must have alternative possibilities available to them. The above argument does not rely on this principle since it does not target free will. Instead, the analogous move in the argument concerns the objective probability of the metaphysically random$_I$ event, namely, that the event be one among a number of possible outcomes whose probability is

[13] In fact, this argument directly parallels the argument for theological fatalism formulated by Zagzebski (2017).

less than 1 and greater than 0. It appears that there's no plausible way to get out of the argument by denying that metaphysically random$_I$ events need to have an objective probability of less than 1 and greater than 0. That would simply be to reject the notion of randomness being considered, to change the subject to another notion of randomness.

There is a similar argument that targets Molinism directly:

Argument from Middle Knowledge: Suppose *e* is a metaphysical random$_I$ event. Hence, *e* is the result of an entirely indeterministic process and *e* is one outcome among a set of possible outcomes whose occurrence has an objective probability of less than 1 and greater than 0. Suppose God has middle knowledge of the following counterfactual of indeterminism *E**: 'if circumstances *C* were to obtain, then *e* would non-deterministically occur.' Suppose God actualizes a world *w* that contains *E**. If God actualizes *w*, the objective probability of *e* is 1. Therefore, the objective probability of *e* is 1. This contradicts our original supposition. Therefore, if *e* is metaphysically random$_I$, then God cannot middle know *E**.[14]

The crux of this argument is that when God actualizes a world in which a certain counterfactual is true, the objective probability of the indeterminate event is 1 *in that world*. This just seems to be a consequence of the Molinist's commitment to a risk free-view of providence. God knows how things will turn out once he makes certain circumstances obtain, despite the fact that the counterfactuals constituting his middle knowledge are contingent. Therefore, his choice to actualize a certain world makes the objective probability of an event named in the consequent of a counterfactual of indeterminism be 1, which means that God's middle knowledge of random events undermines the possibility of those events being metaphysically random$_I$ (though not necessarily that they are physically random$_I$).

3.4.3 Goodness

A final class of arguments concern the connection between randomness and God's goodness or wisdom. One argument focuses on evolutionary randomness to generate a problem for God's good and wise governance of creation.

[14] Cf. Koons (this volume) for a similar challenge to the Molinist way of handling randomness.

Argument from Evolutionary Evil: Evolutionary theory is our best science regarding the development of life on earth. According to evolutionary theory, species evolve by a process of natural selection involving mutations that are relatively random$_P$; they do not occur for the sake of the fitness of individuals or species. The process of natural selection results in massive amounts of suffering and death over long periods of time. God is said to have providential control over creation insofar as God is said to lovingly guide creation toward a good end. The process of natural selection appears to conflict with God's providential control over creation since such a God would not use such a wasteful and brutal method for populating and sustaining the creation when more direct and less wasteful/brutal means are at his disposal. If God exists and has providential control over creation, we would not expect to see the amounts and kinds of waste, suffering, and haphazardness we find in the evolutionary records. In particular, it seems that our best scientific theory of the development of life on earth is in tension with (is evidence against) God's *good* and *wise* guidance of creation.

Arguments like this challenge all conceptions of God's providence since they target God's *means* for realizing his goals. Super Meticulous views of providence face the greatest challenge since they hold that God intends and determines every event to occur. Given the high degree of control God has over creation, we would not expect him to use these means to achieve his goals. Common responses to this argument appeal to the value of an autonomous creation (Wessling and Rasmussen 2017). But on Super Meticulous views of providence like Theological Determinism, creation has no autonomy. Such responses are not available to Super Meticulous Providence of this sort.

Defenders of Meticulous Providence can grant that creation has a certain amount of autonomy insofar as they hold that God does not control the truth-values of conditionals concerning what indeterministic events will occur in what circumstances. But despite that autonomy, Molinists still hold that God chose to actualize *this* world with its unique profile of true counterfactuals of indeterminism. So there remains the question why a good and wise governor would actualize a world with wastefulness and brutality of the evolutionary record we in fact find. General Providence attributes to God at least control over the unfolding of creation of the various views of providence. Such views seem to be able to fully account for the autonomy of creation. But the concern the above argument presents for General Providence is that a good and wise creator would create a world that he had so little control over, that is, a world he knew had the possibility of unfolding in the (putatively) problematic way we observe.

On all conceptions of providence, God is thought to lovingly and wisely guide creation to its intended goal. However, if random events are purposeless,[15] then we might question whether randomness is compatible with God's loving and purposeful plan:

Argument from Purposelessness: If there are ontologically random events (in the sense of either randomness$_I$ or randomness$_P$), then there are events that are not part of any plan or purpose. Suppose that there are such events. If God is provident, then every event occurs for a purpose and is integrated into his loving plan for creation. So, the presence of ontological randomness entails that some events are not part of a purpose or plan, whereas God's providence entails that all events are part of a purpose or plan. Therefore, the presence of ontological randomness is incompatible with God's providence.

Traditionally, Super Meticulous views of providence are committed to every event being part of God's plan (cf. Byl 2003, 106). Is this a necessary commitment of an account of God's providence? Suppose we agree that it is. Then it appears that Super Meticulous Providence is incompatible with randomness$_I$ and randomness$_P$. If God determines every event to happen and God is rational (always acting on the basis of consistent reasons), then it follows that no event is the result of an indeterministic process and that every event occurs for a purpose. Hence, Super Meticulous Providence is incompatible with randomness$_I$ and randomness$_P$.[16] However, defenders of Super Meticulous Providence might push back and question the idea that because God is rational, every event he determines is determined to occur for a reason or purpose. Suppose God sets up the initial state of the world such that a unique future unfolds. It could be that as that future unfolds there occurs an event E that God has no purpose for: E is merely a causal

[15] Here we are only considering the purposefulness of events in terms of *what purpose they occur for*. We are not concerned here with God's ability to, as it were, 'repurpose' events for his aims. See van Inwagen (1988, 53) for a similar discussion. He draws a distinction between God's "eternal" plan and his "reactive" plan.

[16] Divine determination is consistent with randomness$_P$ where there is no purpose from a *scientific or physical* perspective. That is, God may have a purpose for an event that is random$_P$ with regard to goals detectable to scientific investigation.

byproduct of a series of events that help fulfill God's plan, but the occurrence or non-occurrence of E contributes nothing to realizing that plan. God would have been equally satisfied had E not occurred at all.

Similar considerations may be thought to apply to Meticulous Providence. According to Molinists, God knows what will unfold in a world prior to actualizing that world on the basis of his free and middle knowledge. The thought is that God would not actualize a world with certain events capriciously, but rather only for a purpose. Hence, even if not all events are determined to occur, God's rationality and purposefulness in actualizing a world entails that there are no purposeless events. However, the Molinist will point out that God may have a purpose in actualizing a particular world (because, say, of certain goods it contains) without having a purpose for each particular event in that world. God, suppose, chose to actualize this world for a reason, but this world contains an event that God could take or leave (or even that he'd prefer was not included). Hence, Molinism does not obviously rule out purposeless events.

Open theists, on the other hand, are not obviously challenged by the argument given above. Open theists deny that God determines or that he fore/middle knows all future events. Therefore, there may occur events that he did not intend or desire, events that play no role in realizing his plan and may even be detrimental to his plan. The possibility of random$_P$ events seems built into the Open Theist's view of providence.

3.5 Conclusion

There is far more to say about each of the above arguments. Our paper surveyed the conceptual landscape of the connection between randomness and God's providence. To that extent it merely scratched the surface of the many and complex issues at play. What we have hoped to do is to identify the various factors and choice points that need to be decided upon in order to argue for the compatibility or incompatibility of ontological randomness and God's providence. Our discussion of the different forms of randomness and different conceptions of God's providence show, we think, that there is no easy route to establishing that randomness is incompatible with God's providence over the created world.[17]

[17] Thanks to the participants in *Models of Providence: An Abrahamic Inquiry* for the many conversations about ideas in this paper. Special thanks to Jeff Koperski, Kelly J. Clark, Scott Davison, and Chris Tucker for comments on the paper.

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PART III

Science

CHAPTER 4

Randomness in the Cosmos

Nidhal Guessoum

4.1 Introduction

Throughout their history, humans have been aware that the results of some actions, for example, throwing a dice or flipping a coin or drawing a stick out of a group with different symbols, are difficult if not impossible to predict. Many cultures have interpreted this as hidden divine knowledge (believing that God obviously knew the outcome of any such action) or even divine intention and plan (God expressing His will through these "chance" practices); people thus often used those actions as a method of divination, an approach known as cleromancy, aiming to access God's intentions.

Unpredictability was thus, for a long time, believed to be simply a reflection of our limited knowledge, in contrast with God's unlimited knowledge. In that optic randomness in any real, fundamental sense does not exist. Chance is simply how unpredictable things appear to humans, while God knows their reality. Divine providence, hidden in God's mysterious ways, could be revealed in the casting of lots.

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A brief, even spotty review of ancient scholars' views of "chance" (and its relation to providence) will confirm this general stance. For example, according to Augustine (fourth–fifth centuries AD): "Nothing in our lives happens haphazardly. Everything that takes place against our will can only come from God's will, his Providence, the order he has created, the permission he gives, and the laws he has established" (Augustine 2011, 118, 12–32). John Calvin (sixteenth century), like Augustine, claimed that divine providence precludes randomness in the world: "it must be observed that the providence of God, as it is taught in Scripture, is opposed to fortune and fortuitous accidents" (Calvin 1813, I:16, 233). Avicenna (tenth–eleventh centuries) and Averroes (twelfth century) argued similarly (although Avicenna was a much stronger determinist than Averroes): since there is a primary cause to everything, everything (except human will and action) must have a prescribed cause, hence no fundamental randomness (Belo 2007). The poet-philosopher Omar Khayyam (eleventh–twelfth centuries) expressed a similarly deterministic view of the world in one of his quatrains: "And the first Morning of Creation wrote/What the Last Dawn of Reckoning shall read" (Britannica Academic 2021a).

However, the belief that free will conflicts with absolute determinism led other scholars, including Thomas Aquinas, to reject absolute determinism in the world (e.g., Hoffman and Michon 2017, 1–36). Aquinas also considered the relationship of chance to the existence of divine providence and concluded that the latter does not preclude contingency and does not negate the occurrence of fortune and chance (Strumia 2002).

The rise of modern science seemed to side with determinism. In the early seventeenth century, Johannes Kepler showed that the orbits and motions of planets could be described using simple laws, making it possible to predict the positions and speeds of all planets at all times, even centuries or millennia ahead. Half a century later, Isaac Newton showed that those laws followed from his universal law of gravity and laws of motion, more deeply grounding the predictability of the motions of all objects here on Earth or in the heavens. A century and a half later, Pierre-Simon de Laplace (1840) took these developments to their logical, final, and stunning conclusion, arguing that if one had enough brain or computing power, one could determine the position and speed of every object in the universe at all times, past, present, and future.[1] Also, famously,

[1] "We ought to regard the present state of the universe as the effect of its antecedent state and as the cause of the state that is to follow. An intelligence knowing all the forces acting in

Laplace argued, contra Newton, that God was not needed for the clock-universe to work precisely for all infinity—except perhaps to set it off at $t = 0$ (the time of creation).

By the nineteenth century, however, physical phenomena began to reveal a serious difficulty: gases are made of zillions of molecules (though at that time no one knew what those were exactly), which are moving at various speeds, constantly colliding and changing directions and speeds, in unpredictable ways. So, it seemed, the Laplacean claim—we can know the positions and speeds of all objects in the universe at all times—was, at least in practice, not true. While we may be able to know that about planets, molecules in gases were much more difficult. Indeed, tiny differences in initial positions, speeds, or directions of molecules would change the distribution drastically after a long enough time. While "chaos" (phenomena so sensitive to initial conditions as to be unpredictable after a long enough time) had not yet made its big entry into science, its seeds were already in place.

By the early twentieth century, various phenomena, experiments, and theoretical developments led to the formulation of quantum mechanics, with Heisenberg's foundational 'Uncertainty Principle' and fundamental randomness (at least in the standard, Copenhagen interpretation). Indeed, Mark P. Silverman refers to quantum randomness as "the mother of all randomness" (Silverman 2014, 112). However, a minority of physicists have insisted that behind quantum randomness is a deterministic reality, with Albert Einstein leading that camp.

By the late twentieth century, randomness became an important fixture in physics and other scientific fields, and even in technology (for example, cryptography). Moreover, Laplace's claim of total determinism was shown to be wrong even for planets in the solar system, as we shall see.

Randomness is not merely a subject of academic, philosophical, and scientific study, it also relates to humans' lives. Indeed, randomness may impact our survival, at the individual, group, or species levels. Humans need some ability to predict things, for example, when it will rain (for farming schedules and such), and if nature exhibits too much randomness,

nature at a given instant, as well as the momentary positions of all things in the universe, would be able to comprehend in one single formula the motions of the largest bodies as well as the lightest atoms in the world, provided that its intellect were sufficiently powerful to subject all data to analysis; to it nothing would be uncertain, the future as well as the past would be present to its eyes. The perfection that the human mind has been able to give to astronomy affords but a feeble outline of such an intelligence."

then life becomes unmanageable. In fact, rainfall does carry some element of randomness, in terms of timing and amount; however, it turns out that we can extract patterns in the data, which allows us to predict rainfall by month and by region (Eagle 2005, 752).

At the species level, the importance of randomness to humanity can be exemplified by the asteroid that struck Earth some 66 million years ago and resulted in the disappearance of the dinosaurs, paving the way for the emergence of primates and humans. Was that a random event? Was it predictable as per Laplace? Could it have been a smaller asteroid, thus not exterminating all the dinosaurs, or fallen some place in a large desert and not have had the transformational effect for mammals, primates, and humans? I will review this particular case in the section I devote to the bombardment of Earth by meteoroids.

Yet science retained its remarkable ability to predict outcomes of processes and phenomena (at least probabilistically) even in situations where randomness seemed to play a fundamental role. Behind the randomness, as I will try to show, and this will be my main thesis, there seems to be some order after all, which is reflected in most, if not all, areas of the cosmos: the tiny quantum fluctuations in the very early universe (which led to clumping of matter and the formation of stars and galaxies), the formation of planets, asteroids hitting Earth, solar activity (big flares and eruptions), supernova explosions and gamma-ray bursts, all impacting life and animals on Earth.

4.2 What Is Randomness?

In the introduction, I mentioned 'randomness', 'chance', 'haphazardness' (in the quotes from Augustine and Laplace), 'chaos', 'probability, 'determinism', and so on, without defining them. I basically take "random" to mean "unpredictable" and "chaos" to refer to processes or systems which are so sensitive to initial conditions that they sooner or later become unpredictable, even though those phenomena had no intrinsic randomness. There are many examples of such chaotic phenomena, from the weather to the orbits of planets in our solar system.

At the end of the introduction, I alluded to some order underlying the randomness of a given system, giving us the possibility of making at least probabilistic predictions.

We need more precise definitions, however. We can adopt the basic definitions given by the Encyclopedia of Mathematics (2021) or the Britannica Academic (2021b):

- **'Randomness'** per se is not defined in either the Encyclopedia of Mathematics (EM) or the Brittanica Academic (BA) (delete EB); however, they define 'random events' ("Any combination of outcomes of an experiment that has a definite probability [but not certainty] of occurrence"—EM, n.d.) and 'random variable' ("a numerical description of the outcome of a statistical experiment"—(BA), n.d.). Since random numbers, variables, or events are not equally probable, a probability distribution "describes how the probabilities are distributed over the values of the random variable" (BA). We can thus surmise that randomness is the absence of exact and specific predictability of the outcome of a given measurement, or (equivalently) the existence of random variables in the process, which are described by a probability distribution.
- **'Chance'** and **'probability'** (also, commonly, 'odds', 'likelihood', or 'expectation') can be defined as: the extent to which something is likely to happen, with "extent to which" being quantifiable (a "frequentist" definition of 'probability' is the ratio of the number of times a given outcome occurs to the total number of trials).
- A **'stochastic process'** is one which involves random variables or events. For example, the process of radioactive decay of unstable nuclei can be said to be stochastic and is described probabilistically. "More generally, a stochastic process refers to a family of random variables indexed against some other variable or set of variables" (BA, n.d.). Oftentimes, the variation (or "indexing") of random elements with time is what defines the stochastic process.
- Phenomena or processes are said to be **'deterministic'** when the outcome or next state of the system can—in principle—be calculated or described completely if one knows the current state fully. This is what Laplace expressed, as he assumed that all physical processes follow well-defined and fixed laws and thus allow one to predict all future events (of any system, even the entire universe) from current states. Indeterminism, on the other hand, holds that at least some events in the world do not follow deterministic laws but, instead, involve some element of randomness or unpredictability.
- **'Chaos'** combines determinism on short scales and unpredictability over extended periods of time, due to some sensitivity of the system to

its initial conditions; the system is thus deterministic over the next short time-step, but unpredictable over long time intervals. How long a time before a system becomes chaotic depends on the physical parameters and interactions involved in each case. It is important to note that chaotic phenomena are not fundamentally random, but they are still, practically speaking, impossible to predict after long enough times.
- **'Pseudo-random numbers'** are numbers which are generated by a numerical algorithm (usually) or a physical device (sometimes) in which sequences appear to be random, such that it will be extremely difficult to extract the rule, function, or operation that generated those numbers, even though there is such an algorithm. Pseudo-random numbers are very widely used in simulations (Monte Carlo or other) in various fields (meteorology, climatology, cryptography, economics, etc.).

Having given simple definitions of the terms being used in this topic, we can now focus on randomness and present its different types and characteristics.

Carmen Batanero offers four widely held conceptions of the term 'randomness' (Batanero 2015, 34–49):

- ***Randomness as equi-probability:*** where people think (or assume) that the possible outcomes of an unpredictable process are equally probable. (This is a misconception, as the distribution of probabilities of a random variable may not be constant and uniform.)
- ***Randomness as the opposite of causality,*** or as a special type of cause.
- ***Randomness as uncertainty in an outcome:*** the existence of multiple possibilities under the same conditions.
- ***Randomness as a way to describe some phenomenon when information about it is limited,*** making it "unpredictable" (to us).

Batanero (2015, 38) also gives five scientific meanings/conceptions of randomness, along with the problems that they address and the procedures used in such cases. They can be summarized as follows:

- *Intuitive*: what we think of as luck and fate, unknowable except perhaps (in the past) with divination tools (dice, coins).
- *Subjective*: what we think of as "possibilities", which start (in our minds) as all equally probable but get updated using methods such as Bayes' theorem.

- *Classical*: events being equally probable based on dearth of knowledge about any underlying factors; this is used as a basis for fair betting in games of chance, probabilities computed using combinatorial analysis.
- *Frequentist*: related to the frequency of outcomes, probabilities estimated and used as projections in the long run.
- *Formal*: experiments are performed, random sequences are observed and measured; mathematical properties are described, simulations are conducted using pseudo-random numbers or sequences.

In the rest of this paper, I will be dividing randomness into "fundamental" (found in quantum systems), that is, intrinsic and not due to our limited epistemic (knowledge) capabilities, and "chaotic", which is due to the exponential growth of uncertainties and appears erratic only because we cannot follow the system with any precision in our calculations.

Let us now focus on what I am calling the "fundamental" (quantum) type of randomness.

As I have mentioned, there are several interpretations of quantum theory, including some that assume determinism ("hidden variables theories", most notably); however, standard interpretations consider phenomena at the smallest levels (elementary particles, atoms, molecules) as fundamentally random. The best example is the decay of an unstable nucleus, say Aluminum-30, which has a half-life of 3.6 seconds. A half-life is the time after which half of a sample (say 1 gram) of the given element will have decayed. But there is absolutely no way of knowing which nucleus will be among the half that will have decayed. If we zoom in and focus on one specific nucleus, we may wait a millisecond or a century before it decays, even though half the sample will have decayed in 3.6 seconds and then half of the remaining half will decay after another 3.6 seconds, and so on. The process is fundamentally random (i.e., not knowable even in theory), even though there is a simple probabilistic rule (half will decay over each half-life) that allows us to make predictions and use the material and the law that regulates it.

More generally, according to the Heisenberg Uncertainty Principle, it is impossible to predict precisely where an electron will be at any given moment. However, the Schrödinger Equation allows us to calculate the *probability* of finding an electron in any spot (of any size, small or large) at any moment. Moreover, the Schrödinger Equation allows us to draw 3-D distributions of a single electron's probability distribution (or that of a large ensemble, assuming they are under the same physical conditions), telling us where it (or they) will more likely be found in a measurement.

And these probability distributions in the quantum world will translate into non-uniform distributions in the densities of particles at small scales. This also applies to the universe when it was small enough for quantum physics to apply.

4.3 Randomness in the Early Universe; Galaxy Formation

Quantum randomness played a key role in the affairs of our universe from the earliest times. When the universe was 10^{-36} seconds old, and under the effect of the inflaton field that suffused it, the universe underwent an "inflation", that is a period of exponential growth in size, by a factor of about 10^{26}, making the universe go from smaller than an atom to about 1 millimeter in diameter. This inflation had a number of consequences, including (in what concerns us here) the amplification of tiny quantum-level fluctuations in the inflaton field to macroscopic scales.

The usual analogy is that of a balloon in which we blow air, with the surface of the balloon representing the spatial dimensions of the universe and the radial direction inside and outside the balloon, representing time, past and future. (The center of the balloon would be the origin of space and time, the "singularity" from which the universe came out.) If tiny letters are written on the surface of the balloon, any exponential increase in the size would make the letters macroscopically large and separate. And if the writing on the surface of the balloon were done by quantum fluctuations acting on ink that would have been uniformly distributed on the surface early on, then we would see how large-scale structures (the big letters in our analogy, the galaxies in the real universe) would have emerged, especially as gravity would soon start to act on clumps of matter whenever they become large enough for gravity to affect them.

Thus, large-scale cosmic structure (the distribution and sizes of galaxies) is due in some fundamental way to (i) the quantum fluctuations that happened in those early times, (ii) the inflation that magnified those fluctuations to macroscopic levels, (iii) the expansion that continued on afterward, and (iv) the gravitational attraction between large clumps of matter, which themselves resulted from those fluctuations in the density of microscopic particles.

The fluctuations (Fig. 4.1), also translated into slight variations in the radiation that was emitted when (about 380,000 years later) electrons and

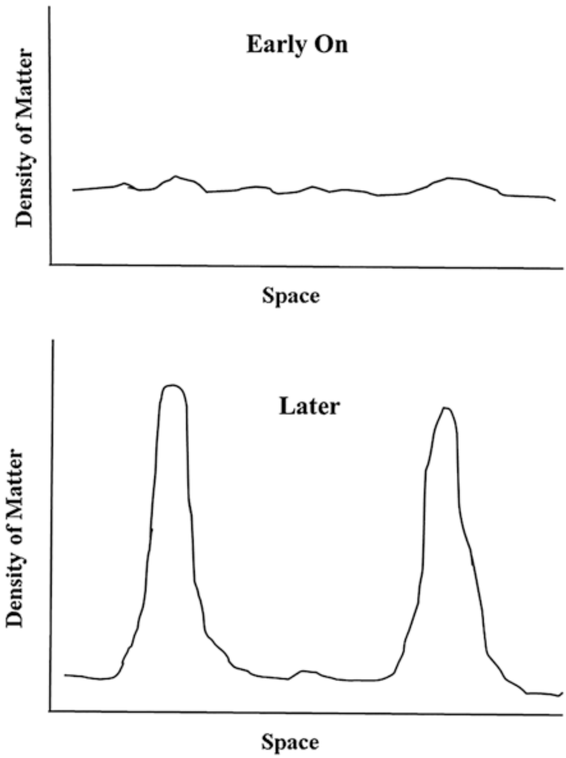

Fig. 4.1 Growth of quantum fluctuations in the density of matter in the early universe. (Source: Nidhal Guessoum)

protons started to bind as atoms (the universe having expanded to be cool enough to allow atoms to form and not break up immediately). That radiation, "decoupled" from the atoms (no longer interacting with matter), filled the "small" universe, and with the continued expansion, had its wavelength stretched, to reach microwave scales today. This "cosmic microwave background" as it is known today, because it fills the cosmos almost uniformly in all directions, constitutes one of the main pieces of evidence for the Big Bang model.

But this "fossil" radiation should carry the imprint of the original fluctuations in density and not be totally uniform. If we measure the radiation in various directions in the sky, we should see some tiny differences.

Indeed, the mapping of this cosmic microwave background has been performed with higher and higher precision and resolution over the last 20 years, with the Wilkinson Microwave Anisotropy Probe (WMAP), which operated between 2001 and 2010, and with the Planck satellite, which was launched in 2009 and operated until 2013, both producing cosmic maps (Fig. 4.2, below).

Variations in the temperature of the cosmic radiation were found to be of the order of 10^{-4}, in agreement with the theoretical calculations. What matters to us here is the fundamental role that quantum fluctuations,

Fig. 4.2 Maps of the cosmic microwave background radiation produced by WMAP (top: https://map.gsfc.nasa.gov/media/121238/index.html) and Planck (bottom: https://wmap.gsfc.nasa.gov/media/121238/index.html)

which are random in nature but follow well-known and well-understood laws, played in the formation of structures (galaxies, clusters) in the universe. No model or theory could ever predict what galaxy would have formed, where, and with what size or characteristics, but the appearance of such structures and the statistical distribution of their sizes were "written" in the quantum laws from the start.

4.4 Randomness and Chaos in the Formation of the Solar System

Fast forward about 9 billion years, and in one region of what will later be called the Milky Way galaxy, a nebula (big cloud of gas and dust) is rotating very slowly around itself. (Everything moves, and almost everything rotates, in the cosmos, because of gravity's pull on one side or another of a given object by nearby or passing objects.) But the nebula being large enough (originally a few light-years across and weighing a trillion solar masses), its internal mass pulls everything inward. The nebula thus contracts, and density becomes much larger in the central regions. The smaller the nebula becomes, the faster it rotates (this is a manifestation of the ice-skater rotation effect, or more technically a result of the conservation of angular momentum). And the faster rotation makes the nebula flatten (this is the "pizza dough effect", or more technically collisions having to conserve angular momentum), making the solar system flat (except for the farthest matter, which was too far to be drawn to the disk).

At this point, some creative chaos occurs. First, most of the matter will have fallen to the inner "small" region of the nebula (a few million kilometers across), with densities and pressures reaching very high values, raising the central temperature to above 10 million degrees, which then allows for nuclear fusion reactions to occur—a star (the sun) is born! The sun then clears up its surrounding region by swallowing up what is very close by and blowing away the remaining nearby gas with its powerful radiation.

The dust in the inner region then undergoes countless collisions and mergers. "Planetesimals" start to form, and small rocky objects slowly emerge, with sizes between about one third and a few times that of Earth.

But the collisions between rocks being numerous, and their outcomes being very sensitive to the speeds and directions of the colliding objects, the formation of Earth, with a perfect size and at a perfect location around the Sun, that is, right in the middle of the "habitable" zone, seems rather fortuitous. Indeed, a "perfect" planet for future complex life, must have the right size for a "good" atmosphere to form (thanks to its appropriate gravity), be rocky (with a solid surface for animals to later evolve and thrive), and be in a region where water, after it is brought over by comets and asteroids, will be liquid, allowing life to form sometime later; plants will then absorb the carbon dioxide (which would have been released into the atmosphere by volcanic and other geological activity) and release oxygen, the latter being vital for the animals (and humans later) to prosper and evolve.

Thus, it is clear that Earth was not necessarily bound to appear, at least not in this particular solar system, considering all the randomness that is involved in the formation of planets. But if we recall that there are tens of billions of solar systems in our Milky Way galaxy alone, then a planet of roughly the size of Earth (a bit smaller or larger would still have worked) at the right location and with the right kind of star, would have appeared somewhere.

However, there is an important difference between an Earth-size, an Earth-like, and a life-bearing planet. Indeed, life-friendly planets are probably not so easy to find, as a number of criteria must be simultaneously fulfilled. And this is just at the formation stage. More trouble lies ahead.

Indeed, it is not enough to form a planetary system, one must ensure its stability, that is, that the planets will not crash into each other before life has had a chance to evolve, as well as the survival and prosperity of life, that is, not be wiped out by unpredictable, disastrous impacts or bursts of radiation.

4.5 Stability of the Planetary System

Once the planets formed and the system (the sun and everything else) settled, the main issue is whether it was stable. Do the planets keep their orbits over long periods of time; are the planets' motions regular enough for their positions to be predictable after millions or billions of years; and can we trace back their positions (absolute and relative) into the far past to determine what happened at various points?

Before comets were understood as small objects, thus having negligible gravitational effects on other objects, their gravitational effect when passing by planets at various distances had to be considered. Newton realized that these pass-bys could lead to incremental changes in the speeds and/or directions of motion of planets, and he concluded that God had to intervene from time to time to restore the order, or else the planets would crash after some time. Leibniz, in contrast, rejected the idea of God having made an imperfect creation and needing regular interventions to save the world.

Laplace, as we noted earlier, believed in total determinism, though this did not contradict Newton's realization that comets could disturb planetary orbits. The point that remained unclear was whether small gravitational effects (the comets would soon be known to be really tiny compared to planets) would end up disrupting the whole system. Chaos had not yet appeared in physics, this had to wait until 1963 when Edward Norton Lorenz published his seminal paper 'Deterministic Nonperiodic Flow' (1963, 130–141), the foundational work for chaos theory, and so the issue did not worry scientists too much (yet).

Well before chaos theory came on the scene, it was realized that there could be an issue with the stability and predictability (or lack thereof) of three-body problems. No general solution had been found for a gravitationally interacting system of three objects (say the Sun, the Earth, and the Moon), and around 1888, King Oscar II of Sweden was enticed to offer a prize for the scientist who would solve the problem or at least make major advances on it (Scott 2007, 21–22; Charap 2018, 67). Jules Henri Poincaré (1854–1912), by then already an accomplished mathematician, submitted a 158-page essay for which he was awarded the prize in January 1889. Just before publication, however, he realized he had made an important mistake. The revised version (submitted in January 1890) was 270 pages long and concluded that not only were there no general solutions to the problem for all initial conditions (Scott 2007), in some cases the system would vary unpredictably over the positions-velocities parameter space,[2] the landmark of what we would come to call 'chaos'. Poincaré (1908) would later write: "It may happen that small differences in the initial conditions produce very great ones in the final phenomena. A small error in the former will produce an enormous error in the latter. Prediction becomes impossible, and we have the fortuitous phenomenon" (Maitland 1914, 67).

[2] A "parameter space" (a concept used widely in physics, in statistics, and in other fields) is the space of all the possible combinations of values for the different parameters that a model could adopt. This "parameter space" is often searched or sampled to find the optimal set of values for parameters A, B, C, and so on, that give the best fit to the data or best description of a given phenomenon.

Despite further work on the stability of dynamical systems, particularly by the Russian mathematician and physicist Aleksandr Mikhailovich Lyapunov (1857–1918), with his introduction of the 'Lyapunov exponent', which characterizes the timescale over which a system becomes highly unstable, unpredictable, and chaotic, the problem was mostly forgotten until the aforementioned Lorenz discovered it while running weather forecast numerical simulations (on computers) around 1960. However, this was not applied to planets and their orbits until 25 years later.

In 1989 and 1990, Jacques Laskar made important contributions to the problem by performing high-precision numerical calculations on the time evolution of the solar system, taking up to eight planets into account and evolving the system for up to 100 million years (Laskar 1989, 237–238; 1990, 266–291; 2013, 239–270). He found that a difference of 1 kilometer in the initial position of a planet could grow to 1 AU (150 million km) over 95 million years! He also showed that for certain initial conditions, some planets could be ejected from the solar system (or other planetary systems out there), which would later explain the discovery of "rogue planets". Others would later confirm these findings, for example, Gerald J. Sussman and Jack Wisdom: "The evolution of the entire planetary system has been numerically integrated for a time span of nearly 100 million years. This calculation confirms that the evolution of the solar system as a whole is chaotic, with a time scale of exponential divergence of about 4 million years" (Sussman and Wisdom 1992, 56).

Additional simulations, more and more precise with faster and faster computers, would later reach the following important conclusion: orbits of the planets in our solar system are stable for 99% of the initial conditions, but phase (where along its orbit a planet would be after, say, 10 million years) is not predictable, at least for some planets. If a planet's rotation axis is inclined, as both Earth's and Mars' are, then big changes of its position along its orbit over millions of years make it difficult for scientists to trace back or forward climate conditions, the evolution of life, and survival. In other words, we do not know whether July in the year 5 million BC corresponded to summer or winter in each hemisphere. We do have ice cores that can tell us what the temperature was like in that era, but not so precise as to determine the weather in a given month north or south of the equator.

4.6 Formation of the Moon

Another "random" event, unpredictable due to the huge number of collisions that will have occurred before—and a very lucky one for life and humans billions of years later—occurred about 50 million years after Earth had formed. The planet had not yet fully settled, indeed its surface had not hardened yet, when an object the size of Mars (about ten times smaller than Earth in volume) hit it in what is commonly referred to as "the giant impact".[3] The object, which has been called Theia, the name of the mythical mother of Selene, the Greek goddess of the Moon, was completely destroyed, its debris scattered in space, along with the parts of Earth that were excavated in the collision.

Indeed, contrary to the way other planets have acquired moons in the solar system (co-accretion of many moons for the large, gaseous, outer planets; capture by Mars of small objects from the asteroid belt), Earth acquired a moon in a giant collision-breakup. Evidence from this comes mainly from the high similarity between the composition of rocks on the moon and the geological material below the crust of our planet (Young et al. 2016, 493). The giant impact thus produced a relatively large moon (the largest moon/planet ratio in the solar system), which enabled it to play a vital role in the evolution of life on Earth. Indeed, for the climate to be stable and not vary widely and wreak havoc on life, the inclination of Earth's axis needs to be stable, that is, not vary by more than about 1 degree; a large moon provides that stability. Moreover, a large moon produces substantial tides, which lead to the mixing of nutrients and life forms on coasts, further helping biological evolution. Furthermore, a recent paper (Grewal et al. 2019, 3669) has indicated that the giant impact may have brought important chemical elements (carbon, nitrogen, and sulfur) to the bulk Earth, elements which were vital for the emergence of life later.

This seems like the luckiest event that one could possibly envision for a planet like Earth. Without that giant impact, the chemical conditions for life to form may have been insufficient, and there would have been no moon to stabilize the climate and allow for an upward evolution of life to complex animals and ultimately humans.

[3] The collision has widely been assumed to be a glancing one, Theia hitting Earth on the side; however, recent work has indicated that the collision may have been head-on, as large amounts of energy were involved for the mixing of materials to give results as measured today (Young et al. 2016, 493).

However, here too, statistics make even such a fluke event not so wondrous. Indeed, studies of embryonic star-planets systems (using the infrared Spitzer Space Telescope, in particular) find some tentative evidence of "catastrophic collisions" (Gorlova et al. 2007, 516–535). It has been estimated that 5–10% of such planetary systems undergo big enough collisions to produce large moons. If so, our lucky event was not such a rare incident after all.

4.7 Randomness in the Bombardment of the Earth by Meteoroids

There are two important issues in the history of our planet: when did life appear and what impact did the bombardment by meteoroids and energetic solar radiation have on the emergence and evolution of life and the appearance of primates and humans?

The strong gravity exerted by the giant planets (Jupiter and Saturn) on objects orbiting or passing nearby tugs those objects, slightly modifying their motions, sometimes enough to send them toward the inner regions of the solar system, to then be attracted by Earth, other planets, our Moon (thus the heavy cratering), or the Sun.

In the last 40 years or so, scientists have become convinced that a "late heavy bombardment" occurred between 3.8 and 4.1 billion years ago (Fig. 4.3). The main evidence for this comes from the radiometric dating of a number of craters on the Moon—hence the other name "lunar cataclysm" (Tera et al. 1974, 1–21; Cohen et al. 2000, 1754); the absence of an atmosphere there leads to a rather pristine preservation of the craters, small and big.

A number of hypotheses have been advanced to explain this major event: a dynamical instability in the outer Solar System; the collisional disruption of a large Mars-crossing asteroid; a gravitational event that swept objects out of the asteroid belt; and other possible scenarios.

Interestingly, the earliest fossils of life forms that have been found on Earth date back to roughly that time. It is often assumed that such a sustained assault on Earth would have wiped out life, if it existed then in whatever form. Recently, however, studies have suggested that craters produced by such impacts could have been ideal for the appearance of life, for meteoroids bring water and iron, and impact craters present important helpful features, including secondary minerals which can act as templates

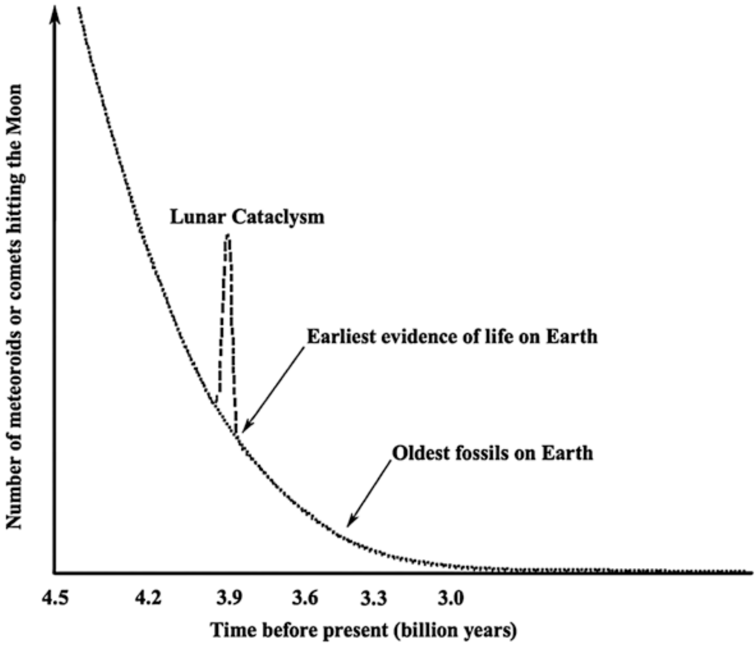

Fig. 4.3 Time plot of Moon bombardment in the first billion years, showing the 'lunar cataclysm', that is, the 'late heavy bombardment'. (Source: Nidhal Guessoum)

or catalysts for prebiotic syntheses, diverse impact energies resulting in different rates of organic syntheses, and so on (Cockell 2006, 1845–55).

Another important event which had a crucial consequence on the emergence of humans on Earth was the fall of an asteroid on Earth about 66 million years ago. The meteoroid is estimated to have been about 10 kilometers wide, and it is believed to have struck just off the coast of the Yucatan peninsula in Mexico. The blast it produced in the shallow sea was the equivalent of 10 billion Hiroshima-type atomic bombs or 100 trillion tons of TNT; it released 10,000 billion tons of carbon and sulfur-rich gases, blocking sunlight for months, igniting fires in many forests, and producing a dead world, killing almost all reptiles, most birds, and plants, starving the dinosaurs to death within a few months, and paving the way for mammals. It was a sudden and brief event by cosmic and geological scales, but a momentous one by all measures.

This event is often cited as an example of how randomness and chaos rule the world, and our existence could very well never have come about, if the asteroid had been smaller or if it had hit in a place where its impact would have been much less devastating.

This is where statistics and probabilities again come to play an important role in our understanding of the world. A study of craters and meteorites found around the globe has allowed us to infer an empirical law of the frequency of such strikes as a function of the size of the incoming, falling rock/meteoroid. This is not an easy, straightforward matter, it must be stressed, partly because not all meteorites are found or registered, craters are often eroded, and data is thus necessarily incomplete. A 20-year record of "air bursts" (explosions of meteoroids as they hit the thicker part of the atmosphere) or medium-size (1–20 meter) meteoroids entering Earth's atmosphere is shown below (Fig. 4.4).

And Fig. 4.5 is a similar map made for "fireballs" (very bright meteors) recorded between April 15, 1988, and April 22, 2019.

From these records (data), one can plot the frequency of, and time intervals for, meteoroids entering Earth's atmosphere as a function of their diameters and the energies they release (Fig. 4.6).

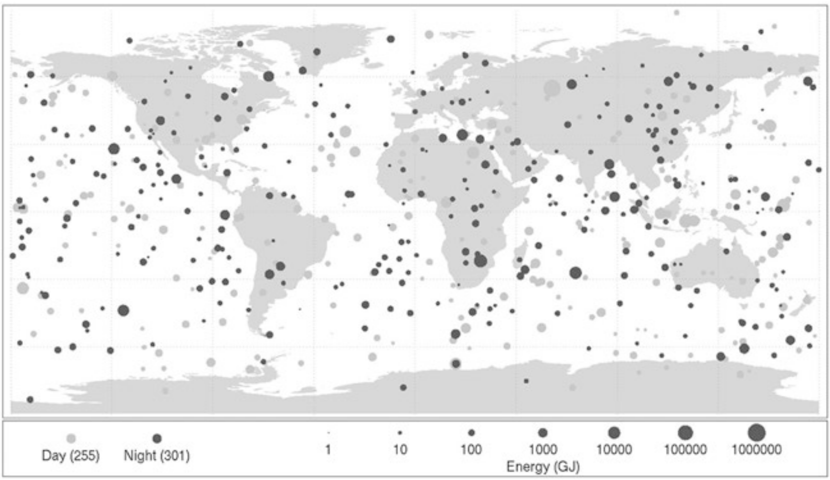

Fig. 4.4 Record of small meteoroids entering and disintegrating in the atmosphere between 1994 and 2013. https://www.nasa.gov/sites/default/files/bollide.jpg

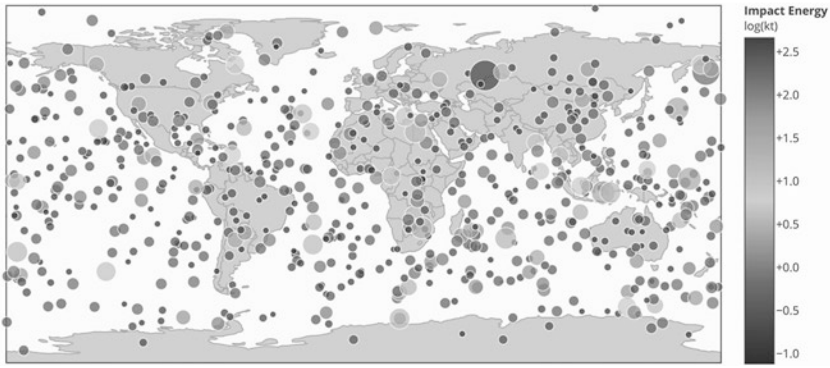

Fig. 4.5 Fireballs reported by US government sensors (April 15, 1988 to April 22, 2019). Alan B. Chamberlin (JPL/Caltech—https://cneos.jpl.nasa.gov/fireballs/)

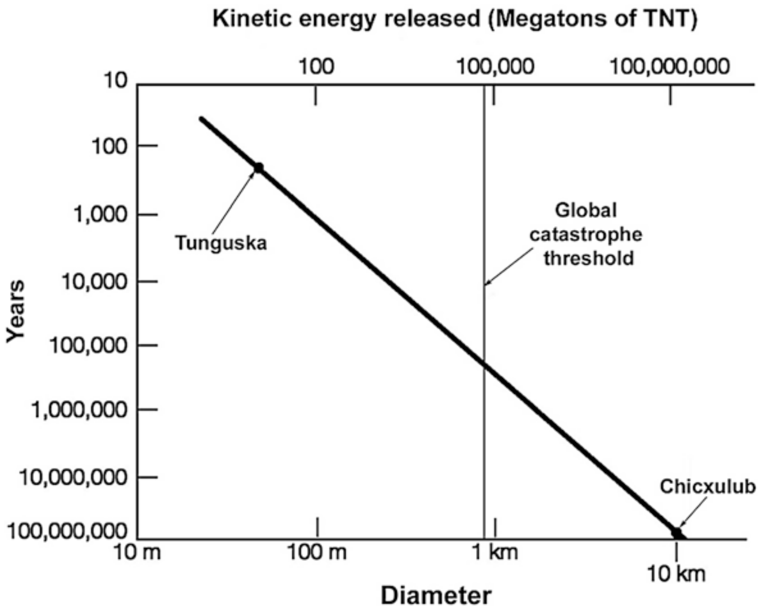

Fig. 4.6 Frequency and time interval of meteoroids entering Earth's atmosphere as a function of their diameter and corresponding energy release. (Source: Nidhal Guessoum)

From the plot, one can see that 10-km size asteroids strike every 100 million years or so, 1-km meteoroids hit every million years or so, 100-m rocks arrive at earth roughly every 1000 years, and so on. Again, we find that random events of these kinds follow rather simple probabilistic and statistical laws, and they can thus be forecast in terms of probabilities.

The important conclusion from this realization is that Earth was bound to be hit by a large asteroid, within a hundred million years or so. The probability of a dinosaur-exterminating asteroid hitting Earth during the last 300 million years was more than 99%. Humans and other highly evolved creatures might not have existed precisely 4.567 billion years after Earth's formation, but intelligent and conscious creatures would have appeared sooner or later, since evolution was unfolding in full glory.

4.8 Randomness in the Sun's Activity

The Sun's activity and evolution during its first billion years is also an important issue pertaining to both randomness and the emergence and evolution of life on Earth. There are, however, a number of important uncertainties in this regard: (a) the composition of Earth's early atmosphere is not well known; (b) there are indications that liquid water existed fairly early on the surface of our planet, but this is not strongly established; (c) it is widely believed that the young Sun was less luminous (by about 25–30%, since its core gradually heats up and produces more energy), but without an Earth atmosphere richer in greenhouse gases, it would have kept the planet frozen for the first 2 billion years (Sagan and Mullen 1972, 52–56); (d) the random solar flare and eruption activity, which was very probably much stronger early on, and which would have repeatedly zapped our planet with UV and X-ray radiation; (e) as with the bombardment, it is not clear whether the energetic radiation would have hindered or helped the emergence and the evolution of life on Earth.

I will focus here only on the randomness part, namely, the solar surface (magnetic) activity, which is observed in the sunspots and flares/eruptions that appear on the Sun, and which leave a mark in tree trunks (over decades, centuries, and sometimes millenia) or ice cores (over centuries, millenia, and longer periods). Sunspots are the footprints of flares, which together with the much stronger coronal mass ejections send out large quantities of charged particles (electrons and protons) into the solar system. This "solar wind", along with the energetic photons of the accompanying X-ray and UV radiation, can break organic molecules on Earth or at least ionize them and induce reactions or even mutations in the DNAs of the cells. And this can either kill a cell or produce a mutation that is most likely destructive, but it can also lead to the appearance of different species or life forms—evolution.

Reproducing early solar activity is extremely difficult. Figure 4.7 shows the variations in sunspots over the last 400 years (upper panel) and over the last 40 years (lower panel). In fact, one can produce plots of sunspot numbers for the last 10,000 years (Yin et al. 2007) from Carbon-14 concentrations in tree-rings and/or geomagnetic variations. One method by which one can explore solar activity in the first 1–4 billion years is to study stars that are very similar to the Sun but have different ages. Egeland et al. (2016, 330–334) studied five such sun-like stars and found that young, fast rotating ones show many-times larger variabilities in their activities, while old, slowly rotating ones display very little variability.

What must be stressed here, however, is that while solar magnetic activity is chaotic, it still follows quasi-periodic cycles. The most famous and easily noticeable cycle of solar activity is the 11-year cycle, which takes the Sun from "solar maximum" to "solar minimum" and back, periodically; neither the 11-year interval nor the level of activity repeat exactly, as can be shown in Fig. 4.7.

Figure 4.7 clearly shows both the irregularities in the activity over short time scales (month to month, year to year) and the quasi-regularity (cyclicity) over long time scales (decades), even though the magnitude of the activity in each cycle varies substantially.

4.9 Randomness, Order in the World, and Divine Providence

What we have learned from this general review of "random" processes in the cosmos is that "randomness" is ubiquitous in the universe. We have found important examples of it ranging from the earliest times of the universe to rainfall in farmers' fields today, including the chaotic formation of the planets and our moon, the subsequent meteoritic bombardment and energetic radiation that Earth was subjected to, particularly in the first billion years or so, and the chaotic solar activity still going on today.

The second important idea that I have stressed is that there are two kinds of randomnesses: the "fundamental" one, which is due to quantum indeterminacy (as believed by most physicists), and the "epistemic" one,

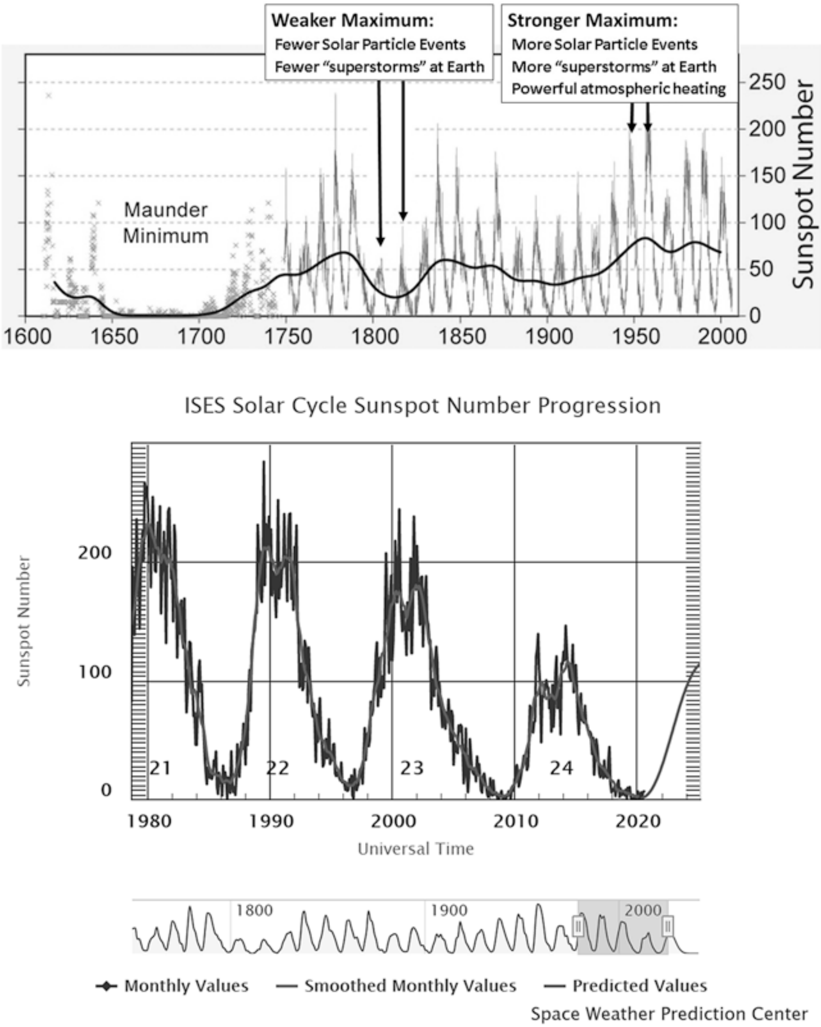

Fig. 4.7 Sunspot number (solar activity) variation over the last 400 years (top: https://www.swpc.noaa.gov/products/solar-cycle-progression), and 40 years (bottom: https://www.swpc.noaa.gov/products/solar-cycle-progression)

which manifests itself in chaotic phenomena and which is only due to our inability to theoretically determine (calculate) the state of a system over long timescales if it is highly sensitive to initial conditions and the equations that describe it are non-linear.

The third and perhaps most important idea I have stressed is that all the randomness that we encounter in nature is, however, not without some underlying order or probabilistic-statistical pattern. In each case, whether quantum-based or chaotic, we have found some laws regulating the random process. Even the two big "lucky" events that allowed life to evolve and let humans emerge after a few billion years, namely, the planetary collision from which our Moon was born and the asteroid strike that killed the dinosaurs and the big reptiles and allowed mammals to prosper and produce primates, those two events were not "flukes" but rather expected to occur on long enough timescales.

One comes out amazed from such a big-history review that randomness not only follows simple, elegant laws and produces beautiful order, but in fact was necessary for differentials to occur in nature and varieties to emerge. Without quantum fluctuations, the universe would have been utterly homogeneous, and complex structures (galaxies, stars, planets, etc.) would not have formed.

What emerges is a multi-layered picture of our universe: at various scales (of space or time), processes can be probabilistic, then collectively predictable, then chaotically unpredictable, then globally or long-term predictable, and so on. For instance, Earth's atmosphere, made of gases, has: quantum probabilistic (un)predictability at the lowest scale (individual atoms and molecules); then statistical predictability of the gases' characteristics (temperature, pressure, etc.); chaotic behavior of the weather, becoming unpredictable over just a few days; predictability of the climate over longer timescales (seasons and long cycles); instability over very long terms; and so forth.

In earlier times, randomness used to be conceived of as God's way of hiding His plans (recall that many cultures practiced cleromancy, casting lots by throwing dice or bones with symbols to try to "uncover" divine plans or divine hints). More recently, and with the realization that randomness may play a key role in cosmology and biology, a number of authors have insisted that randomness strongly conflicts with divine providence. For instance, Robert Charles Sproul wrote: "The mere existence of chance is enough to rip God from his cosmic throne. … If chance exists in its frailest possible form, God is finished" (Sproul 1994, 3). Similarly, Benedikt Paul Göcke, reviewing randomness in cosmology and biology formulated an 'Argument [against the existence of God] from Chance and Randomness': "If there is a random state of affairs in the universe, then God does not know that his providential plans are fulfilled" (Göcke 2015, 233–254). As I explained earlier, if the collision between Theia and early-Earth had occurred with different parameters (a different size for Theia, a different angle of collision, etc.), life would probably have evolved differently, perhaps not leading to primates and humans; likewise, if that 10-km asteroid that struck Earth 66 million years ago had been substantially smaller or had hit elsewhere, the dinosaurs would not have been exterminated, and we humans would not be here today.

However, what we have seen in this review is that there are probabilities and regularities behind those random events. For instance, 10-km sized meteoroids strike Earth every 100 million years or so, thus sooner or later one such asteroid or comet would have hit Earth and changed the course of life's history on the planet. And if we believe that the primate niche is inscribed in the general evolutionary scheme of Earth's environment, then a species more or less similar to humans would have emerged at some point (around now, give or take a few hundred million years).

Is God's plan then built on probabilities and statistics? There are two ways to answer this question.

The first is by an analogy used by Peter van Inwagen in his essay 'The Place of Chance in a World Sustained by God' (van Inwagen 1988, 225), that he and his wife, when they decided to have a child, knew they wanted one to be born sometime in the next year or so, but they didn't plan for a specific child, a girl with detailed characteristics. According to van Inwagen, God made general plans for creation, established the laws (some of which are probabilistic) by which natural processes will lead to the creation of various objects and beings, and most importantly sustained those laws and interactions (the way he sustained those causal interactions is, according to van Inwagen, how God acts in the world), and let things unfold.

This view is still subject to the critical retort: so God does not know the characteristics of each object, creature, and event at every point in time?!

The second way to answer the above question is, in my view, to insist that God being outside of time "sees" everything happening everywhere and everywhen, thus God does know the full characteristics of everything even though the process that leads to this or that may be partially or fully probabilistic or even random, unlike the above child conception analogy.

But what about quantum randomness, which is "fundamental"? Quantum randomness can be related to God in an interesting way that was suggested by Serkan Zorba in an essay titled 'God is Random: A Novel Argument for the Existence of God': only God has the ability to generate absolutely random numbers or sequences, as opposed to pseudo-random numbers, which follow complex, difficult to break, but nonetheless deterministic rules. He writes: "I will propound the idea that the epistemic cost of unpredictable randomness is infinite intelligence, and thereby present a new a posteriori argument for the existence of God from the irreducible randomness of the quantum world" (Zorba 2016, 51).

At the other end of the theological spectrum, a number of western theologians have proposed "open" relations between God and nature, whereby God willingly granted some freedom and autonomy to nature by setting some fundamental indeterminacy in the world; just as God granted humans free will, He may have granted nature free processes. Traditional Islamic theologians will not accept such an "open, free" relation between God and nature; however, panentheistic traditions (including some Sufi conceptions of God, the world, and humans), might integrate characteristics of nature, including any intrinsic randomness, into the (mysterious) divine nature.

Our understanding of randomness in the world, nature, and the cosmos, is far from robust or complete even in the scientific realm. And how it can be integrated into any religious or spiritual conception of the world and any theistic or even deistic philosophy still has much ground to cover.

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CHAPTER 5

Randomness, Providence, and the Multiverse

Bruno Guiderdoni

Is there evidence for the action of providence in the cosmos? Most cosmologists would answer "no." For them, the universe has no purpose at all, and it is ruled only by randomness acting according to the laws of physics (ultimately, general relativity and quantum field theory). To their eyes, the outcomes of the universe, including the existence of life and human beings on Earth, are radically contingent. However, this view is now discussed anew, in the context of a series of discoveries in the last decades. This chapter presents a brief summary of the issue. It addresses how science evacuated the centrality of the human of the universe by unfolding the importance of contingency, how contingency itself was questioned, and how cosmologists are trying to answer this question.

As a matter of fact, most cosmologists would subscribe to the materialistic view, as stated by Jacques Monod, a French biologist and Nobel Prize Winner. In 1970, Monod published *Chance and Necessity*, a book on the alleged philosophical implications of the contemporary discoveries in molecular biology, including his own on the role of RNA in decoding DNA. This book had a strong impact on the general audience, and was translated into many languages. At the very end of the book, Monod summarized his views on the cosmos with a few sentences: "The old

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covenant is broken. Finally the human knows that it is alone in the indifferent immensity of the universe, from which it emerged by chance. Its destiny and its duty are written nowhere. To it belongs the choice between the Kingdom and darkness."

5.1 The Indifferent Universe of Materialism

Monod's statement is clear: the universe is indifferent to the existence of the human, which has emerged by chance. With these words, Monod put a conclusion to the long-lasting philosophical project of materialism, which started 25 centuries ago with the works of Democritus (470–360 BCE) and Epicurus (341–270 BCE), and was subsequently developed in more details by Lucretius (99–55 BCE). According to Lucretius' work, *De Natura Rerum* (Lucretius 1993), the world is eternal, and ruled by chance. There is no "first principle" (*archè*) that produces the world, as pre-Socratic philosophers thought, and no god to enforce his will. Of course, Monod's views are much more sophisticated than Lucretius'. But both worldviews share the same ontological reductionism and materialism. For Monod, the deciphering of the DNA and RNA codes is an important step forward in the scientific endeavor, and it shows, after the unraveling of the mysteries of matter by physics and chemistry, that life itself can be understood by the interplay of chance (random mutations) and necessity (the laws of biochemistry and selection pressure). Very much as Lucretius, in his times, considered this interplay to be the full and final explanation of the "nature of the things."

Monod's views are interesting for another reason, his choice of the words in his final sentences: "the old covenant," "destiny and duty," "the Kingdom" (with a capital in the original French word "*Royaume*") and "darkness." It is not clear why Monod chose these specific words. In his book, he commented on, and criticized, animism and the separation between mind and matter, and he explained that the attraction of the human to metaphysical explanations and religions is likely coded into one's DNA itself. According to Monod, there is no God, and the universe is indifferent to the human. In its loneliness, the human has a choice between, on the one hand, the "Kingdom," which in Monod's mind is the quest for "objective knowledge" (i.e., science), a quest that is demanding and valuable, and, on the other hand, the "darkness," which is likely to refer to superstition and obscurantism. Monod uses these Biblical motifs to subvert them, and criticize the monotheistic views on the world, especially God's existence and providence.

5.2 General and Special Providence

For monotheistic religions—principally Judaism, Christianity, and Islam—every created being has purpose in accordance with God's plan. To be more specific, it is useful to distinguish between various modes of action that creation implies in monotheistic doctrines. First, God has the power to bring things into existence out of nothingness. All three religions agree on the creation "*ex nihilo*," that is, from nothing other than God's Wisdom and Will. Second, God does not bring into existence all of what is possible. He has the capacity to make choices, and to give existence to a subset of possible things within a larger ensemble. Third, God organizes created things "*ex numero et pondere*," that is, he measures things, and makes the cosmos appear as an organized whole out of all the individual creatures that are brought into being and their interconnections. Finally, God has a specific relationship with each one of his creatures, to which he provides what is necessary for its subsistence, and for achieving his plans for it. Obviously, this relationship is unique with the human being, which is gifted with spirit and free will to fulfill a central role in God's plan for the Creation.

It is important to realize that each of these characteristics is related to four specific issues in metaphysics and philosophy. God as *the Creator* (attribute 1) is an answer to Leibniz's (1714) questions: "Why is there something rather than nothing?" God as *the Chooser* (attribute 2) explains why we live in this specific world rather than in a world with different characteristics. God as *the Organizer* (attribute 3) is an explanation for the existence of laws of physics in the world, including the possibility that these laws drive change or evolution in the cosmos. All these actions are linked to what can be called "General Providence" directed toward all creatures. Finally, because God is *the Provider* (attribute 4), humans have a specific relationship with God, and they should thank him and behave in accordance with his Will, inasmuch as God gives purpose and meaning to their lives.[1] This can be called "Specific Providence," because it refers to a peculiar link that God has with each of his creatures, and especially each human being. We could say that, according to those who believe in him, God is a *sufficient* explanation for many, if not all, patterns of our existence.

[1] According to the Islamic tradition, God has many names that refer to specific aspects of his relationship with Creation. God is the Creator (al-Khâliq). He is also the Existentiator (Al-Mûjid), the Measurer (al-Muqaddir), the One who wills (Al-Murîd), and the Provider (ar-Razzâq).

In contrast, materialism does not believe that God is a *necessary* explanation for any of the above-mentioned four philosophical issues. These issues can get satisfactory answers without invoking a transcendent Agent. For instance, materialism claims that there is no cause to the existence of matter, and we have to assume that matter has always been there, although its form can change. For it, having God as the "Creator" just shifts the issue from the existence of matter to the existence of God. When monotheism answers that God is the only necessary being, materialism claims that matter could very well be the necessary being, without multiplying explanatory entities. As for the "Chooser" among a set of possible things, materialism thinks that things appear by chance out of an ensemble of possibilities. In an infinite universe, everything that is possible will end up happening. For issue three about the organization of the cosmos, the laws of physics do the job of the "Organizer." Of course, we do not know why laws hold, but this issue is hidden under the consideration that these laws are primarily the creation of the human mind to describe observations and experimentations. And finally, for materialism, the only purpose and meaning of the human are given to the human by the human itself, as Monod wrote at the end of his book.

According to Monod, the deciphering of the riddles of biology by the discovery of DNA and RNA was the final step of the destruction of the world of the "old covenant" which relied on God's existence and providence and flourished in the medieval synthesis of, for instance, Thomas Aquinas' *Summa Theologiae* or Dante Alighieri's *Convivio* or *Divina Commedia*. In this medieval synthesis shared by Jews, Christians, and Muslims, and based on Aristotelian physics and Ptolemaic astronomy interpreted in the light of the Sacred Scriptures, the centrality of the human appears through its location at the center and lower place of the world, as a result of a "Fall" that was both physical and moral. But, step by step, modern science has dismantled this medieval synthesis in which the human being was central in a closed world with a finite age.[2] Let's briefly consider this shift.

In the Copernican model of the world, the Earth is a planet with the Sun occupying the central place in the universe. However, at the beginning of the seventeenth century, it appeared that the stars were other suns

[2] As stated in Dante's *Convivio*, the radius of the closed universe, after the major work of Al-Farghânî (d. 861, Alfraganus for the Latin), is 120 million km, and its age corresponds to a creation 4000 B.C. according to Biblical counts of the ages of the prophets.

located at large distances, and that the Sun was one of the stars among many. When, in 1610, Galileo Galilei sees mountains on the Moon, spots on the Sun's surface, satellites turning around Jupiter, or a ring around Saturn, he shows that there is nothing special with the Earth. The passage from the closed world to the infinite universe was hard to accept, because it displaced humanity from its central role. Isaac Newton gave the key to understanding the structure of the world with the laws of motion and gravitation. He showed that there were many "centres of fall" in the cosmos. However, in his views, there was still some providence in the universe, because only God could guarantee that the law of gravitation holds at a distance. Empty space as the locus of gravitation became the *sensorium Dei*. Moreover, for Newton, God corrects the motions of the planets to keep the solar system stable, because the mere application of the law of gravitation seemed unable to account for the details of astronomical observations. Later, Pierre-Simon de Laplace explained this disagreement by computing the gravitational influence of all the planets of the solar system on each one of them, thanks to Newton's law of gravitation, and Albert Einstein elucidated the puzzling characteristics of a law of gravitation at a distance, with the curved space-time of general relativity. Each of these steps effectively placed God at a greater distance.

The true scale of the universe was discovered incrementally, with the identification of the shape of the Milky Way by William Herschel (1781), the first measurement of the distance of a star by Friedrich Bessel (1838), and finally, the discovery of the extragalactic nature of the "spiral nebulae" by Edwin Hubble (1926). At each step forward, the universe appeared to be larger, and the Earth became more insignificant in terms of size and location. Physical cosmology, which appeared at the beginning of the twentieth century, was built on the foundations of general relativity, and the growing power of telescopes, spectrographs, and photographic plates to probe the deep universe. The "principle of mediocrity," which was born at the time of the Copernican model, is at the basis of the cosmological theory. We humans live on an ordinary planet, orbiting an ordinary star, on the periphery of an ordinary galaxy, the Milky Way that includes about 100 billion stars. The Milky Way itself is in the Local Group, with several other galaxies, and especially the Andromeda galaxy (M31) at 778 kpc,[3] our closest giant neighbor, which is about twice as big as the Milky Way. The Local Group itself is at the periphery of the Local Super-cluster,

[3] 1 pc = 3.26 light-years, 1 kpc = 1000 pc, and 1 Mpc = 1000 kpc.

centered on the Virgo cluster, which is located at a distance of 16.4 Mpc, and where the giant galaxy M87 occupies the center. There are many super-clusters in the universe, at the crossing of the filaments and sheets that constitute the large-scale structures. This "principle of mediocrity" translates into the so-called Copernican principle, stating that the Earth is not located at a special position or at a special epoch of the universe. From the cosmological point of view, "there" is like "here," and "some time ago" is like "now." Another (although not equivalent) way to restate the Copernican principle is to postulate the "universality of the laws of physics," without which any attempt to develop cosmology is hopeless. This universality of the laws is constantly checked by the cross-consistency of all the astronomical observations, and there are dedicated research programs to detect any change of the constants of physics.

It is possible to solve the Einstein equation of general relativity under the so-called cosmological principle which states that, above a given scale, there are "average properties" of the universe that do not depend on location. The cosmological principle, which is another way to rephrase the "principle of mediocrity," leads to the simplifying assumptions of a homogeneous and isotropic universe with a uniform time flow. Under these assumptions, Einstein's equation can be solved to obtain the Friedmann-Lemaître equations that describe the space-time evolution of the universe. The observations of Hubble and Humason (1931) confirmed what these equations described: we live in an expanding universe, although it is important to emphasize that it is space itself that is expanding and not matter "exploding" into previously empty space.

Two models would be in competition in the following 30 years: the Big-Bang model (BBM), in which the universe emerged out of an "initial singularity" (Friedmann 1922, 1924; Lemaître 1927), and matter is diluted by the expansion, and the Steady State model (SSM) in which the universe is eternal, and eternally expanding, with new matter constantly appearing to fill in the voids, and to compensate the dilution (Bondi and Gold 1948; Hoyle 1948). In BBM, there is a special time (the initial singularity), but not in SSM. For this reason, these two models suggested philosophical implications. Would BBM be reminiscent of Biblical creation, and SSM of the eternal universe of Lucretius? Whereas Pope Pius XII claimed that science confirmed the Biblical narrative of creation in his address of 1952, Georges Lemaître was more careful about this type of "concordism," because he knew that physics, based on conservation laws, is unable to conceive of the appearance of something out of nothing. On his side, Fred Hoyle, one of the proponents of SSM, also saw the Big Bang as a revival of the creation ex nihilo in the fiat lux of Genesis, and preferred the eternal universe in which things have plenty of time to appear "by chance," in the wake of Lucretius' views.

The discovery of the Cosmic Microwave Background (Penzias and Wilson 1965) provided evidence for a universe much hotter and denser in the past and strongly favored the Big-Bang model. SSM was quickly abandoned. The CMB observations are consistent with the theory of Big-Bang nucleosynthesis in which light elements such as He^3, He^4, and Li^7 are made during the first three minutes of the expanding universe. The heavier elements are forged in stellar interiors, and thermonuclear reactions provide stars with their source of energy (Burbidge et al. 1957).

Another piece of the cosmological puzzle is the existence of "dark matter," whose gravitational effects appear in the fast motions of cluster galaxies, as well as in the flat rotation curves of spiral galaxies and the deviation of light rays by gravitational lensing (Zwicky 1933; Rubin et al. 1978, 1980; Tyson et al. 1984). Dark matter is mostly made of unknown particles, which are not those that make "normal matter" (the particles of the so-called Standard Model of particle physics), whose density is constrained by nucleosynthesis. Dark matter is the dominant component of matter, and rules gravitation at large scales. To end this brief sketch of the panorama offered by modern cosmology, it is necessary to mention the discovery of the *accelerated* expansion of the universe (Perlmutter et al. 1999), which is interpreted as the result of "dark energy," whether it is due to a non-zero cosmological constant, or to an unknown "scalar field" associated with a still-to-be-discovered particle.

Many pages of the narrative of cosmic evolution are now written, and the Earth appears as a tiny, peripheral bit of matter within the vast expanse of space. Probably one of the most striking pictures that illustrate this narrative is the image of the Hubble Deep Field taken by the Hubble Space Telescope (Williams et al. 1996), which unveils about 10,000 galaxies in the field of 11 arcmin. We see distant galaxies as they were in the past, when light was emitted and the universe was much younger than it is now. Subsequent galaxy counts seem to show that the observable universe, defined as the sphere around us where light can reach us during the finite age of the universe (13.8 Gyr is the current best measurement), includes about 100 billion galaxies, each of them including 1–1000 billion stars.

The richness of the universe unveiled by modern cosmology still increased with the identification of the first exoplanet (Mayor and Queloz

1995) that was followed by the discovery of thousands of planetary systems around nearby stars, many of them harboring rocky planets similar to the Earth and located in the so-called Habitable Zone that enables the presence of liquid water. After surveys conducted by the Kepler satellite, it is believed that most stars have planets. One of the main issues now is to detect bio-signatures in the atmospheres of some of these exoplanets that would signal the existence of elementary life forms, for instance unicellular organisms that would have something similar to a photosynthetic function that would produce biotic oxygen. Several projects are in preparation to make use of the forthcoming James Webb Space Telescope (launch in 2021) and the 30-meter class telescopes (commissioning in 2025) to attempt such detections.

5.3 Is the Universe Fine-Tuned for Life?

It is clear that the development of modern cosmology bolstered the idea of an indifferent universe. What would be the purpose and meaning of the human life among so many billions of stars and planets? Cosmological, geological, and biological evolution appear to have been contingent with random processes at all the stages. Theologians and deist/theist philosophers would have to find how God acts in this universe within the constraints given by science (see, e.g., Barbour 1997; Saunders 2002; Polkinghorne 2005; Ward 2007). Yet, the idea of a purposeless Earth (and human) in a vast universe would begin to be criticized just a few years after the publishing of Monod's essay, during a meeting held in Krakow in 1973, to celebrate the 500th anniversary of Copernicus' birth date. Brandon Carter, a physicist, suggested that we should be careful about too systematic an application of the Copernican principle: clearly we live in a zone of the universe where, and at an epoch when, our very existence as observers is possible. This is known as the Weak Anthropic Principle (WAP). Carter proposed a stronger statement, the Strong Anthropic Principle (SAP): the universe *must* have the overall properties that make our existence as observers possible: any change in the values of these overall properties would have made our existence either more difficult or impossible. These two statements triggered a long-lasting controversy among scientists and philosophers of science, with attitudes ranging from exasperation to excitation (Bertola and Curi 1993).

WAP seems reasonable. It looks like a reminder of the series of "decentring discoveries" of the last centuries, and question each one of them. We should not be surprised that we are located in a galaxy (very few stars, if any, form out of galaxies), and more specifically in a spiral galaxy: elliptical galaxies are mostly made of old stars, most of them being 10 Gyr-old Red Giants that have inflated in their late stages and have destroyed nearby planets, whereas late-type, irregular galaxies have low contents of those heavy elements that are necessary to form planets. We should not be surprised by living in a universe that is 13.8 Gyr old, because the chemical enrichment of the interstellar medium took a few Gyr before the formation of the Solar System, 4.56 Gyr ago. The emergence of life took 0.5 Gyr on Earth, and evolution proceeded slowly to produce the first animal and vegetal diversification. As a result, we should not be surprised to live not only in an old universe but also in a vast universe, because the expansion has lasted all this time, and galaxies were able to travel away from their neighbors. Similarly, the Earth, located around a G-type star (among the most frequent spectral types in the Milky Way), is in the habitable zone, bringing what is sometimes called the "goldilocks" conditions, "not too hot and not too cold," that enable the existence of liquid water. The existence of liquid water is also conditioned by the Earth's mass, which enables plate tectonics and the presence of an atmosphere at a sufficient pressure. Less massive planets have no tectonics, and more massive ones keep their thick initial atmosphere of hydrogen and helium. Finally, the Moon played a role in stabilizing the rotation axis of the Earth, very much as Jupiter gave inner rocky planets some kind of gravitational protection against deadly comets coming from the outskirts of the solar system.

The list of all these conditions (plus many others) gave birth to the "Rare Earth Hypothesis" (REH; Ward and Brownlee 2000) that is antagonistic to the "principle of mediocrity." It is not easy to assess the combination of the low probability of gathering all these conditions with the very large number of planets that are present in the Milky Way (or in the universe), what could be coarsely encapsulated into Drake's frequency equation (Drake 1961). The general feeling among the community of astrophysicists is that the very large number of planets should more than compensate the restrictive list of REH. The fact that this feeling is overwhelming manifests itself in the organization of a growing international community of active astrobiologists, as well as in the development of costly research programs aiming at detecting bio-signatures in solar system planets and satellites, and in nearby exoplanets.

Of course, WAP and SAP were immediately criticized for being too anthropocentric. What is at stake here is not really the emergence of the human beings, that is, life with superior cognitive capabilities, but rather the existence of planets that make simple life possible, or even complex life possible, that is, multicellular life, or maybe more, the existence of predators and preys, a powerful trigger for biological evolution. It is possible that the existence of multicellular life forms, and predator-prey couples is linked to some overall property of the Earth (like the Great Oxygenation Event), since motility involved in predator-prey couples requires more oxygen for metabolisms. Multicellular life forms (*Gabonionta*) seem to have appeared already 2.1 Gyr ago (El Albani et al. 2010) and maybe even moving life forms (El Albani et al. 2019). As far as life forms with superior cognitive capabilities are concerned, we get into the hazy field of the emergence of the human, which might be totally contingent (Gould 1989), or, on the contrary, unavoidable, provided the mechanisms of convergent evolution are at work (Conway-Morris 2003).

Clearly the emergence of life on Earth required many local conditions, and WAP has been discussed mostly in the related background of REH. In the context of theism, WAP may be seen as evidence for divine providence, but is of no consequence for our overall understanding of nature. The case for SAP is different as it involves the very possibility of life anywhere in the universe. As a consequence, it triggered a fierce debate that is still going on now, more than 40 years after it started. The ensemble of pieces of evidence that was initially referred to as SAP, is now preferentially called “the apparent coincidences” of the properties of the universe (Carr and Rees 1979), the universe “just right for life” (Davies 2007), the “fitness of the cosmos for life” (Barrow et al. 2008), or the “fortunate universe” (Lewis and Barnes 2016). The list of these pieces of evidence is impressive (see, e.g., Barrow and Tipler 1986 for a first thorough study, and the above-mentioned references). One characteristic example is the formation of carbon nuclei in the interior of stars through the so-called triple-alpha process. It is made possible by the existence of a “resonance” in carbon energy levels that is ultimately due to a happy combination of various constants of physics (Hoyle 1981). Without such a coincidence in the constants, all within tightly defined ranges, carbon would have formed in much lower quantities in stars, making the formation of planets and of carbon-based life a much more difficult process.

Rees (1999) produced a convincing summary of how most of the large-scale patterns of the universe that seem to be necessary for harboring life, are based on “just six numbers.” The number of space dimensions $D = 3$ is a condition for the stability of the planetary orbits around stars, as well as electrons' orbitals around nuclei. One or two space dimensions ($D = 1$ or 2) are just too simple for the development of complexity, and $D = 4$ or larger produce the above-mentioned instabilities. The relative matter density of the universe $\Omega_m = 0.25$ assesses the influence of gravitation on the expansion of the universe, and the possibility to form galaxies and stars. With a significantly lower value, no galaxies and stars would have formed. With a significantly larger value, the universe would have collapsed within the few Gyr, without letting enough time for the development of life. The magnitude of the cosmological constant $\Lambda = 0.75$ gives the value of the acceleration of the expansion. A larger cosmological constant would have produced a much faster acceleration that would have hampered galaxy and star formation. The intensity of matter fluctuations at the epoch of recombination, as they are measured on the CMB, is $Q = 10^{-5}$. Smaller values would have given a much smaller number of galaxies now, and larger values would have given very dense galaxies where planetary system would be unstable because of the frequent gravitational encounters between stars. Admittedly, the fine-tuning of these last three parameters is not very tight. Values different by 10–20% would not give qualitatively different evolutions for the content of the universe. The intensity of the weak interaction (that participates in the internal binding of nuclei) is $\varepsilon = 0.007$. With a slightly larger value, Big-Bang nucleosynthesis would have been more efficient, and all stars would have burnt their nuclear fuel in a short amount of time. On the contrary, a slightly smaller value would have made stars unable to light up. Finally, the ratio of the electromagnetic constant to the gravity constant $N = 10^{36}$ defines the sizes of the planets as well as of the life forms that would live on them. A slightly smaller value would make smaller life forms probably unable to evolve toward complexity, whereas a slightly larger value would slow down planet formation.

This list gives an idea of the kind of arguments around the "coincidences" or the "apparent fine-tuning" of the properties. Maybe each value by itself could be considered coincidence, but the whole argument of the fine-tuning relies on the number of these coincidences, which seems unexpected, or puzzling. The heart of the issue is that the universe seems to be fit for life, or bio-friendly, and it unavoidably brings to mind the religious statements about a world created for the human being. Of course, what fine-tuning might say is that the world is finely tuned for the existence of life, and not necessarily for the specific existence of the human being. But the religious discourse about providence starts already at this level of general providence, and the sacred scriptures remind the believer that the world was created as a gift to the human, before developing the topic of the specific providence by which God feeds, teaches, and loves each one of us.

5.4 Debates on Fine-Tuning

Because fine-tuning is reminiscent of providence, very much as the Big-Bang model was considered similar to the fiat lux of Genesis by Hoyle and Pope Pius XII, the evidence of fine-tuning was, on one side, criticized, and, on the other side, discussed and interpreted.

The first attitude toward the argument is denial. After all, how exactly are the constants fine-tuned? Some of them seem to be loosely-tuned. The cosmological constant might be one half, or twice, its measured value without much change in the fitness of the universe for life. However the "natural" value proposed by theory is much larger: it should be 10^{120}, and the fact that it is close to 1 is already an extraordinary fine-tuning that has led many theorists to think that some kind of (unknown) mechanism should have put it exactly to zero (Weinberg 1989). Consequently, the observational measurement of its non-zero value was really a surprise. The list of fine-tuning coincidences includes some tight ones and some loose ones, but the overall probability of finding all of them gathered in a single realization of a random process appears very low. The evidence is such that it demands an explanation.

Alternatively, one might think fine-tuning is a kind of observer selection effect. If the universe did not have the properties that enable our existence, nobody would have been here to see the hostility of cosmic conditions. However, this attitude seems contrary to the scientific quest that always question facts. White (2003) illustrates this situation by the metaphor of the firing squad.[4] If a convict must be executed by a platoon of soldiers, and if he survives the execution, he would not say: there is no problem to discover that I am alive, because if I were dead, I would not be able to discover anything. On the contrary, he would try to understand whether there was a plot to save him, or whether the guns used by the soldiers had some kind of malfunction.

The last type of criticism of cosmological fine-tuning consists in denigrating this position as another shameful type of "Intelligent Design," a line of argument that tried to disprove the theory of evolution. However,

[4] See also Swinburne (2010).

cosmological fine-tuning is completely part of mainstream science, and does not contradict cosmic, geological, or biological evolution, which are even very much part of the case. If the case for fine-tuning is sound and serious, it has to be interpreted, and this interpretation comes at a cost. Four roads seem to have been explored, one with more success.

The first road consists in slightly modifying the rules of science by incorporating SAP into it as a methodological principle. In addition to, for instance, Occam's razor, the refusal of final causes, and the Copernican principle, we would include the principle that the universe has the properties to host observers. If SAP were a starting principle, no more discussion is needed. However, asserting SAP as a first principle looks like a desperate patch. It is a glaring admission of weakness, and, because it stops further exploration of the topics, it may hide a whole avenue of interesting discoveries.

The second road is to confess our ignorance. In his well-known "Seven World Riddles" (Du Bois-Reymond 1880), Du Bois-Reymond lists the apparent teleological arrangement of nature as one of these riddles that might remain unanswered in spite of the efforts of scientists. We surely won't be able to unravel all the laws of nature. This line of arguments, called the *ignorabimus,* might be defended by very different kinds of people. Such a standpoint means that cosmology as a science is reaching its limits, and that we should consider the patterns of the universe, and the coincidences that make it, as just "happenstance." The line of arguments of cosmological fine-tuning leads us to question our very existence as observers, and we know that self-reference can produce tricky problems. The issue of fine-tuning might be linked to the way we become aware of the cosmos, and we know that our consciousness itself may be a scientific riddle, as put forth, for example, by the philosophical standpoint of "mysterianism" (McGinn 1991).

The third road is to accept some sort of teleological argument—something most scientists would be reluctant to do. Whereas the first road was adding up a new principle to science, this third road would suppress one of its fundamental principles, that is, the refusal of final causes. This kind of interpretation of the properties of the universe with final causes is favored by deism (which would speak only of general providence), and theism (whether it is Judaism, Christianity, or Islam) that would add special providence to general providence. However, final causes do not belong exclusively to monotheism: pantheistic views can endorse them. They might consider that matter is slowly "taking awareness" of itself (see, e.g., Reeves 1981), and that this process requires properties of matter that make complexity possible. A variant of these views can be found with Wheeler's Participatory Anthropic Principle (PAP). PAP is an interpretation of quantum mechanics "à la Wigner" in which the observer is responsible for the collapse of the state vector. Thus the observation of the universe by observers puts its wavefunction in a state that enables their very existence as observers.[5] In this context, the universe *must have* the properties to enable the existence of the observers, because the observers select the wavefunction of the universe. Here, "must have" describes the result of a causal process.

The mainstream interpretation of SAP is the multiverse, which would re-inject randomness into cosmology. According to this proposal, our universe is drawn from a large ensemble of realizations (or random draws) in a kind of "cosmic lottery" that explores a whole range of possibilities for the values of the laws of nature and constants of physics. One specific example of this explanation is Lee Smolin's theory (Smolin 1997) in which stellar black holes are the seeds of subsequent Big Bangs, with different parameter sets. The parameter sets that enable the existence of massive stars (and their final evolution to black holes) are very fecund. These parameter sets are also those that enable the existence of life. However, the so-far preferred scenario of the multiverse comes from particle physics. An overarching law, or "fundamental law" (at high densities and temperatures), would produce "derived laws" (at lower densities and temperatures) by "symmetry breaking," where some of the characteristics of the derived laws, including the values of the constants, are determined at random.

There is a mechanism for producing such symmetry breaking: cosmic inflation (Guth 1981; Linde 1982; Albrecht and Steinhardt 1982). Inflation was introduced to explain properties of the observable universe such as flatness, isotropy, and the absence of magnetic monopoles. The overall idea is that, when the universe was very young (typically 10^{-35} sec after the "singularity"), a scalar field was responsible for an exponential expansion that diluted the universe, homogenized its initial density irregularities, and flattened its space curvature as measured within a Hubble radius (the size of the observable universe). This process can occur repeatedly, in various places, giving rise to "eternal inflation," and a large number of Big Bangs and "universes." CMB observations have already

[5] See Barrow and Tipler (1986).

corroborated some of the predictions of inflation. The scalar field is not known yet, but there is hope that forthcoming observations of the CMB will be able to test a large fraction of the possible models, and especially the possibility that the scalar field is simply the recently discovered Higgs boson.

Grand Unified Theories (GUTs) should give us the nature of the overarching or fundamental law. The best candidate could be superstring theory, one of the two major attempts to unify general relativity and quantum physics. Particles are described as vibration modes of "superstrings" in a 10D space. At lower energy, some of the dimensions have to be "compactified," and to become very small, to make predictions in agreement with our observed 3D universe. However, the theory is currently undergoing a strong crisis since there seems to be 10^{500} different ways to compactify the extra dimensions. At this stage, either we have to contemplate the possibility that these 10^{500} universes actually exist, which Susskind (2008) calls the "landscape," or there is a yet-to-be-found process that makes only one compactification possible, which is the hope of those who still defend the theory. In any case, the theory is not tested yet, and there are debates about the very possibility of its testability.

5.5 The Cost of Each Option

This brief overview shows that it is not easy to get rid of SAP. As scientists, we are not ready to accept the existence of final causes, because this refusal is one of the fundamental principles of modern science. We cannot accept either the ignorabimus, which is the end of the scientific exploration in a whole field of cosmology. Finally, we would be very reluctant to include, into the list of our fundamental principles, an anthropic principle that seems a completely ad hoc way to solve a potentially fruitful crisis.

Since we cannot be satisfied by final causes, the ignorabimus, or the anthropic principle, there is only one option left, that is, the multiverse. It seems an attractive solution, because it is suggested by GUTs. However, there is a cost for this option, and even a "double" cost. First, it may not be testable. Could a non-testable theory be considered as scientific? At this stage, we might have to slightly twist the definition of what a scientific theory is, by accepting that it may have untestable consequences beyond our observable universe, provided there is sufficient evidence within our observable universe (evidence which is still missing for the superstring theory, Woit 2006; Smolin 2006). Second, are we sure that we have gotten rid of final causes with the whole process of the multiverse? Shouldn't the overarching law that produces the cosmic lottery be considered "fine-tuned" to be able to produce bio-friendly universes among its many duller outcomes?

There are three possible answers to this question. We may find in the future that one, and only one, fundamental theory is self-consistent and possible. But why would it be this specific theory that makes bio-friendly universes possible? Or we may find that several or many theories are self-consistent and possible. Maybe all these theories exist in reality, in the spirit of the "ultimate ensemble theory" (Tegmark 1998), there is no choice, and everything exists. Or maybe only one of these possible overarching theories actually exists, and we are led to understand why this one rather than another one: there has been a "choice," which it is difficult to attribute to randomness, because randomness presupposes a process for the realization of random outcomes, and, by definition, there is no physical process over the fundamental law.

Of course, it is very difficult to guess whether we shall have hints toward one or the other of these three answers in the future. At this stage of bold speculations, the preferred option is a matter of faith. In any case, we shall always face the issue raised by Leibniz: why is there something rather than nothing? And why is there this "something" rather than another one? Or, in other words: what is the origin of the substance that makes the world (Haeckel 1900)? What puts the "fire in the equations" that transforms mathematics into matter (Ferguson 2004)? Is it the mere logic of the only possible solution? Or does all what is logically possible have a correspondence in matter? Or is there a still unknown *metaphysical* process or reality that triggers/makes a choice?

Finally, there is another aspect of the issue to be considered. The observed fine-tuning favors bio-friendly universes, but is life the rule or the exception? Many scientists would think that elementary life might be ubiquitous, given the large number of planets in the habitable zones found by current surveys. We have no evidence of it, but we hope that, in the next decades, we should be able to conduct spectroscopic surveys of bio-signatures in a few dozen planets around nearby stars. Only one positive result would confirm the intuition of many astrobiologists, while negative results would only put a limit on the statistical frequency of life. Now, what about *observers*? So far, the only known observers are present on Earth. The problem is that once animals with superior cognitive capabilities appeared on Earth (such as dolphins, elephants, dogs, or apes), it took just a few ten million years to have *Homo sapiens*, and just a few hundred thousand years to have a technologically-developed civilization that would be detected through its short wavelength radio wave emissions within a sphere of about 70 light-years, that encompasses about 40,000 stars and probably a similar number of planets. Why does a whole bunch of evidence, from Fermi's paradox to the absence of signal in the 60-year old SETI surveys, point to the silence of the universe? At this stage of the reflection on the "Great Filter" (Hanson 1998; Bostrom 2008), there are three possibilities: (i) the "emergence bottleneck," in which life is a very rare event, in the wake of REH; (ii) the "Gaian bottleneck," in which elementary life appears frequently, but vanishes quickly because it is not able to control the evolution of the planet, and avoid the transformation of the latter into a desert without atmosphere or an ice ball, following a scenario that might have been the one on Mars (Chopra and Lineweaver 2016), or (iii) the "self-destruction bottleneck," where technologically-developed civilizations disappear "just after" they start developing, either through war or through the exhaustion of natural resources. Do these considerations change the perspective on fine-tuning? It seems that they may have at least an ethical consequence. If we are actually *alone* in the (observable) universe, because of one of the three above-mentioned bottlenecks, or maybe the combination of the three, doesn't this loneliness bring back a new centrality to the Earth and give a certain sense of responsibility to the human? It is interesting to note that the multiverse explanation tends to transform SAP into a variant of WAP (we are located in a specific location of the multiverse, that is, a bio-friendly universe), and the silence of the universe tends to transform WAP into SAP because the large bio-friendly universe would have just the single outcome of the human kind as observers.

At the end of this overview, let us come back to Monod. For him, the world can be fully described by the interplay of chance and necessity. This interplay explains the contingency of the human being, and its subsequent meaninglessness. With Monod's words, the human beings appeared by chance in an indifferent universe. Necessity is the set of constraints given by the laws of nature, within which random processes can unfold. It turns out that, with WAP and SAP, this necessity is more constraining than what Monod was considering in the 1960s, when he wrote his book. The set of constraints tightly corresponds to the possibility of a bio-friendly universe, and a small change in these constraints would have the dramatic consequences of making the universe more hostile to life. In this context, the multiverse appears as a solution to release the strong constraints of the current laws, by injecting a new dose of randomness in the process, at an earlier stage.

With the multiverse, matter is necessary, and all patterns, *including the derived laws*, are the products of randomness and necessity. Necessity is now understood as the frame of constraints imposed by the *overarching* law. Is this overarching law necessary (as the only one that is self-consistent), or are there various possibilities? No matter the answer, the question remains as to what has put "the fire in the equations." If there are various possibilities, we are still facing the classical issue: why is the universe so? What gave the *preponderance* to one choice on another one? Or, to put it with Leibniz's words: "Moreover, if the things have to exist, we have to explain why they have to exist in such a way, and not otherwise."

For a long time ahead, the hypothetical overarching law might appear similar to Lucretius' *clinamen*,[6] something whose action is "just enough" to let randomness play its role, but whose origin is mysterious. Believers might think they are still right to continue to see it as evidence for providence in the multiverse. Of course, the multiverse appears to be still larger and more astonishing than previous views on the universe. But it is not a problem for those who believe in God's Will and Power. The vast expanses of sterile universes in the multiverse might just be a consequence of God's creative power, which makes the overarching law with the purpose of creating a bio-friendly universe that is not "indifferent," and ultimately creatures like the Human. "I am the Lord, the God of all mankind. Is there anything too difficult for me?" (Jeremiah 32:27).

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[6] The *clinamen* is the slight deviation from the motion of vertical free fall. It affects all atoms and allows them to collide and assemble to form "things."

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CHAPTER 6

Can a Muslim be an Evolutionist?

Caner Taslaman

6.1 Religious Authority

"What should a Muslim reject on religious grounds?" Every Muslim denomination affirms the authority of the Quran: every fundamental tenet of faith—such as the almightiness and mercy of God, and the Hereafter—must have a basis in the Quran. A Muslim should reject, then, any claim that contradicts any verse, under all plausible interpretations, of the Quran (one need not bother with strained or exaggerated interpretations). If a claim contradicts a certain interpretation but not another plausible interpretation, it cannot be claimed to conflict with the Quran simpliciter. Since the plausible non-contradicting interpretation may be correct, the claim may not conflict with the Quran.

Most Muslims also accept the authority of the Hadith, a collection of the sayings and actions attributed to the Prophet Mohammed. But the Hadith contains some fabricated statements (*hadith mawdu*) that are falsely attributed to the Prophet. Some of these fabrications came from Judeo-Christian narratives (referred to as *Israilliyyah* and *Masehiyyah*). There is an abundance of Hadiths related to the creation of the universe and life, details which are not given in the Quran. Since many of these

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Hadiths are rightly disputed, I will restrict my discussion of whether or not the theory of evolution conflicts with Islamic beliefs to the Quran.

Of course, merely not contradicting the Quran does not imply that a claim is true. I often start my speeches, "I believe that the theory of evolution is not in conflict with Islamic belief." But that claim is not about the truth of the theory of evolution. I leave discussions of the truth of evolution to, for example, biologists and geneticists. While I might similarly claim that the helical structure of DNA does not conflict with Islam, I leave the determination of the truth of the claim to, say, biochemists. And when I say that the Quran doesn't conflict with the theory of evolution, I do not mean that the Quran reveals evolution; yet, these two statements are also often mixed up. Likewise, if I were to claim that the helical structure of DNA does not contradict the correct, I would not mean to say that the Quran reveals the helical structure of DNA. I only argue that evolution is compatible with Islam, not that all Muslims must believe in evolution. Moreover, I reject the claim that Islam is incompatible with evolution.

Consider, for example, the (false) claim that the moon is bigger than the sun does not conflict with Islam. Since the Quran doesn't mention the sizes of the sun and the moon, no claim about their relative size could contradict with the Quran. So, although the claim that the moon is larger than the sun has been scientifically discredited, it doesn't contradict with Islam.

Likewise, I will argue, no claim about the emergence of life forms and humans can contradict Islam. Although the Quran clearly asserts that all species of life, including humans, are created by God, it does not reveal *how* God created. Since the Quran doesn't teach *how* God created species, the Quran is compatible with evolution.

6.2 Creation: Processive or Instantaneous Creation?

If a painter were to tell us, "I made this painting," we would understand what he means. We would also know that the painting came into existence through various processes: the painter bought a canvas and dyes, mixed the dyes, stuck the brushes in the dyes and then stroked them on the canvas, and so on. "I made this painting" does not contradict the fact that the painting was made through these processes. Such processes are integral parts of the painter's creation. Likewise, when God says, "I created the heavens" or "I created living beings" or "I created humans," one should not assume that such expressions imply immediate, processless creation or instantaneous comings into existence.

According to Islam, everything that we observe around ourselves is a product of God's creation, which is typically involved in various processes. When a Muslim finishes his meal, he says "Alhamdulillah" to thank God for the food. However, prior to becoming a meal, the potatoes on the dish went through several processes—they grew in the field, were picked by a farmer, sold to a grocery, bought by a person, and then cooked. All such processes happen thanks to God's creation of atoms, the earth, life, plants, and time. So a Muslim should not claim that creation through processes contradicts the existence of God. When a Muslim drinks milk with his meal, he might recall: "*And, behold, in the cattle there is indeed a lesson for you: We [God] give you to drink of that which is secreted from within their bellies between that which is to be eliminated from the animal's body and life-blood: milk pure and pleasant to those who drink it*" (Quran 16:66). By drinking milk, the grateful Muslim does not reject the facts that the cow ate grass, the grass went through many processes in the cow's body and the milk came to the table via the labors of many people. While the verse never mentions all of these processes, believing that God works through processes does not contradict, "*We give you to drink.*"

Many claim that Quranic descriptions of God's creation such as "He says: Be, and it is" (*Kun fa Yakun*) imply a processless creation of life and humans.[1] But ordering something to be does not imply instantaneous (non-processive) causation. It implies only that the command (or will) of God was involved in creation. While some translate the Arabic article *fa* as "immediately" and interpret *Kun fa Yakun* as "He says: Be, and it immediately is," *fa* is often understood, in other contexts, as "afterwards, hereupon," implying process.

For example, when "He says: Be, and it is" is used in the narration of the creation of Jesus, the context suggests a processive creation: "*Said she: 'O my Sustainer! How can I have a son when no man has ever touched me?' It is answered: 'Thus it is: God creates what He wills when He wills a thing to be, He but says unto it, 'Be' – and it is*'" (Quran 3:47). Jesus came into existence by God's order, "Be," yet according to the Quran, his mother carried him in her womb until due time (i.e., processive creation).

[1] The following verses contain the statement "He says: Be, and it is": Surah al-Baqarah, 2:117; Surah Ali-Imran, 3:47, 59; Surah al-An'am, 6:73; Suran an-Nahl, 16:40; Surah Maryam, 19:35; Surah Ya-Seen, 36:82; Suran al-Mu'min, 40–68.

Moreover, when the statement "He says: Be, and it is" is used for the creation of the universe, many Muslims affirm a processive creation; yet they thoughtlessly claim that the same expression for the creation of humankind implies instantaneousness. There is no reason to interpret the creation of humankind and Adam (like Jesus and the universe) as "instantaneous."

While verses containing *fa* and "Be!" express the essentiality (but not the immediacy) of God's will, God's creation can be processive. Those who reject evolution because it would require God to create through processes ignore both the Quran's teaching and God's creation.

We can come to appreciate the Might and Art of God through the universe functioning via processive creation. The causal succession of chains of events in the universe is a prerequisite for acquiring scientific knowledge. Through scientific knowledge we have learned about the internal structure of the stars, the atmosphere around the earth, how bees produce honey, and the function of the human. Without appreciating the laws of processive creation, it would be impossible to properly comprehend the actions of God.

6.3 Creation in Six Stages (Days)

Some of the earliest objections to the theory of evolution involved opinions about the ages of the universe and the earth. Christians who took a very literal interpretation of Genesis, for example, held that the creation lasted just six days. Even today some Christians hold to "Young Earth Creationism," which claims that the creation of the earth happened no earlier than 10,000 years ago. But, since our focus is Islam, I ask: Can a Muslim accept that the universe is 13.8 billion years and the earth is 4.5 billion years old? I will argue that this scientific calculation of the age of the universe does not contradict Islamic beliefs.

The Christian parallels are not irrelevant since the Quran says the creation of the universe and the earth in "six stages (days)."[2] Do these verses contradict the ages of billions of years of the universe and the earth? In the Quran, the Arabic word used to describe "six stages/days," *yawm*, has the same etymological roots as the Hebrew word "yom." Likewise, *yawm* can

[2] The verses where "six stages/days" occurs are: Surah al-Araf, 7:54; Surah Yunus, 10:3; Surad Hud, 11:7; Surah al-Furqan, 25:59; Surah as-Sajdah, 32:4; Surah Qaf, 50:38; Surah al-Hadeed, 57:4.

mean both "24-hours" and "stage" or "period of time." We find such interpretations in Islamic literature centuries before modern scientific views on the age of the universe. Moreover, in the Quran itself *yawm* refers to 50,000 years and 1000 years, consistent with a "stage" interpretation. These verses are:

> *Sajdah, 32:5- He governs all that exists, from the celestial space to the earth; and in the end all shall ascend unto Him on a Day the length whereof will be like a thousand years of your reckoning.*
>
> *Ma'arij, 70:4- All the angels and all the inspiration ascend unto Him, in a day the length whereof is like fifty thousand years.*

Since the Quran doesn't commit Muslims to creation in six literal 24-hour days, the geological and paleontological findings indicating that the universe is billions of years old did not ignite any religion-science clashes in the Islamic world.

6.4 Creation of Man from Clay

The most common Muslim rejection of evolution involves the creation of man from clay.

> *An'am, 6:2- He it is who has created you out of clay, and then has decreed a term for you—a term known only to him. And yet you doubt.*

While the creation of Adam (with name explicitly mentioned) from dust is mentioned only once (Surah Al-i Imran, verse 59), several verses mention the creation of man from dust and water (clay). For example: *We have created you out of dust (*Surah al-Hajj, verse 5); *Now, indeed, We create man out of the essence of clay* (Surah al-Muminoon, verse 12)*; He creates you out of dust* (Surah ar-Room, verse 20). Since the verses that describe the creation of the first man also describe the creation of all humanity, let us approach a Quranic understanding of the creation of the first man through an understanding of the creation of all humans.

We are often misled by far out interpretations instead of the simplest and clearest explanation that stands before us. What is that simple explanation? Our food comes from animals and plants. When a seed is planted in the soil, it germinates and develops into a full plant by mixing together water and soil (clay, mud); when animals eat these plants, they digest and re-generate them into body parts. For example, a corn seed is thrown into the soil, the seed takes water and minerals from the soil and becomes a mature plant, the corn is then fed to a chicken, the chicken modifies the corn and distributes its constituents to its body. Both plants and animals are formed via modifications of the raw materials present in mud. And when we eat animals, their body parts become ours. The raw materials of me, then, are the plants and animals that I eat, which are in essence a processed version of mud. *We ourselves are formed by the processing of clay.* The body of every single human being is continually formed (created) from body parts of plants and animals. In short, creation from clay is not an instantaneous, completed process. Indeed, every element in our bodies, iron, oxygen, calcium, zinc, and so on, is present in the soil. Without allegorical or strained interpretation, these verses describe the regular, processive creation of all humans from clay. Hence, evolution should not be ruled out because the Quran affirms "creation from clay."

The Quran also describes the "creation from clay" as an initial stage, which "beginning" (*badaa*) implies the occurrence of other stages:

> *Makes most excellent everything that He creates. Thus, He begins the creation of man out of clay. Sajdah, 32:7*

When someone produces something out of a certain material, he could describe the process by making reference to the material. A sculptor, for example, might say "I made the statue from marble." When we hear such commonly used language, we do not assume that the marble didn't require shaping and polishing. Why, then, assume that "I created men from clay" implies a lack of processes? Pointing to the raw material does not imply no process. If there is no problem understanding a sculptor processing the raw materials into products, there is no problem thinking that God creates through intermediary processes. "Creation from clay," then, is a shorthand specification of the raw materials of every human being, not a denial that the clay becomes a human being through a divinely guided process.

So when Prophet Saleh tells his people *"He brought you into being out of the earth"* (Quran, Surah Hud, verse 61), nobody takes this verse to mean that people emerge from the earth without the involvement of parents or biological processes. If divine creation implies lack of processes, then should we understand this verse as meaning the immediate creation of the people from earth, which is ludicrous.

The Muslim, then, rejects the claim that God does not create humans through physical and chemical processes (from clay to animals and plants to humans). God, the Quran tells us, governs all these processes with the intention of creating animals and humans. Biology is the branch of science that tells us how God did it. Theologically speaking, no biological description (correct or not) of the formation of life out of lifeless raw materials (e.g., clay) can contradict creation as taught by Islam.

6.5 Human Dignity, Common Ancestry

Muslim's reject evolution on the basis of the theory's claim of common ancestry between humans and animals, particularly with the apes. I often hear rejections of evolution expressed as follows: "My grandfather is not an ape!" However, when asked to specify which verses of the Quran speak against common ancestry, critics have little to say. However, some claim that descent from apes would be against human dignity. In this chapter, I will consider objections related to human dignity.

The establishment of an ancestral relationship between humans and apes does not jeopardize human dignity. In the Quran, Satan is censured for his arrogance in claiming his origins superior to that of man, thereby rising against God.[3] From this, should we understand that the Quran condemns ancestral arrogance. Rooting human dignity in ancestry lacks a Quranic foundation.

Consider Pharaoh and Abu Lahab: humans share ancestry with them, yet sharing ancestry with wicked people is no detriment to human dignity! If the existence of such wicked people among our species does not diminish our dignity, why would ancestry shared with an animal? Indeed, the fiercest enemies of the Prophet Muhammad, Abu Lahab and Abu Caheel, were his relatives. If being related to a bad person diminished human dignity, it would follow that the Prophet Muhammad lacked dignity. But no Muslim would accept such a claim. Ancestry has nothing to do with dignity. Is the claim of common ancestry of humans with fish or apes worse than the claim of shared ancestry with Pharoah or Abu Lahab?

Indeed, while Pharoah and Abu Lahab are censured in the Quran, fish and apes are not. So why should one feel uncomfortable about sharing ancestry with animals which are not scorned in the Quran, yet feel no

[3] Surad Sad, 38:76.

discomfort about sharing ancestry with those that the Quran declares as worse than animals?

The compatibility of evolution with human dignity does not imply that evolution is Islamically correct or that it should be accepted. That would require an assessment of the evidences of biology, geology, paleontology, and so on. Nevertheless, there is no Quranic basis for rejecting evolution from an Islamic perspective on human dignity.

6.6 *Nafsi Wahida*: Descent from Adam and Eve?

While some Muslims hold that non-human species were created through evolution, humans, they claim, are an exception. However, as we've been arguing, there is no Islamic problem in believing that God created all living beings, including humans, through evolutionary processes. How, then, should we understand the Quran's claim of "creation out of one kind/entity" (*nafsi wahida*):

> *O humankind! Be conscious of your Sustainer, who has created you out of one kind, and out of it created its mate, and out of the two spread abroad a multitude of men and women.* (Nisa, 4:1)

Some theologians interpret "one living kind/entity" (*nafsi wahida*) as the creation of Eve[4] from Adam's rib and the descent of all humankind from this first couple. However, the Quran says nothing about the creation of Eve from Adam's rib. That belief snuck into Muslim thought from the Judeo-Christian tradition (*Isra'iliyyat*), which contains many apocryphal narratives. Hence, Muslims should not base religious views on such narratives.

This narrative is also exploited for the denigration of women—woman's creation from and for man grounds, some say, the ontological inferiority of women to men. Some also claim that since woman was created from an errant rib, she has an inborn tendency to go astray. Again, the Quran neither contains nor tolerates such sexist arguments.[5]

The creation of humanity out of a single kind is more properly understood as asserting that men and women are members of the same species (Yar 2011, 78–79). So we read in the following verses the Arabic word *nafs* as meaning "kind":

[4] The name "Eve" does not occur in the Quran.
[5] For more on this subject, see Barlas (2002, 133–36).

He creates for you mates out of your own kind (nafs).[6] *Room, 30:21-*

he raised up in their midst an apostle from among themselves (nafs). Ali Imran, 3:164-

The first verse emphasizes the creation of mates of the same kind, and the second speaks of messengers of the same kind (the apostles were not chosen from among angels). Since neither mates nor apostles were created from the body parts of humans, the term "creation out of one kind/entity (*nafsi wahida*)" should be taken to mean "as members of the same, human species."

The Quranic claim that humans are created out of one kind, then, does not imply that Adam was created instantaneously out of the clay and that Eve was created out of Adam's rib (and all subsequent humans created from this first couple). It implies something much simpler—all human beings are of the same species. As such, it doesn't conflict with evolutionary theory. And, so, evolutionary theory does not conflict with Islam properly understood.

6.7 Theological Agnosticism

So far, I have attempted to show that the theory of evolution is compatible with belief in God, and that from an Islamic perspective there is no need to oppose this theory. I argued that Quranic terminologies such as "creation from clay" and "*nafsi wahida*" do not require the rejection of evolution. Moreover, I reject the claim that the Quran teaches or even implies the theory of evolution. Combined, these arguments show that it is impossible to argue for or against the theory of evolution based solely on the content of the Quran. The best stance for a Muslim, then, is to evaluate the scientific-philosophical aspects of the theory independently of religious concerns; that is, Muslims should be theologically agnostic about evolution. By theological agnosticism, I mean that since the Quran neither favors nor rejects the theory, a Muslim should, *with respect to theology,* be agnostic about whether or not evolution is true; the Quran neither affirms nor denies the truth of evolution. Therefore, a Muslim can and should in good faith focus entirely on the scientific aspects of the theory (safely setting religious considerations aside).

I do not use the term "theological agnosticism" in its common sense of "God is unknowable." The Quran affirms both the existence and

[6] See also Surah an-Nahl, 16:72; Surah ash-Shu'ra, 42:11.

attributes of God (such as God's Knowledge and Power). And it reveals the creation of life by God. So a Muslim should not be agnostic about God's existence and some of God's attributes.

So while the Quran reveals that God is Creator, it does not reveal how God created. So, rationally, the Muslim should be theologically agnostic about God's methods, when viewed from a purely religious angle. Indeed, Muslims should be theologically agnostic about every scientific issue that does not conflict with the Quran. So, for example, Muslims should be theologically agnostic about the precise number of continents or planets (let geology and astronomy answer those questions for us). And since the Quran doesn't specify, we should be theologically agnostic about whether species were created independently or evolved from each other (let biology, say, or paleontology tell us).

Theological agnosticism does not imply *scientific agnosticism*—while Muslim theology does not tell us the number of planets or continents, various sciences do. And theological agnosticism does not imply that a Muslim should be scientifically agnostic about evolution. A Muslim should carefully consider the relevant sciences to determine their rational belief. A Muslim, then, can consider evolution with either prejudice or fear. She has no theological stake on the issues. Muslims should reach their opinions about evolution on the basis of scientific evidence and without any religious concerns, just as they do when assessing theories of light, fluid dynamics, or Einstein's general theory of relativity.

What does the scientific evidence say about the theory of evolution? While there are still issues outstanding, it is the most successful scientific theory of all of it alternatives. Indeed, there is a marvelous beauty in this theory as it relates all living beings to each other and reveals a kind of unity in life.

If God has not revealed an issue to us, it is best to say, "I do not know" (theologically) and turn, again without prejudice or fear, to the relevant sciences.

6.8 Conclusion

I have distinguished the question "Can a Muslim be an evolutionist?" from the debate about the correctness of the theory, and focused on the former. I have argued that a Muslim can, without prejudice or fear, accept evolution. The Quran, clearly considered, offers no verses that contradict the theory of evolution. Therefore, a Muslim *can* believe in evolution. I have not claimed that a Muslim *must* accept evolution. Just as the Quran contains no verse that conflicts with the theory, no verse in the Quran obligates believing in the theory either.

I have defended theological agnosticism about evolution, holding that the acceptance or rejection of evolution is not determined from an Islamic perspective; theologically, Muslims should be agnostic about the theory. Our judgment about the theory, then, should be based on the relevant scientific evidence. So, although I am theologically agnostic about evolution, I am convinced that the theory of evolution is the most successful scientific explanation among its alternatives.

Since the theory of evolution is not in conflict with Islam, Muslim thinkers can relax and approach the topic with open-mindedness, scrutinizing evolution in the light of scientific findings and philosophical evaluations, and thereby arrive at their own considered conclusions about evolution.

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CHAPTER 7

Chance, Evolution, and the Metaphysical Implications of Paleontological Practice

Alan C. Love

7.1 Evolutionary Metanarratives

Stories are narratives that connect agents and events in causal relations to show a particular path through a welter of possibility (Beatty 2016). A subspecies is *meta*narrative, which is intended to interpret or explain life circumstances and bring meaning to isolated events by setting them within the context of an overarching pattern. A metanarrative typically offers a framework for structuring and justifying the beliefs and practices of individuals, groups, and societies. Throughout human history, metanarratives have been pervasive and are associated with religious, political, or social institutions that perpetuate asymmetric power relations between groups of people. This suggests that metanarratives might be less common in the realm of scientific inquiry where many of their aspects have been called into question, if not significantly undermined. However, their ubiquity might also indicate that metanarratives should be expected among

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communities of scientists, even if they take on distinctive shapes and contours (Beatty 2017; Losos 2017).[1]

For more than two decades, a protracted debate has been waged over how to interpret the wider significance of fossils from the Burgess Shale and the Cambrian Explosion. On the side of contingency that emphasizes unpredictability, Stephen Jay Gould argued that if the "tape of life" was rerun, then the lineages that resulted would differ radically from what we find today (Gould 1989). One implication is that the human species is a happy accident, a pure gift of chance from the evolutionary process. On the side of convergence that emphasizes repeatability, Simon Conway Morris argued that if the "tape of life" was rerun, the lineages that resulted would be largely similar to what we now observe (Conway Morris 1998). A significant implication is that intelligence would still emerge from the evolutionary process (Conway Morris 2003). Although diametrically opposed, both sides provide an explanatory metanarrative with a basis in evolutionary biology seen specifically through the lens of paleontology and its efforts to reconstruct the history of life from the fossil record. Conway Morris and Gould set forth overarching interpretations of life circumstances that bring meaning (or not) to isolated evolutionary events by contextualizing them within a pattern of history which can structure and justify beliefs about what it means to be human.

A central inferential maneuver of these metanarratives is that the success of evolutionary science (primarily) and paleontology (in particular) justifies the perspective on offer. This move—from scientific success to general metaphysical conclusions about what the world is ultimately like—is common and has been scrutinized extensively by philosophers in the context of questions about scientific realism. An assumption pervading these analyses is that the relevant success is located in the performance of scientific theories or their component features, such as whether a theory has made novel predictions: "Scientific realism is a positive epistemic attitude towards the content of our best theories and models" (Chakravartty 2017). However, as Ian Hacking argued several decades ago, "One can believe in some entities without believing in any particular theory in which

[1] Metanarratives are not scientific theories. Although there can be implicit theories that structure and guide inquiry, there also are situations where metanarratives operate in science, such as by constraining explanatory options or as supposed outcomes of successful investigation. The latter possibility is in view here.

they are embedded" (Hacking 1983, 29). Hacking concentrated on visualization practices in microscopy to illustrate this point, bequeathing to philosophy the memorable slogan in relation to electron microscopy: "if you can spray them then they are real" (23).

Assuming the sciences are a—if not the most—reliable way to learn about the way the world is, then the successes of science are a good place to work out the structures of reality (i.e., metaphysics). However, we know from history that scientists can be dramatically wrong. The successes of today could be the failures of tomorrow. Empirically successful theories of the past have subsequently been falsified and rejected. Why think anything different will obtain for current theories? Part of the motivation for shifting from theories to practices is that many practices have been stable across dramatic changes in scientific theories. For example, genetic approaches have been in use for more than 100 years despite major changes in our understanding of the nature of heredity and concept of the gene (Waters 2017). Practice-based knowledge is a distinct locus for scrutinizing the success of evolutionary science, and paleontology in particular.

Recent methodological innovations in paleontological practice, in combination with empirical work in evolutionary biology (Blount et al. 2018; Losos 2017), call into question whether either of the metanarratives put forward by Gould or Conway Morris is justified. These practices illustrate how analyzing fossils in terms of parts (traits) and wholes (e.g., organisms, lineages) advances our understanding of character evolution and suggest that global claims about the history of life, whether in terms of essential contingency or predictable convergence, are unwarranted (Hopkins and Lidgard 2012; Hunt et al. 2015; Lidgard and Love 2018). Do these successful practices harbor other metaphysical implications? Possibly, but in a much more piecemeal fashion than is conducive to metanarrative. Instead of an epic saga or metanarrative, successful scientific practices are better suited to circumscribed narrative genres, such as a short story. They seldom lead to global metaphysical conclusions of the kind that have been at stake in ongoing debates about the history of life. However, they can provide fodder for theological analysis and I explore some possible directions of inquiry related to implications of these successful paleontological practices for aspects of standard conceptions of divine providence.

7.2 Chance and Contingency Versus Convergence and Predictability in the History of Life

Surviving rocks of the Ediacaran period (~635–541 million years ago [mya]) and Cambrian period (541–485 mya) chronicle a complex evolutionary transformation, culminating with the appearance of Cambrian fossils that represent multicellular animals and exemplify characteristic features of extant phyla (Erwin and Valentine 2013). The appearance of these fossils in the Cambrian Explosion over a short span of geological time, and at this time and not earlier or later, constitutes an enduring evolutionary problem (Erwin et al. 2011; Marshall 2006; but see Wood et al. 2019). Several Cambrian localities of exquisite preservation contain large numbers of individuals in a wider array of taxa than normally observed and exhibit rare detail for both soft and hard tissues. The Burgess Shale in Canada (508 mya) is arguably the most famous of these (Briggs et al. 1994), especially because of beguiling arrangements of morphology, such as the five-eyed and stalk-mouthed arthropod *Opabinia regalis*.

Although ongoing research is helping to elaborate and refine multidisciplinary explanations of this distinctive event in Earth history, much of the controversy has revolved around what kind of meaning or wider significance the Cambrian Explosion, and Burgess Shale in particular, has for understanding who we are as humans. The competing evolutionary metanarratives of contingency (Gould 1989) and convergence (Conway Morris 2003) have dominated this discussion, both of which move from the success of evolutionary science and paleontology to metaphysical conclusions about what the world is ultimately like.

7.2.1 Contingency

Gould's argument for the contingency metanarrative begins with a thought experiment about what would happen if evolution "started over", especially at the dawn of animal life reflected in the Cambrian Explosion. It was framed in terms of a technology that has largely (though not wholly) been superseded: magnetic tape data storage.

> I call this experiment "replaying life's tape." You press the rewind button and, making sure you thoroughly erase everything that actually happened, go back to any time and place in the past—say, to the seas of the Burgess Shale. Then let the tape run again and see if the repetition looks at all like

> the original. … I believe that the reconstructed Burgess fauna, interpreted by the theme of replaying life's tape, offers powerful support for this different view of life: any replay of the tape would lead evolution down a pathway radically different from the road actually taken. (Gould 1989, 48, 51)

The phrase "view of life" is intentional as Gould is explicit in drawing out the metaphysical implications of this paleontological success: "This … alternative represents no more nor less than the essence of history. Its name is contingency" (51). The invocation of essences signals a metaphysical picture:

> This book is about the nature of history and the overwhelming improbability of human evolution under themes of contingency and the metaphor of replaying life's tape. It focuses upon the new interpretation of the Burgess Shale as our finest illustration of what contingency implies in our quest to understand the evolution of life. (51)

Three elements of Gould's argument need to be recognized. The first is that contingency is used in two distinct ways (Beatty 2006). One sense of contingency is unpredictability or contingency *per se*. If you stood at the origination point for the playing of the tape, the sheer number of possible combinations that could occur through time would make it impossible to predict the direction of evolution (unless you were an omniscient Laplacian demon). Hence, we get "the overwhelming improbability of human evolution." The second sense of contingency is causal dependence or the effect of a historical pathway (contingent *upon*). Current products of the evolutionary process, such as humans, are conditioned by a host of detailed prior states that were necessary to yield a particular outcome. This augments the metanarrative because the influence of causal history means any present outcome is unique or contingent upon many details of dependence that could have been different on many occasions by virtue of contingency *per se*.

The second element of Gould's argument is the contrast class to contingency. He frames two distinct and mutually exclusive possibilities for the outcome of replaying life's tape. Why did only a small number of phyla or major taxa persist compared with the many that arose in the early Cambrian period (at least on this reconstruction of the Burgess Shale)? The first possibility is that the survivors (including our ancestors) were much better adapted to their environments. If we replayed the tape over and over again, we would get similar outcomes (i.e., convergence arising from adaptive evolution to similar environments; see §2.3). "If each replay strongly resembles life's actual pathway, then we must conclude that what really happened pretty much had to occur" (Gould 1989, 48). The second possibility is that the survivors (including our ancestors) were lucky, winning a lottery among equally, if differently, adapted forms. Replays of the tape would yield different outcomes, "results strikingly different from the actual history of life" (48). This contrast can be applied directly to thinking about human existence. Why did *Pikaia*—the first known chordate and possibly an ancestor of vertebrates, including humans—persist, rather than *Opabinia*? Gould affirms the second possibility: "replay the tape a million times from a Burgess beginning, and I doubt that anything like *Homo sapiens* would ever evolve again. … Wind the tape of life back to Burgess times, and let it play again. If *Pikaia* does not survive in the replay, we are wiped out of future history" (289, 323).[2]

A third element in Gould's argument is a different interpretation of patterns of diversity through the history of life. He accuses evolutionary biologists of harboring a default assumption that there is a gradual and steady increase of species diversity through evolutionary time (a cone of increasing diversity). However, the lottery-style survivorship of some major taxa rather than others in the Cambrian points to a different model of diversification—decimation followed by diversification—in which an initially large amount of diversity is severely pruned and followed by subsequent diversification occurring within surviving lineages. This illustrates the previous two elements because the decimation-diversification model accents both senses of contingency and aligns with the second interpretation of surviving lineages winning the evolutionary lottery and diversifying into many different and uniquely adapted forms.

These three elements—(1) two senses of contingency, (2) contingency and convergence as mutually exclusive options, and (3) the decimation-diversification model of diversity—together comprise Gould's argument that replaying life's tape supports an evolutionary metanarrative of contingency. This is a metaphysical conclusion based on the paleontological achievement of having reconstructed the Burgess Shale fossils, justifying the claim that they have implications for human existence. "The animals of

[2] Gould does not claim that *Pikaia* is actually ancestral in the human lineage. For literary purposes, he has it stand in for a small group of chordate taxa extant in the early Cambrian.

the Burgess Shale are holy objects—in the unconventional sense that this word conveys in some cultures. … we greet them with awe because they are the Old Ones, and they are trying to tell us something" (Gould 1989, 52).

7.2.2 Convergence

Simon Conway Morris, one of the paleontologists involved in reconstructing Burgess Shale fossils, agrees that the fossils have something to say, but disagrees about what they are trying to tell us. Conway Morris thinks the message affirms the first possibility of convergence—the independent evolution of similar traits due to similar environmental circumstances. If we replayed life's tape, we would get a very similar outcome.

> The reason for discussing convergence here is that its recognition effectively undermines the main plank in Gould's argument on the role of contingent processes in shaping the tree of life. … Contingency is inevitable, but unremarkable. It need not provoke discussion, because it matters not. There are not an unlimited number of ways of doing something. For all its exuberance, the forms of life are restricted and channelled. (Conway Morris 1998, 13)

Conway Morris went on to provide a systematic synthesis of convergence phenomena from different levels of organization across life's phylogenetic tree: "the recurrent tendency of biological organization to arrive at the same 'solution' to a particular 'need'" (Conway Morris 2003, xii). Icons such as the kiwi bird, which has well-developed senses of smell and hearing, a face covered with "whiskers," bones containing marrow instead of air sacs, and shaggy, hair-like plumage, help to illustrate how a common niche for ground animals in New Zealand—where there were no mammals—originally facilitated such an evolutionary outcome. The implication from the evolutionary metanarrative giving meaning to human existence is stated forthrightly in the subtitle ("Inevitable Humans in a Lonely Universe") and preface: "[my] aim is to argue that, contrary to received wisdom, the emergence of human intelligence is a near-inevitability" (xii).

Empirical warrant for Conway Morris's argument is the existence of recurring patterns in evolutionary outcomes across diverse taxa, whether it is the camera eyes of cephalopods and vertebrates, the farming practices of humans and ants, or the rodent-like features of the kiwi. These patterns show that the number of evolutionary possibilities is limited by the operation of natural selection in similar environments and therefore the explosion of combinatorics that Gould appealed to with contingency per se is rendered moot. The restrictions and channels exhibited by these patterns make it possible to predict many evolutionary outcomes.

> The constraints we see on evolution suggest that underlying the apparent riot of forms there is an interesting predictability. This suggests that the role of contingency in individual history has little bearing on the likelihood of the emergence of a particular biological property. (Conway Morris 1998, 139)

These patterns also diverge from the expectations of both models of diversity in the history of life discussed by Gould. Instead of a gradual increase of diversity or an initial burst of diversity followed by substantial pruning, Conway Morris favors a rapid increase of diversity in the Cambrian followed by a slower general increase over time afterward (207). Notably, he does not take issue with the causal dependence thesis (contingent *upon*) because he acknowledges that the camera eye of a squid will be conditioned by its molluscan heritage in a way that differs from the camera eye of a primate.

Conway Morris, similar to Gould, is explicit in emphasizing that an argument is being made from our understanding of the Burgess Shale—successful paleontological science—to implications for what it means to be human.

> The reality of convergence suggests that the tape of life, to use Gould's metaphor, can be run as many times as we like and in principle intelligence will surely emerge. … we muddy the waters of the debate if we fail to acknowledge that the processes of evolution have metaphysical implications for us. (14)

However, the implications are dramatically different. For Gould, "perhaps we are only an afterthought, a kind of cosmic accident, just one bauble on the Christmas tree of evolution" (Gould 1989, 44). For Conway Morris, "there is inherent in our human situation the possibility of transcendence" (Conway Morris 1998, 14).

7.2.3 *Contemporary Coda*

Since the initial articulation of these two evolutionary metanarratives, a number of relevant scientific developments have occurred (reviewed in Erwin 2016). These remind us that we should be cautious about drawing metaphysical implications from both successful scientific theories and practices because their fortunes can change. One example of this in the present context is a change in taxonomic methodology that prompted a revisionary understanding of the Burgess Shale fossils (Brysse 2008). The change occurred with the adoption of cladistic methods for reconstructing phylogenies within paleontology and included a key distinction between stem groups and crown groups. A crown group is a "monophyletic clade" (a group consisting of a species and all its descendants) of extant species that trace back to a last common ancestor and include extinct representatives derived from this common ancestor. A stem group is a "paraphyletic clade" (a group consisting of some but not all descendants of the last common ancestor); it contains extinct members of a monophyletic clade that are not part of the phylogenetic branch of the crown group. The common ancestor of the clade is not part of either group. This distinction makes it possible for there to be unique and distinctive features in a stem group (e.g., the five eyes and stalked mouth of *Opabinia*), even though by virtue of other traits (e.g., body segmentation) it is part of an extant major taxon (e.g., arthropods). "Since 1989, cladistic analyses have accommodated most of the problematic Cambrian taxa as stem groups of living taxa" (Briggs and Fortey 2005, 96; cf. Brysse 2008).

This change in taxonomic methodology and reclassification of Burgess Shale fossils undermined Gould's decimation-diversification model, which depended on interpreting the weird wonders as distinct phyla or major groups that went extinct in the Cambrian. However, this was not as central as the other elements of Gould's argument (two senses of contingency and contingency vs. convergence as mutually exclusive options). These remained intact and inspired a wide range of empirical tests (Blount et al. 2018). Most prominent among these are experimental evolutionary studies (e.g., Good et al. 2017). In these experiments, replicate populations are propagated under highly controlled conditions (e.g., with a small set of known environmental variables and already characterized genotypes). These populations are monitored for evolutionary changes in gene frequencies or the origin of an ability to metabolize a novel resource. Causal dependence (history), contingency per se (chance), and deterministic processes (natural selection/convergence) can be evaluated quantitatively and repeatedly, effectively running life's tape again and again on small scales. Adjustments can be made in the initial conditions and environmental circumstances modified in a precise manner. Biologists can scrutinize what happened at a particular stage of the experiment and possibly design additional experiments to test new hypotheses.

Other relevant empirical demonstrations involve natural experiments, such as evolutionary patterns associated with the repeated colonization of islands by *Anolis* lizards after severe weather events (Losos 2017; Stroud and Losos 2016), as well as documentation of repeatability in genotypic and phenotypic evolution (Orgogozo 2015). Overall, the message emerging from these different scientific studies does not support either evolutionary metanarrative. Both contingency and convergence are present heterogeneously across taxa undergoing evolutionary change in different traits at a variety of levels of organization.[3] If there is any tendency across the history of life, evolutionary repeatability and predictability are more reliably (though not exclusively) observed in closely related lineages, whereas contingency is more typical (though not universal) as historical depth, phylogenetic distance, and ecological difference increase (Blount et al. 2018). However, these experimental studies are not primarily about the fossil record and have focused on microevolutionary processes. Whether that means their results should count more or less (or the same) in the context of evaluating evolutionary metanarratives is an open point of debate (Desjardins 2016; Turner 2011). At a minimum, it is profitable to see how the evolutionary metanarratives are undermined by actual paleontological practices—studies of the fossil record.

7.3 Chance and Selection in the Fossil Record: Successful Paleontological Practices

Paleontological practices have been in the foreground of Burgess Shale discoveries from the beginning. Infamously, the iconic taxon *Hallucigenia sparsa* was reconstructed incorrectly (Brysse 2008). Related difficulties in reconstructing and classifying Burgess Shale fossils resulted from a

[3] "Although Gould's ideas on contingency have stimulated a great deal of productive work, his view that contingent effects were pervasive throughout evolution remains debatable. … Clearly, evolution can be both contingent and deterministic, and often in complicated and fascinating ways" (Blount et al. 2018, 8).

standard problem for paleontology: the differential preservation or co-location of organismal parts. For example, *Anomalocaris canadensis* was first described based on a headless carapace in 1892 (Brysse 2008). Two other supposed fossil animals, the jellyfish *Peytoia* and the sponge *Laggania*, turned out to be isolated body parts from *Anomalocaris*. The situation was resolved only after a more complete specimen was recovered in 1981. This showed that the original "carapace" was a disarticulated frontal feeding appendage, the amorphous "sponge" a portion of the body, and the circular "jellyfish" its mouth. However, in many cases, there is not a complete specimen that resolves all of these parts into clarified locations within an organism and nearly all fossil specimens are incomplete (i.e., based off of a partial set of fossilized traits). This points us to a significant aspect of how paleontologists operate as scientists.

All scientific practice involves using proxies—measurements of particular properties that stand in for something else. For example, phylogenetic systematic methods encourage treating taxa (wholes) as aggregates of traits (parts). In paleontological analyses, hard body parts are more available and abundant than soft body parts. The hard body parts serve as proxies for the lineages studied, frequently in the absence of any preserved soft body parts. This is applicable to both classification and testing hypotheses about chance and natural selection in the fossil record. When scientists are interested in evaluating questions about whether a lineage is convergent (due to natural selection) or contingent (due to chance factors), then an ambiguity can emerge between and among morphological and molecular parts and whole organisms or genomes of a lineage or clade that contain these parts. Does one body part (e.g., a skeletal element) represent the evolutionary dynamics of other characters in the lineage (e.g., a genomic element)? This is common practice in paleontology: single size and shape characters are often taken to represent a species or lineage in quantitative studies of evolutionary modes (Hopkins and Lidgard 2012).

Newer analyses where multiple characters are recorded for the same species or lineage frequently distinguish different evolutionary modes for different characters (Hopkins and Lidgard 2012; Hunt et al. 2015; Voje et al. 2018). This can be illustrated with a hypothetical lineage of fossil fish (Fig. 7.1). Many characters are available to represent the lineage. Of those available, a subset is selected to be measured and represent the lineage (in this case, eye width, tail fin length, and pectoral fin length). After doing the quantitative analysis, each of the three characters is best accounted for

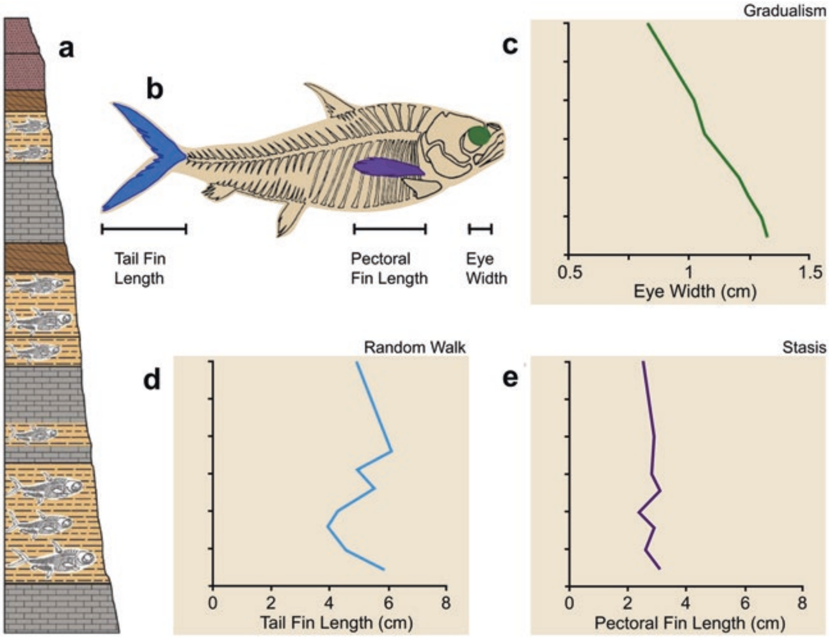

Fig. 7.1 Distinct evolutionary trajectories of different traits in a hypothetical fossil fish lineage exemplify results from hundreds of published studies (Hopkins and Lidgard 2012; Hunt et al. 2015). (**a**) Population samples are taken at successive intervals from sedimentary layers that contain fossils. (**b**) Characters are measured for each sample. Different evolutionary modes are seen in character trajectories plotted against stratigraphic positions for eye width (**c**), tail fin length (**d**), and pectoral fin length (**e**). Illustration: Monica Jurik. (Source: Lidgard and Love (2018). Reproduced by kind permission of Oxford University Press on behalf of the American Institute of Biological Sciences under the terms of the Creative Commons Attribution Non-Commercial License [http://creativecommons.org/licenses/by-nc/4.0/])

by a different model of evolutionary change: gradualism for eye width, random walk for tail fin length, and stasis for pectoral fin length. If we had only used a single size or shape character, it would have generated a different perspective on the evolutionary trajectory of the fossil fish lineage. More abstractly, there is a complicated relationship between parts and wholes through evolutionary time (Losos 2017).

When this type of analysis is performed on marine invertebrate taxa with good preservation and well-sampled vertical distributions of fossils in the geological column, single traits frequently show different evolutionary modes in the same sequence (e.g., chance, then selection, then chance). This diachronic complexity of evolutionary change increases as a greater number of traits is measured. Mosaic patterns of trait evolution are common in the fossil record. Researchers can empirically detect both selection (in the form of directional change or stasis) and chance (in the form of a random walk), and both of these are present heterogeneously across the measured characters in taxa undergoing evolutionary change. Additionally, sequences of fossils with more representatives (i.e., more samples in a sequence) are more likely to display complex modes of evolutionary change (e.g., random walk followed by stasis) rather than simple modes (e.g., random walk alone or stasis alone) (Hunt et al. 2015). Thus, the same organismal part is subject to varying dynamics of evolutionary change over time in a lineage rather than being primarily the result of a single evolutionary mode (e.g., directional change).

Although there is an inevitable degree of uncertainty in using models to analyze these complex patterns, and these methods have biases that lead to particular kinds of errors (Voje 2016, 2018; Voje et al. 2018), the primary conclusion based on their success is unaffected. For example, in some cases the best model identified according to the criteria does not adequately describe the trait dynamics in a fossil time series (Voje 2018). However, the aggregated result of heterogeneous and complex modes without one predominating evolutionary trajectory remains. Overall, these methodological innovations in paleontological practice call into question the evolutionary metanarratives advanced by Gould and Conway Morris. And this conclusion is congruent with the consensus arrived at through natural and laboratory experimental studies of chance and natural selection (§2.3).

In a comprehensive review of the question of contingency versus convergence in relation to the Burgess Shale and Cambrian Explosion, paleobiologist Doug Erwin captures this consilience of different perspectives acutely.

> It seems unlikely that there will be any general answer to questions over the role of contingency versus necessity in evolution, either with the Burgess Shale fossils and the Cambrian radiation specifically, or more generally in the history of life, in large part because at such a coarse level the question is

> wrongly specified. The relative importance of contingency depends upon whether one is interested in molecular processes, development, phenotype, or macroevolutionary patterns, and the answer may differ at these different levels, even for the same event. (Erwin 2016, 297)

This synthetic conclusion accents two key points about the adequacy of metanarratives for evolutionary history.[4] The first is that empirical research yields a mixed message about the predominance of evolutionary mode: there is no "general answer to questions over the role of contingency versus necessity in evolution." A framing of the two evolutionary metanarratives as mutually exclusive and exhaustive options is undermined. To retain an inference from successful science to metaphysical implication, as is the desire in these evolutionary metanarratives, other options must be formulated or the enterprise disbanded (e.g., because we cannot formulate relevantly precise empirical models for the history of life). Second, these evolutionary metanarratives frame the question too coarsely. When the units of interest are more precisely specified (e.g., molecular processes vs. macroevolutionary patterns)—a move justified by the successful paleontological practices of modeling evolutionary change for traits instead of organisms or lineages (Hopkins and Lidgard 2012; Hunt et al. 2015)—the patterns observed may be different and therefore new kinds of answers might become available (Lidgard and Love 2018). A natural question is whether different metaphysical implications might be warranted in light of this heterogeneous architecture of successful science.

7.4 Potential Implications for Divine Providence?

Does the argument from successful paleontological practices in reconstructing evolutionary dynamics based on the fossil record imply something for conceptions of divine providence—a very different kind of metaphysical implication? This question is appropriate since the two competing metanarratives both speak to what the history of life implies for the human species. However, it is not possible to review the entirety of possibilities for how divine providence has been understood historically (Flint

[4] One might resist drawing general conclusions from Burgess Shale fossils and the Cambrian Explosion because they are deemed non-representative. This would require deciding whether there are any independent, comparable cases that might validate their representativeness. Natural candidates might be recoveries after mass extinctions or the invasion of "unoccupied" habitats, such as moving onto land or colonizing islands.

2010; Jowers 2011; Tracy 2010) or in relation to the sciences (Clark 2014, ch. 2; Koperski 2015, ch. 4; Saunders 2002). Instead, I focus on discussions that have been motivated by contrasting evolutionary metanarratives from Gould and Conway Morris in theological contexts that speak to the metaphysical question of divine action generally and providence in particular.[5]

Consider a recent paper that tries to navigate between these evolutionary metanarratives by arguing that there is unpredictability due to randomness in the world, but this is constrained within patterns of convergence due to natural selection (McCall 2019). This discussion is not informed by the scientific developments and successful paleontological methods described above. As a consequence, it retains a strict dichotomy between contingency and convergence, while seeking a hybrid conceptualization that adopts the major features of each metanarrative. The result is unclear and uninformative: how much randomness is there and how tightly is it constrained within patterns of convergence? These types of arguments, with explicit dependence on the dichotomy between contingency and convergence, have been advanced by a variety of authors: "The alternative positions are set out in Gould's *Wonderful Life* (1989) and Conway Morris' *Life's Solution* (2003). … One or other of them must be mistaken" (Bartholemew 2008, 186–7). They are apropos in the context of evolutionary metanarratives that propose overarching interpretations of historical patterns to inform what it means to be human.

The first possibility is that there is no metaphysical implication of scientific success relevant for understanding divine action in the world. If every conception of divine providence is a metanarrative, then the heterogeneous results of empirical studies exemplified in paleontological analyses of character evolution could be uniformly uninformative. For example, if providence is understood broadly as the claim that "the events of our world, no matter how chaotic or disturbing they might appear, unfold precisely according to the plan established eternally by our all-knowing and loving sovereign" (Flint 2010, 329), then a variety of combinations of chance (contingency per se), history (contingent *upon*), and natural selection (convergence) could be accommodated within such an overarching

[5] Metaphysical implications could be either positive or negative (e.g., providing reasons for or against a particular conception), but also can include the introduction of new questions (e.g., a previously unrecognized puzzle about how these successful practices comport with a particular conception of providence).

plan. From our perspective, even though there is no reason based on paleontological practice to see the arrival of the human species as either sheer accident or deterministically predictable, there also is no reason to think that one combination of chance, history, and natural selection means something different from another. Successful scientific practice offers nothing that discriminates between understanding one sequence of historical events as going according to plan and another not.

What happens if we introduce concepts and distinctions from discussions of divine providence, such as the difference between special divine action (SDA) and general divine action (GDA)? The former comprises "those actions of God that pertain to a *particular* time and place in creation as distinct from another," whereas the latter can be characterized as "those actions of God that pertain to the whole of creation universally and simultaneously" (Saunders 2002, 21). Many putative occurrences of SDA are littered throughout the Tanakh, such as the account of Egyptian plagues prior to the Hebrew exodus. Exemplars of GDA might be regularities associated with "laws of nature" such as gravitational attraction. Both SDA and GDA are pertinent to providence, though distinguishing the two cleanly is not easy. Assuming God could intervene or act in the world, then successful paleontological practices associated with reconstructing evolutionary change in the fossil record suggest there is a wide latitude for achieving particular outcomes (e.g., humanoid species) in the history of life through judicious combinations of chance, history, and natural selection. Without a predominant deterministic trend (such as convergence) or indeterministic lack of pattern (due to different forms of contingency), a plethora of options remain. And, even if one trend was empirically established as predominant, it is not clear that it would speak for or against any conception of SDA (Koperski 2015, ch. 4). Thus, this permissive inference is weak (i.e., there appears to be no contradiction) and arguably collapses into no metaphysical inference. GDA seems less relevant because the causal processes operative in geological history are not typically thought of as acting "universally and simultaneously" across all that exists. However, if GDA is cashed in terms of environmental changes, mutations, and natural selection (inter alia) operating through geological history, then we recover the same weak inference of consistency because the lack of an overarching signal in the fossil record makes it difficult to meaningfully detect providence in contrast to some other signature (or lack thereof), such as genuine randomness.

Another way to probe possible metaphysical implications from successful paleontological practice is to look for congruence or incongruence with major options for conceptualizing divine providence. One option—*divine omnicausality*—is associated with traditional conceptions of providence from thinkers such as Augustine, Calvin, and Warfield, as well as many in the Muslim tradition (Helseth in Jowers 2011, ch. 1). On this view, God is the ultimate or primary cause of all events such that nothing occurs by "chance" (i.e., the causal structure of the world is fully ordered and arranged). However, secondary causes are genuine rather than epiphenomenal. These secondary causes are real but absolutely dependent on God's preservational, primary activity. Neither causal dependence (contingent *upon*) nor convergence (natural selection) pose difficulties on this view because both pertain to the realm of secondary causes. Chance (contingency per se) might appear incongruent with this option but recall that contingency is cashed out as unpredictability (i.e., epistemic chance). Therefore, it need not be a challenge for divine foreknowledge (or a Laplacian demon), which can handle the explosion of possible combinations, or if God's relation to time is such that all of world and universal history is "seen" simultaneously from an atemporal vantage point (Ganssle 2001).

Divine knowledge handling an explosion of future possibilities is especially suited to *divine omnidirectionality*, which holds that God has hypothetical knowledge of all counterfactuals about what would happen in any circumstance (Craig in Jowers 2011, ch. 2). On this view, so-called secondary causes need not depend on God's primary causation for their existence, but the causal structure of the world remains fully ordered and arranged because divine knowledge can map out the complete space of possibilities from any chosen set of initial conditions (fully embracing both senses of contingency). The complex evolutionary outcomes of chance, history, and selection do not surprise God. On a third view, sometimes labeled "open theism," the causal structure of the world is not fully ordered and arranged; there is no future causal order to foreknow (Boyd in Jowers 2011, ch. 4). In this case, there is not a "fixed" future of possible events for God to know counterfactually in advance. Thus, the actual causal path taken through history is only learned by God as it plays out. Whether this would lead to something broadly humanoid is less clear and any necessary exercise of omnipotence along the way to secure this type of outcome might need to be much more substantial.

Finally, we can contemplate whether there are any ramifications from successful scientific practice for standard objections that drive differences in conceptions of divine providence. The most prominent of these are the problem of freedom and the problem of evil (Flint 2010). If divine providence involves meticulous foreknowledge, which is embedded in the clause "unfold precisely according to the plan established eternally by our all-knowing … sovereign," then free will appears inconsistent with these commitments (at least according to open theists). If things "unfold precisely," then God knows what I will do beforehand. This removes the possibility of me doing otherwise (since God could not be wrong in what is foreknown). However, in the present case, the question of freedom seems irrelevant, at least if we are attributing free will primarily to humans. That God could somehow "steer" evolutionary history through complex combinations of chance, history, and natural selection based on foreknowledge does not threaten human freedom; one might even argue that it makes it possible. Exercises of omnipotence are not prima facie implausible since the primary reason against their use is the violation of genuine agential choice, which might be a non-issue for Burgess Shale animals (among others). Regarding the problem of evil, especially in its evidentiary form, it is not clear that an evolutionary history governed primarily by natural selection versus one more commensurate with the empirical evidence (i.e., heterogeneous, complex combinations) would pose a greater threat in augmenting or diminishing the amount of purported evil present in the world. However, many argue that increased SDA exacerbates the problem of evil since it raises the specter of why God doesn't more reliably remove or mitigate evil occurrences (Saunders 2002).

One might be concerned that these inferential offerings are meager. However, they help highlight one overlooked possibility. Although providence is typically conceptualized as a combination of SDA and GDA, many sacred texts associated with ideas about divine providence in Judaism, Christianity, and Islam are directed at particular people in specific circumstances (e.g., the story of Abraham discovering a ram in the thicket, thereby making it possible to sacrifice something other than his own son). If our most robust and empirically grounded analyses of the fossil record tell complex stories about the interplay between chance, history, and natural selection, then we might seek to detail that story more locally for the geological sequence relevant primarily to the human species (not the entire history of life). Instead of worrying about *Opabinia* or *Pikaia*, we might concentrate our attention on *Homo*. Unfortunately, as has been noted by many, the fossil record (and general empirical information available) for our lineage is notoriously incomplete (Antón et al. 2014). And since our most successful paleontological practices yield stable empirical generalizations precisely when there are more samples available, it is unlikely that we can (at this time) apply them with profit to the human fossil record (i.e., ascertaining the signature of chance, history, or selection for particular traits).

Yet we should not lose sight of the fact that there could be possible metaphysical implications of successful paleontological practice. If the fossil record for *Homo* was sufficiently representative (i.e., contained enough sample sequences), then the application of successful practices for reconstructing character evolution could have metaphysical implications for traits in the human lineage. The detection of a particular evolutionary mode for a character, such as bipedality showing an unambiguous random walk over millions of years, might suggest new reflections on what it means to be human (i.e., bipedality might be less central or "accidental" to our humanity). Only time will tell if we arrive at an adequate empirical situation in terms of fossil record data to ascertain this possibility. However, an emphasis on successful scientific practices where the empirical situation is better could point us to distinct records of the past where different kinds of traits can be analyzed in sufficient detail, such as lithic tools or other cultural artifacts (Tostevin 2019). Instead of paleontology, successful *archeological* practice might offer a more illuminating route to identify metaphysical implications.

7.5 Conclusion

My analysis has ignored a number of issues related to contingency and convergence in evolutionary biology. What exactly constitutes convergence (Pearce 2012; Powell 2012)? The inability to distinctly specify convergence makes it difficult to claim that it is more or less predominant in the history of life. Similar concerns exist for contingency (Desjardins 2016; Turner 2011), as well as how best to characterize its evolutionary sources and effects, such as mass extinctions and adaptive radiations (McConwell and Currie 2017; McConwell 2019). In particular, there are good theoretical arguments for taking both contingency and convergence as domain relative in order to sufficiently distinguish them and compare their relative importance (Lewis 2018). Although it would require explicit demonstration, this argument is congruent with the conclusions about character evolution drawn from successful paleontological practice, which are domain relative since the relevant modal profiles are in the empirical analysis. I also have ignored substantial empirical questions about the nature and status of directional trends in the fossil record and their connection to contingency or convergence (Huang et al. 2015).

Both Gould and Conway Morris offer metanarratives of ultimate reality through divergent interpretations of the fossil record. These visions are akin to epic sagas that provide a global interpretation of evolution and the history of life on earth, from origins to apocalypse. The heroic deeds and adventures of the saga are either due to contingency or convergence over extended periods of time, with an accent on the achievements of these heroes at special junctures, such as the Burgess Shale and Cambrian Explosion. We noted at the outset that our propensity for narrative, and metanarrative in particular, means we should not be surprised at finding such attempts in the halls of science (Beatty 2017). They fit within the move from scientific success to metaphysical conclusions about what the world is ultimately like.

However, subsequent successes of paleontological analyses of character evolution in the fossil record demonstrate that neither epic saga is warranted. Once the methodological shift of looking at parts instead of wholes is made, researchers find empirical signatures of both selection (in the form of directional change or stasis) and chance (in the form of a random walk), and both of these are present heterogeneously across the measured characters in taxa undergoing evolutionary change. One character can be under directional selection, while another displays a random walk at the same point in a sequence; a character can be under directional selection at one point in a sequence, while the same character is subject to a random walk at a later point in the sequence. Empirical studies inspired by Gould's image of replaying the tape of life have yielded a similar conclusion: "evolution can be both contingent and deterministic, and often in complicated and fascinating ways" (Blount et al. 2018, 8). The original framing of the question is a false dichotomy (Losos 2017). "It seems unlikely that there will be any general answer to questions over the role of contingency versus necessity in evolution, either with the Burgess Shale fossils and the Cambrian radiation specifically, or more generally in the history of life" (Erwin 2016, 297).

The metaphysical implications of successful paleontological practices for conceptions of divine providence are unclear, in part because conceptions of providence are intended as metanarratives of divine action. Since the evolutionary metanarratives of Gould and Conway Morris break down, the connections between successful paleontological analyses of character evolution and understandings of divine providence are, if anything, piecemeal.[6] This piecemeal inferential potential leaves many options open. Apart from this permissiveness, we identified the possibility that empirically grounded analyses of the human fossil record might tell complex but compact stories about the interplay between chance, history, and natural selection in our own lineage. Although the necessary representation in the fossil record is currently lacking, which means our best paleontological practices cannot be deployed, this possible metaphysical implication and the structure of the argument point toward other successful practices, such as from archeology, which might speak more directly to what it means to be human.

Assuming the successes of the sciences are a good place to work out the ultimate structure of reality and keeping in view appropriate concerns derived from the history of science, we might draw a different kind of lesson. The metaphysical implications available from the sciences are not characterized most aptly in terms of metanarratives or epic sagas. Instead, the implications are suited to a different narrative form, such as a short story. A short story has a fully developed theme but is significantly shorter and less elaborate than genres of longer form, whether novels or epic sagas. Short stories might have less appeal for those seeking an overarching integration with systematic theology, but it is worth highlighting that short stories are a common genre in literature from different religious traditions. Thus, there may be a novel basis for exploring metaphysical implications from successful science within the context of these other genres embedded within theological understandings of diverse communities.

Do the exceptionally preserved fossils found in the Burgess Shale tell us something about chance, contingency, evolution, and history? Yes, though not in the form of an epic saga that Gould or Conway Morris argued for; instead, successful paleontological practices point toward rich short stories that are both heterogeneous and more circumscribed. Do the Burgess Shale fossils imply that we are here simply by chance or instead a

[6] This is does not rule out the possibility of metanarratives based on successful scientific practices, nor does it impugn the search for metanarratives per se. However, it is evidence that evolutionary metanarratives based on the fossil record are implausible, including but not limited to those of Conway Morris and Gould.

predictable outcome? No, but both options in this dichotomy are evolutionary narratives of comprehensive scope. There is much we can learn about chance, history, and predictability from the themes of the short stories that emerge out of successful paleontological practices involving the empirical study of evolutionary modes for traits in the fossil record. The Old Ones might be trying to tell us something, but we need to adjust our expectations before we can hear what they are saying.

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PART IV

The Abrahamic Faiths

CHAPTER 8

Judaism and Providence

Tyron Goldschmidt and Samuel Lebens

8.1 The Basics of Judaism

This chapter concerns the treatment of providence in the Jewish tradition, and theological problems about randomness. First, some basics of Judaism:

- The central *principles* of Judaism include the doctrines that: (1) there is only one God, (2) God revealed the Torah to Moses, (3) the Torah is properly interpreted by the Rabbis, (4) God rewards the righteous and (5) punishes the wicked, and (6) will send a messiah and resurrect the dead (for more on Jewish principles, see Lebens 2020).
- The central *practices* of Judaism include: (1) observance of the Sabbath, (2) observance of dietary restrictions, (3) observance of menstrual purity rules, (4) three daily prayer services, (5) studying Biblical and Rabbinic texts, and (6) tithing for charity.

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- The central historical *events* of Judaism include the: (1) election of the Israelite patriarchs, (2) enslavement and redemption of the Israelites from Egypt, (3) revelation of the Torah, (4) kingdoms of Israel and Judah, (5) exiles of Israel and Judah, and (6) persecution of the Jews during the exiles.
- The central historical *figures* include the: (1) patriarchs and matriarchs, (2) prophets, and the (3) classical, (4) medieval, (5) early modern, and (6) modern rabbinic sages.

Or so it is for *Orthodox* Judaism, which is the focus of this chapter. We'll omit 'Orthodox' from here on.

8.2 Providence and Randomness

Some believers take every detail of the universe to be directed by God toward a grand purpose. But science has supposedly discovered randomness in nature. Are religion and science in conflict regarding providence and randomness?

This problem seems to arise only on a specific understanding of randomness. Following Kelly James Clark (2014: 108), we distinguish between:

- practical randomness: what's going to happen cannot be predicted by *us, in light of our limited knowledge* about what's happened so far; and
- principled randomness: what's going to happen cannot be predicted by *anyone, however much they know* about what's happened so far.

Principled randomness means that even God cannot predict what's going to happen next, which seems at odds with God directing everything toward a grand purpose. If God is directing every event, then he's *directing* what happens next. And so decides what happens next. And so predicts what happens next. Thus, principled randomness means that God does *not* direct every event. In contrast, practical randomness presents no such problem. Practical randomness means only that *we* cannot predict what's going to happen next. But even if we cannot, God still might.

The first question is whether science has discovered principled randomness. The two main places where scientists have reputedly identified randomness are in the:

- genetic mutations at work in evolution; and
- indeterminism of quantum mechanics.

Whether randomness in either of these cases is principled is a tricky question. There is no scientific consensus. We leave the science to the scientists, but as we ask: how should religious Jews react if scientific consensus eventually decides on the existence of principled randomness? There are at least two possibilities.

First: so much the worse for providence. The religious Jew might deny that God directs every detail toward some grand purpose, but God might still direct some, many, or most details, to some grand purpose; but given the existence of principled randomness, God couldn't direct *everything*. Second: so much the worse for science. The religious Jew might deny that science is always accurate.

There is precedent in the Jewish tradition for denying that God guides everything and that science always provides an accurate picture. *Dati* ("modern orthodox") Jews tend to accept contemporary cosmology and evolutionary theory, and try to harmonize these with their understanding of Genesis. *Haredi* ("ultra-Orthodox") Jews by contrast *tend* to accept a literal understanding of Genesis, and thus reject contemporary cosmology and evolutionary theory insofar as these posit a much older universe.

After a survey of the traditional Jewish approaches to providence, we present a response to principled randomness that should satisfy both Modern Orthodox and ultra-Orthodox sensibilities.

8.3 The Question of Providence and Five Answers

According to the principles stated above, God interacts with the world—revealing the Torah, electing the patriarchs, and so on. A preeminent commentator on the Torah and Talmud, Rabbi Moses ben Naḥman (*Naḥmanides* or the *Ramban*, thirteenth century) states:

> It's clear and known that belief in God's knowledge of the lower species and their individuals and his providence over their generalities and particulars are great cornerstones from the Torah of Moses. … Thus, the denier of providence … has no place in the world to come. (Naḥmanides 1963: 17)

Denying providence is heresy that can cost a Jew their afterlife. But questions about the details of providence remain. The big question remains: How *much* does God interact with the world?

Medieval Jewish tradition often distinguishes between *particular providence* and *general providence*. Particular providence is God governing (at least some of) the details of an individual's life. *If* you're governed by particular providence, then God directs your life toward some grand purpose. God cares about you and is busy with you. Whether you win the lottery or stub your toe, there's a meaning to it (at least sometimes).

General providence is God governing the life of a species. *If* penguins are governed by general providence only, God preserves the species of penguins, but does not direct any particular penguin's life toward some grand purpose. God does not care deeply about an individual penguin and is not busy with it. Whether a particular penguin survives or is eaten has no meaning. God cares about the species as a whole, and will direct *its* existence toward some purpose or other.

These descriptions are not precise. Unfortunately, most writers do not define exactly what they mean by *particular providence* or *general providence*. And note the *if*s. We're not yet saying that your life is governed by particular providence or that penguins are governed only by general providence. Again, the big question is about how far particular providence extends: Does it extend over everything? The book of Psalms (145:9) says that God's *mercy* extends to all of his creatures. But does his *providence*? Does it extend over people but not penguins? Does it extend over all people all the time?

On these questions, there is disagreement. The prophets and classical rabbis do not teach definitively *how much* of the world is governed by providence. Later rabbis reach different answers on the basis of this underdetermined tradition. We'll provide a series of answers in what follows (Leibowitz 2009 is especially recommended for more details).

8.3.1 Answer 1: Particular Providence Over Everything

This answer is *suggested* by many early rabbis. For example, from the *Talmud*, the sage Abba Arikha (*Rav*, second–third centuries) describes how God spends his day:

> Rav Yehuda says [that] Rav says: There are twelve hours in the day. During the first three, the Holy One Blessed Be He sits and engages in Torah. During the second [quarter] he sits and judges the whole world. When he sees that the world deserves destruction, he rises from the throne of judgment and sits on the throne of mercy. During the third [quarter] he sits and

> nourishes the whole world, from the horns of oxen to the eggs of lice. During the fourth [quarter], he sits and plays with Leviathan, as it says: "This Leviathan you have formed to play with" [Psalm 104:26]. (Avoda Zara 3b)

This doesn't look like abstract care—God preserves even the eggs of lice. Wouldn't his particular providence extend then to everything else?

Rabbah Bar Naḥmani (third–fourth centuries) teaches:

> "Do you know when the wild goats of the rock give birth? Can you mark when the hinds calve?" [Job 39:1] This goat is cruel to her young. When she squats to give birth she ascends to the top of the mountain so that [the kid] will fall from her and die. And I invite an eagle for her that receives [the kid] upon its wings and sets it before her. And if [the eagle] were a moment early or a moment late [the kid] would immediately die. … "Can you mark when the hinds calve?" The womb of this hind is narrow. When it squats to give birth, I invite a snake that bites her at the opening of the womb, and it becomes loose so she can give birth. And if [the snake] was a moment early or a moment late, [the hind] would immediately die. (Bava Batra 16a–b)

God invites eagles and snakes to help the baby goat. He watches and intervenes in real time.

There are many other examples. For just one other, *Genesis Rabbah*, a commentary compiled around the same time as the Talmud, includes a teaching from Rabbi Shimon Ben Yoḥai (second century):

> Rabbi Shimon ben Yoḥai and Rabbi Elazar his son were hidden in a cave for thirteen years at the time of [Roman] persecution. … At the end of thirteen years, they left, sat at the entrance of the cave, and saw a hunter trapping birds. And if Rabbi Shimon heard a heavenly voice proclaim "Pardon! Pardon!," it escaped. And if he heard a heavenly voice proclaim "Execute!," it was trapped and seized. He said "A bird is not caught unless it is decreed from heaven—how much more so with a person." (79:6)

If God governs the lives of individual birds so closely, why wouldn't his particular providence extend to everything else?

However suggestive, such passages are not *definitive*. Perhaps particular providence extends over lice eggs and goats, but not mosquitos and salmon. Perhaps particular providence extends over just some lice eggs, but not all of them. Perhaps these sources could be read as figurative expressions of general providence over nature. Nevertheless, they have often been taken to teach that divine providence extends over everything. None emphasizes this more than the early rabbis of *Hassidism*. For example, Rabbi Menaḥem Mendel of Vitebsk (eighteenth century) teaches that:

> no person jams his finger, and grass dries and is uprooted, and no rock is strewn, except at the time and place fitting for it. … Everything is from God, according to the wisdom of his name and according to his glory, to reveal his divinity, and his wisdom, and his attributes. (1818: 15)

Aharon Roth (twentieth century) reports the following teaching from the founder of Hassidism, Yisrael Ben Eliezer (the *Ba'al Shem Tov*, eighteenth century):

> It happened that the lamp of great light, our master, the Ba'al Shem Tov, may his merit protect us, was with his students in a field. Suddenly, a strong wind blew and some leaves fell to the ground. He said, "My children, know that this wind that now passed suddenly was on account of one worm that was at the top of a certain left. The sun was shining exceedingly on it; it cried to God; and so God sent the wind …" [The Ba'al Shem Tov] said this to them to convey to them the scope of the Creator's providence and his mercy upon all creation. (1998: 127)

The dominant view among orthodox Jews today might be that particular providence extends over everything. But it has not been the universal view.

8.3.2 Answer 2: Particular Providence Over People Only

The most distinguished proponent of this view is Rabbi Moses ben Maimon (*Maimonides* or the *Rambam*, twelfth–thirteenth centuries). After dismissing four alternative views about providence, he states his preferred view (his *real* preference may be hidden elsewhere):

> Divine Providence does not extend to the individual members of species except in the case of mankind. It is only in this species that the incidents in the existence of the individual beings, their good and evil fortunes, are the result of justice, in accordance with the words, "For all His ways are judgment." But I agree with Aristotle as regards all other living beings, and *a fortiori* as regards plants and all the rest of earthly creatures. For I do not believe that it is through the interference of Divine Providence that a certain leaf drops [from a tree], nor do I hold that when a certain spider catches a

> certain fly, that this is the direct result of a special decree and will of God in that moment. … In all these cases the action is, according to my opinion, entirely due to chance, as taught by Aristotle. (1956: 286–7)

Maimonides takes this theory to be motivated by prior Jewish tradition, and draws connections between human intelligence and providence:

> Divine Providence is related and closely connected with the intellect, because Providence can only proceed from an intelligent being, from a being that is itself the most perfect Intellect. Those creatures, therefore, which receive part of that intellectual influence will become subject to the action of Providence in the same proportion as they are acted upon by the Intellect. (1956: 288)

Particular providence depends on intelligence. Insofar as humans are intelligent and other creatures are not, particular providence governs humans and not other creatures.

What of the sources mentioned in the previous section that point in an opposite direction? After quoting some of those and similar passages, Maimonides answers that:

> they imply nothing that is contrary to my view. All these passages refer to providence in relation to species, and not to providence in relation to individual animals. The acts of God are as it were enumerated; how He provides for every species the necessary food and the means of subsistence. (1956: 288)

The passage about, for example, the eagle means that God preserves the species of goat—perhaps by fixing a natural relationship between goats and eagles. But he need not have any special care for *this* goat. However, not all of the passages can so easily be interpreted away: Rabbi Shimon ben Yoḥai claimed a specific divine decree for each bird.

A qualification of Maimonides' view accommodates some particular providence over non-human animals—as *a part* of the providence over humans. Rabbi Moshe Cordovero (the *Ramak*, sixteenth century) explains:

> If a lamb is found among the lambs in a field among the fields owned by one of the pious people, particular providence will engage with him, and that lamb will be saved from the death encompassing all the rest of its kind, like [from] wolves or the like. And it's all for reason of the person, not on account of the lambs themselves. (1883: 114)

God does not care so much for the lamb as for the man. The Talmud and Midrash similarly report cases where God protects and directs animals for the sake of people. For example, *Genesis Rabbah* (18:22) tells how God arranged for a scorpion to travel on the back of a frog across a river—in order to sting a wicked man. God's particular providence over birds can be understood along similar lines. After all, the birds were being trapped by humans, and the decrees over them served a lesson about humans.

This qualification of Maimonides' view is natural. Since people's lives are intertwined with animals, particular providence over people would likely involve animals. Furthermore, the particular providence over the patriarchs mentioned by Maimonides also involves animals—for example, the ram discovered at the binding of Isaac (Genesis 22:13).

A problem: Maimonides draws a connection between human intelligence and particular providence: particular providence extends to more intelligent people than to less intelligent people, and to some people not so much. Why did Maimonides have such an elitist view?

The short answer: it followed from his Neoplatonism. The central idea is that God's creation and governance occur through a process known as "emanation." In this process, intellectual content (something like God's ideas) overflows into a series of "separate intellects" (which Maimonides identifies with angels), and finally become concrete as the overflow reaches all the way down into our world.

God's wisdom, as it flows down to us, is manifest in natural laws governing the universe. This is God's general providence. But because there's a constant stream of intellectual information flowing from God down to us, the more intellectual we are, the more likely our minds will be receptive to the flow. The prophets, for Maimonides, had so perfected their character and intellect that they could tune in to that stream of information and, so to speak, hear the word of God.

How does this make sense of the connection between particular providence and the intellect? According to Maimonides, God never alters natural laws (even miracles Are written into natural laws at creation; see Maimonides 1948: ch 8). So, if God wants to save you from a shipwreck, he won't do so by changing the weather. Instead, if your intellect is sufficiently refined, you'll receive a sudden apprehension against boarding. This isn't prophecy; you're receiving an inclination rather than a message. Still, it's a form of communication. You'll only receive heavenly communication to the extent that your intellect is properly prepared. Prophets receive more vivid communication, but others can receive apprehensions and inclinations—that's how particular providence works.

8.3.3 Answer 3: Particular Providence Over Righteous People Only

Rabbi Ovadya Seforno (fifteenth–sixteenth centuries) on Leviticus 13:47 writes that providence extends only to a few righteous Jews:

> When he awakens to contemplate the existence of his creator, and His greatness and His goodness … he will walk in His ways, making His will as his will. Behold—he doubtless resembles his creator more than the rest of creation, and he is the intended purpose of the Creator who bestows being, as they say, "the righteous is the foundation of the world" (Proverbs 10:25). … But those who slumber who do not know at all and are not all awakened to the knowledge of any of this—they are all the gentiles and the majority of the Israelite nation, except for precious individuals—they are doubtless under the governance of nature. … Those people are like animals, upon whom divine providence does not fall individually but only on the species, for through them [the species] is the purpose of the creator fulfilled. (Seforno *ad loc*)

By fulfilling God's will, righteous Jews realize God's special purpose for humanity. God cares for them and looks over them closely. Those who do not realize God's purpose for humanity are left to the same natural forces governing the rest of creation. The Jewish tradition even gives some righteous individuals power over what God does (see, e.g., Berakhot 32a; Taanit 23a).

Seforno's division seems objectionable: it discriminates between righteous Jews and righteous non-Jews. Aren't righteous non-Jews just as deserving of particular providence? Perhaps we shouldn't be disturbed. Just as the election of the Jewish people was for "all of the families of the earth" (Genesis 12:3), perhaps the good that their election will bring to humanity requires a special form of providence (Deuteronomy 9:5). Thinking in these terms can mitigate the sting of Divine discrimination.

Leibowitz (2009) proposes that Seforno is *not* discriminatory. Just as the vast majority of Jews are not excluded *in principle* from divine providence, so too non-Jews are not excluded *in principle*. It's just that Seforno held that the vast majority of Jews and all non-Jews *happen* not to be righteous!

Other sources have non-Jews—especially Christians and Muslims—helping to realize God's purpose for humanity. For example, Naḥmanides writes that those who follow the Torah realize God's purpose for humanity. While the Torah was revealed to the Jewish people, it has reached Christians and Muslims too:

> Don't make a mistake about the [non-Jewish] nations, for even they are inheritors of the Torah—those who are close to the center of civilization, such as the Christians and the Muslims, since they copied the Torah and learnt it. And when Rome expanded to some of the outskirts, they learned Torah from it, and made statutes and laws like the Torah out to the distant lands, then made laws and statutes comparable to Torah. (1963: 143)

Similarly, Rabbi Menaḥem ha-Meiri (thirteenth–fourteenth centuries) also has an inclusive view about Jews, Christians, Muslims, and others who follow a decent moral code (see Leibowitz 2009).

Other sources hold that righteous Jews pay a price in that they are subject to more punishment for their fewer sins (at least in this world; see Ibn Ezra and *Radak* on Amos 3:2; *Ohr HaHayyim* on Deuteronomy 8:5). Perhaps this could be extended to righteous non-Jews. Perhaps the idea is this: a person is only going to fall under God's direct purview if their way of life resonates with God's purposes. But coming under God's purview has its costs as well: God might subvert nature to protect the righteous, but also punish them more harshly when they fail.

8.3.4 Answer 4: Particular Providence in the Land of Israel Only

According to the Torah, God is especially at work in the Land of Israel, "a land that the Lord your God searches over; the Lord's eyes are constantly over it, from the beginning of the year till the end of the year" (Deuteronomy 11:12). For example, Rabbi Nissim ben Reuven (the *Ran,* fourteenth century) writes:

> The sin [of idolatry] is more appropriate to fear in the wilderness [of Sinai] than in the land of Israel, since [the nation of] Israel knew that the other lands are apportioned to the governance of the stars and constellations … except for the miraculous [interversions]. (1530: 23a)

If Israel is more directly under God's providence than other places are, shouldn't we be even *more* careful there regarding idolatry? But the idea is this: in other lands, you might come to worship the constellations that really do have some sort of power over you; because God delegates the running of the world to various forces of nature (see Shabbat 156a). In Israel, by contrast, there's only God. The *Ran* takes this to explain the recommendation of the sages in the Talmud:

> One should always live in Israel, even in a city where most of the inhabitants worship idols, rather than outside of Israel, even if most of the inhabitants are Jews. That is because whoever lives in Israel is considered that he has a God, but whoever lives outside of Israel is considered as one who doesn't have a God. … In fact one who lives outside of Israel is considered as one who worships idols. (Ketuvot 110b)

This view is problematic because providence seems to extend beyond the land of Israel. Isn't God described as deeply involved in the lives of patriarchs and sages even outside of the land? In reply, Baḥya ben Asher (*Rabbeinu Baḥaye,* thirteenth–fourteenth centuries) teaches that providence outside of the land somehow flows from the providence over the land. He comments on the verse in Deuteronomy cited above:

> According to the plain meaning, the basis of his providence is in this land, since he certainly searches out every land, but the point is that the basis of his searching and providence is here, and from here it extends to the other lands—like a person's heart is placed in the middle of the body, since it's the basis of vitality, and from there the vitality extends to the rest of the limbs. Scripture teaches that the Land of Israel isn't placed under the governance of the stars and constellations like the other lands. … Rather, the Holy One Blessed Be He in his essence and in his glory searches over it constantly, and does not appoint over it from among the other powers, any rules or governor. (*Baḥaye ad loc*)

How this flow of providence works is not clear. Rabbi Judah Halevy (eleventh–twelfth centuries) argues that prophecy only happens *in or concerning the land of Israel* (HaLevi 1964: 90–1). Even though Moses never set foot in Israel, for example, his entire prophetic career was aimed at bringing the people back to their land (see also Mekhilta on Exodus 12:1; Moed Katan 25a). Perhaps God's particular providence only spills over the borders of the land of Israel when the needs of the land and its residents require intervention elsewhere.

8.3.5 Answer 5: Philosophical Transcendence

A fifth answer denies particular providence altogether. This radical view is rejected by virtually all orthodox Jews. But Rabbi Levi ben Gershom (*Gersonides* or the *Ralbag*; fourteenth century) comes close to the view. Gersonides requires a grasp of Aristotle's *Posterior Analytics.* A summary:

> Aristotle sets out a surprisingly ambitious set of requirements for knowledge (*epistêmê*). For our affirmation of a proposition to count as knowledge, that proposition must be grasped through a demonstration (Post An I.2). There can be demonstrations only of propositions that are necessary, and only universal propositions can be necessary (Post An I.4). (Aristotle adds even more conditions that do not concern us directly, for example that I can only know B on the basis of A if A is 'better known' to me than B.) This has the upshot that there can be no demonstrative knowledge, which strictly speaking means no knowledge at all, of particulars. (Adamson 2005: 274)

What *we* call knowledge of particular things (like our knowledge that London is in England) doesn't really count as knowledge because it can't be *demonstrated* as *necessary*. Only general principles can. If God's knowledge is perfect, then he wouldn't bother with our sub-par knowledge-lite. He's aware only of the real deal—general facts.

God, then, would not have knowledge of "particulars as particulars." He'd know the laws of nature but he wouldn't be bothered to take note of any of their particular instances in the concrete universe; he'd know what it means to be a human being but he wouldn't know any individual humans. Furthermore, as Seymour Feldman explains:

> Gersonides argues that the Divine nature is such that He is precluded from having knowledge of particulars. To have such knowledge one must have the appropriate cognitive equipment, such as sensory organs. But to have sensory organs is to have a body, and God does not have a body! Nor should one think that by denying knowledge of particulars to God we are imputing to Him an imperfection or deficiency. God is simply not the kind of entity that could have such knowledge, just as a wall is not the kind of entity that could talk. In neither case do we have a real deprivation, since to deprive an entity of something is to imply that this entity *could*, under the appropriate conditions, have that feature. (1987: 81)

But if God had no particular knowledge of Abraham, how did God speak to him? If God had no particular knowledge of the Israelites, how did he free them from Egyptian slavery?

Gersonides first explains how prophecy is possible despite God's ignorance of particulars: God broadcasts only general messages, but particular people in particular circumstances will hear those messages in different ways. God is always broadcasting a message that will be heard by people like Abraham in like circumstances: "Go forth from your native land and from your father's house to the land that I will show you" (Genesis 12:1). But only a few will grasp the message.

Gersonides then extends his account from prophecy to particular providence:

> [T]he kind of providence that guides the righteous by means of the communication given them concerning the benefits or evils that are to befall them can occur even though the giver of this communication does not know the particular individual receiving this communication, and despite the fact that the giver of this communication does not know the particular events, concerning which this communication is given, as particulars. … The type of providence that results in a fear that saves the recipients from evils and produces in them instincts that direct them toward the acquisition of benefits and that enables them to avoid harm. (1987: 180–1)

For example, perhaps God inscribed into the laws of nature that before any sort of disaster occurs a message be broadcast to warn people to keep away. We're not all tuned in enough. But we can say that God has saved those who are from a disaster, even though God had no particular knowledge of the events in question.

The view is similar to Maimonides', except that Gersonides does not take God to know who receives his messages and when. That's about as distant as God can get within a recognizably Jewish framework.

Some argue that Maimonides is more radical than Gersonides—Maimonides' *true* position is not the one above, and he hides it because it is so radical. According to this secret theory, God never involves himself with particular individuals. While miracles may be written into natural laws for the benefit of whole nations, God is uninvolved in the day to day life of individuals, however intelligent or righteous they are. Here (supposedly) is the hint:

> Divine Providence is constantly watching over those who have obtained that blessing which is prepared for those who endeavour to obtain it. If man frees his thoughts from worldly matters, obtains a knowledge of God in the right way, and rejoices in that knowledge, it is impossible that any kind of evil should befall him while he is with God, and God with him. (1956: 389)

Because "those who possess the knowledge of God, and have their thoughts entirely directed to that knowledge, are, as it were, always in bright sunshine," God provides for all the needs of the perfect but only because they have no needs. They don't want health. They don't want wealth. If they're basking in the vision of God, they have no worldly desires at all. So God has provided for all of their worldly needs, *since they have none*. When a person loses that state, they're no longer provided for. They might start to feel hungry, but food will not miraculously materialize. The light of "providence" will not shine on them, at that moment, as "the cloud … intervenes between them and God" (1956: 389).

We doubt that Maimonides has a secret, more radical theory of providence than the one advertised earlier on. If we're wrong, Maimonides is more radical than Gersonides (see Raffel 1987).

8.4 An Idealist Interlude

With this map of Jewish answers in place, we defend a particular view about God's relationship with the world. This view is neutral on four of the theories outlined above, though it might appear to conflict with Gersonides. Like the first answer to the question of providence, God ends up having his fingers on everything. But, like the later answers, God has *more* of his fingers on certain creatures than others.

We begin with a *philosophical* argument that is not part of Jewish tradition. But nothing in it is at odds with Jewish tradition, and the argument will help make sense of some Jewish sources.

The argument is based on what was first seen clearly by the Christian philosopher George Berkeley (1685–1753). There's nothing especially Christian about his view, and most Christians disagree with him. You will likely disagree with his view too. But you might see why *we* accept it and, then, what follows from it for the question of providence.

Berkeley's view is that everything is a mind or an experience (or sensation or 'idea') in a mind (see Berkeley 1982: sections 1–24). This view is known as *idealism*.

How could anyone deny that there are tables and chairs? Berkeley does not deny that there are tables and chairs. What he denies is that they exist outside of any mind (see Berkeley 1982: sections 34–40). He takes his view to be simple, common sense:

> I do not pretend to be a setter-up of *new notions*. My endeavours tend only to unite, and place in a clearer light, that truth which was before shared between the vulgar and the philosophers: the former being of opinion, that

> *those things they immediately perceive are real things*; and the latter, that *the things immediately perceived, are ideas which exist only in the mind*. Which two notions put together, do in effect constitute the substance of what I advance. (1979: 94)

To understand Berkeley, focus on an apple. You perceive something red, sweet, and hard. Berkeley takes the redness, sweetness and hardness you experience to be nothing other than sensations in your mind. Why think *that*? To see that redness, sweetness, and hardness do not exist beyond the mind, consider that scientists can generate vivid experiences by stimulating parts of your brain—neurosurgeons sometimes do generate sensations by touching certain parts of the brain.

Imagine scientists tinkering with your brain so that you experience redness, sweetness, and hardness. There's nothing in the external world corresponding to these experiences. They're just sensations in your mind. But, since the experiences you would have are intrinsically identical to the experiences you actually do have when you see an apple, experiences of the apple are also nothing other than sensations in your mind.

Or consider more realistic cases: hallucinations. Hallucinations of an apple are intrinsically identical to real experiences of an apple. What is experienced in each case is just something in the mind.

One reply insists on a difference: the sensations might be *intrinsically* identical, but they have different *external* causes. The stimulated or hallucinatory experiences are not caused by and do not correspond to a *real* apple outside the mind. When you *see* the apple, by contrast, your experiences are caused by and correspond to a *real* apple outside the mind.

This strategy bifurcates the world. What we originally *took* to be the real apple—red, sweet, and hard—is now a combination of sensations in our mind. What actually *turns out* to be the real apple would be something totally different. Since redness, sweetness, and hardness are in our minds, and the apple is outside our mind, it could not really be red, sweet, or hard. What would the real apple be like then? We have no clue, except that it is something that causes and corresponds to what is in our minds—and, since we know nothing about one side of the equation, we have no clue about what that correspondence is like either (see Berkeley 1982: sections 18–22).

The strategy of bifurcating the world into appearance and reality mires us in deep ignorance about the real world. Berkeley has a more optimistic proposal: the real world is nothing over and above the appearances. The apple is a real thing, and it is *constructed* out of the sensations of redness, roundness, and hardness. The real world is just the whole collection of experiences. There are only minds and the sensations or experiences in those minds.

Three immediate problems:

- How does idealism distinguish between the real world and hallucinations? After all, they are equally constituted by sensations.
- What causes our experiences if not material objects? After all, they don't pop into our minds uncaused. This question is pressing if more than one mind can experience the same "object."
- Where do objects go when no one is experiencing them? The apple doesn't disappear when we stop looking at it.

Berkeley's answer to the first question: sensations constituting the real world and those constituting hallucinations differ—not in being sensations, but in their *stability* and *organization*. For example, the real world is *intersubjective*. You and I will have very similar sensations of an apple, whereas I will not experience the pink elephant you're hallucinating (see Berkeley 1982: sections 34–41).

Berkeley's answer to the second question is that *God* causes our (non-hallucinatory) experiences. Since there are no material objects, our experience would have to be caused by another mind. And since our intersubjective experiences are so detailed and complex, that mind would have to be extremely impressive (see Berkeley 1982: sections 25–33).

So the answer to the third question: when we are not experiencing the real world, *God* could keep it in being. When we turn away from the apple, God could keep the sensations of the apple in his own mind, and so the apple does not disappear (see Berkeley 1982: sections 45–8).

The opposite view is that there are two fundamentally different kinds of stuff: mind and matter. But the nature of matter and how it interacts with mind is obscure from us, and must always be since it lies forever beyond the reach of the mind. The bifurcated picture is uneconomical and mysterious. The view that all reality is fundamentally mental is economical and transparent.

If you aren't convinced, here's the clincher. Whereas Berkeley tried to prove the existence of God from the truth of idealism, we can go the other way round: we derive idealism from religious belief.

Religious readers take God to be perfectly rational. This means that he would not do anything useless. If Berkeley's picture is *possible*, then God *could* create experiences exactly like ours without creating any material object. But if God *could* have created a world that looks just like ours without creating any material objects, then material objects would be useless. So, if idealism is possible, then material objects are useless. So, if idealism is possible, God would not create material objects. You must admit that idealism is a *possible* way for God to have created a world. Since idealism is possible, God would not have created material objects, and thus idealism is true (see Goldschmidt and Lebens 2020).

We cannot fully convey the beauty and plausibility of Berkeleyan Idealism (also see Adams 2007). But we must say *something* since idealism is crucial for understanding God's role in the world: God causes all experiences of natural objects and events, and since there is nothing more to these objects and events than those experiences, God is thereby keeping them in existence. The dependence of all natural objects and events on God is radical and intimate. God has his fingers on everything, and nothing exists without immediate dependence on God.

As God is the immediate cause of everything in nature, natural things do not immediately cause other natural things. After all, it would be unnecessary and silly for God to immediately cause all natural things *and* to give those things their very own causal powers. How could one experience cause another experience anyhow? When cotton is placed in a fire, then, the fire is not the real cause of the cotton burning. When one billiard ball smashes into another, then, the billiards do not cause any of the noises and motions. God causes the cotton to burn, and the billiard balls to move by causing the relevant sequence of sensations and all the patterns of order in nature that science discovers (compare al-Ghazali [eleventh century] 2000: Discussion 17).

8.5 Radical Reductions

Our Jewish form of idealism comes equipped with a response to randomness. Idealism is the view that everything is a mind or an idea in a mind. Let's distinguish a few versions. First:

- Berkeleyan idealism: Everything is a mind or an idea in a mind. Some material objects are ideas. But no minds are ideas and no ideas are minds.

On this view, there is: (1) the infinite divine mind, (2) finite creaturely minds and (3) ideas in these minds. Ideas in the mind of God come together to make up material objects (e.g., our apple). But God's ideas never come together to make up a mind. Minds are independent ingredients of reality. Contrast:

- Tame Hassidic Idealism: Everything is a mind or an idea in a mind. Some material objects are ideas, some minds (indeed, all finite minds) are ideas, and some ideas are minds.

There is, once again: (1) the infinite divine mind, (2) finite creaturely minds, and (3) ideas in these minds. Ideas in the mind of God come together to make up material objects (our apple). Now add that some of God's ideas come together to make up minds too. In fact, all finite minds are just ideas in the mind of God. Just as the apple is a bundle of God's ideas, so too our minds are bundles of God's ideas. Finally, a more radical view:

- Radical Hassidic Idealism: Everything is a mind or an idea in a mind. But no material object and no mind is an idea.

There is: (1) the infinite divine mind, and (2) ideas in this mind. There is nothing else. Everything other than the divine mind is an idea in the divine mind. But no material objects and no minds could be ideas. Just as the idea of a vacation is not itself a vacation, God's ideas of minds are not themselves minds. And so nothing other than the divine mind and its ideas exist. No material objects and no finite minds exist. What then of our apple? What of ourselves?

Radical Hassidic Idealism seems absurd. Are you not *here*? What could be more obvious? But distinguish between an author writing a story, and what happens in that story. There are two levels of reality. The one is Conan Doyle's level of reality. The other is Sherlock Holmes' level of reality. On one level—the level of what happens in the story—Sherlock Holmes exists, lives at 221B Baker Street, and so on. On another level—of what happens outside the story—Sherlock Holmes does not exist, does not live on 221B Baker street, and so on.

Now imagine that the author is a divine author, and the story is a history of the world. These are two levels of reality. Radical Hassidic Idealism concedes that on one level—the level of the story—our minds *do* exist, but that on another level—the level where God is author—our minds do *not* exist. Or distinguish between God imagining a world and what God imagines. Radical Hassidic Idealism tells us that on one level of reality—the level of what God imagines—finite minds and material objects, people and apples, exist, but on a more fundamental level—the level where God is merely imagining a world—they do not exist. At this fundamental level, only God and his *ideas* of minds and his *ideas* of material objects exist.

We're not sure whether Hassidic Idealism is best framed in terms of a divine fiction or a divine dream, or whether there is any difference between divine fiction and divine dream. But the result is much the same: in one way—at the fundamental level of reality—we do not exist. But in another way—in the divine story, the divine dream—we do exist. We are God's imaginary friends (see Lebens 2015).

We call the last two views *hassidic idealism* because they capture the theology of the early Hassidic masters. For example, the founder of Hassidism teaches that when reciting the *Shema* prayer, which declares the unity of God, the worshiper must understand that:

> there is nothing else in the entire world, other than the Holy One, Blessed be He; that all the world is filled with his glory [alluding to Isaiah 6:3]. And the fundamental principle of this intention, is that the person should consider himself as empty and void, and he has no fundamentality other than the soul that is within him, which is a portion of God above [alluding to Job 31:2]. Consequently, there is nothing in the world other than the one, Holy One, blessed be He. (Ben Eliezer 1938: Parashat Va'Etchanan 13)

Insofar as we exist at all, we exist derivatively. Insofar as we exist at all, we have no independence. We are swallowed up by the divine. We are about as close to nothing as possible (for more on the association between Hassidism and what we call Radical Hassidic Idealism, see Goldschmidt and Lebens 2020; Lebens 2020). Now we return to the question of providence.

8.6 Idealism and Providence

In some theological pictures nature functions somewhat independently of God. God winds up the machine, and then lets it go. God creates initial conditions and natural laws, and then lets the universe unfold (except for the occasional miracle). But on Berkeleyan Idealism, the universe cannot unfold without God's constant intervention. The universe is just a patchwork of experiences knitted together by the will of God. The experiences don't cause themselves. And we don't cause them. The experiences are caused by and exist in the mind of God. This puts a gloss on *Genesis Rabbah*:

> 'He encountered the place' (Genesis 28:11)—Rav Huna in the name of Rabbi Amei said: Why do… we call Him 'Place'? Since he is the place of the world, and the world is not his place—from what is written, 'Behold! There is a place at me' (Exodus 33:21). (68:9)

On Radical Hassidic Idealism, the universe isn't even a patchwork of experiences knitted together by the will of God. The universe is a divine fiction or a figment of divine imagination. But it is not a human fiction or figment. Nothing slips mistakenly through the pen of an omniscient author. Nothing wanders unexpectedly through the imagination of an omnipotent mind.

God is the immediate cause, the immediate author, or the immediate dreamer of all natural things. But that does not mean that he is the immediate cause (or author or dreamer) of all things in the same way. For example, he might bring about some things in more miraculous ways than others. When he causes an event that follows the usual pattern of events—for example, making cotton burn in fire—that's no miracle. When he causes an event that does not follow the usual pattern—for example, making cotton freeze in fire—that's a miracle.

Idealism, we can safely say, rules out perfect divine transcendence. God has his fingers on everything. Nevertheless, idealism—Berkeleyan or Hassidic—does not tell us how much particular providence there is. How do the fingers of God move things? How does God imagine things?

Berkeleyan Idealism does not tell us which of the five answers of Sect. 8.3 is correct, although it rules out Gersonides'. Hassidic idealism by contrast, divides the question of providence into two, and answers half of it. That is to say, Hassidic idealism transforms the question of the extent of providence into two questions:

1. How far does God's particular providence extend in the world as it is fundamentally?
2. In the story of our world (i.e., at the level of reality in which we're real people), how far does God's particular providence extend?

Now, the answer to question 1: God's particular providence extends over everything that exists, even though the only things that exist, besides him, are his ideas. As an omnipotent being, he has complete control over his ideas. But question 2 is more interesting, and is left unanswered by Hassidic idealism.

Question 2 asks how often God, a character in his own story, appears on the scene, in the story itself. Hassidic idealism is compatible with any of the five answers of Sect. 8.3, even Gersonides'. Within the story God tells, Hassidism might still be partial to answer 1; it might think that God is always, even as a character in his own story, in the story itself, intimately involved in every event that transpires. However, the basic ideas are consistent with a wide array of theories of providence, so long as we restrict our attention to question 2. And though the Hassidim tend to see God's hand everywhere, Hassidic idealism makes room for any of the medieval views, so long as they are restricted to what's going on *within* the story of the world. We can now deliver on our original promise: a benefit of Hassidic idealism is that it sees no conflict between an event being both completely random and completely determined by the will of God.

E. E. Cummings wrote a poem, "Nobody loses all the time." It tells us of an uncle, Sol, who suffered a series of business disasters. His vegetable farm failed because chickens ate the vegetables. So, he started a chicken farm, which failed when skunks at the chickens. He started a skunk farm, which failed because the skunks died of cold. Sol "imitated" the skunks "in a subtle manner" by "drowning himself in the watertank." Eventually, Sol was buried, and so "started a worm farm."

Let's *assume* that Sol is a fictional uncle, that Cummings is not telling a true story. Here's a question: was Sol a victim of dumb luck? In the poem, it seems as if Sol's life was a series of mishaps, a statistical anomaly, a counter-example to the general rule of thumb that in a world of pure chance, "Nobody loses all the time." Let's assume that in the story of the poem, Sol's life was governed by random forces. That doesn't undermine the fact that every experience that Sol ever had was, from a different perspective, determined by the will of Cummings, his creator.

For the Hassidic idealist, whether principled randomness is a real feature of the world we live in doesn't matter. It wouldn't undermine the religious significance of any event. We can now adopt two perspectives at once. Just as random events in a story are truly random within the story but also wholly determined by their author, random events in our world can be both random within the divine story in which we live, and determined by God from a more fundamental perspective. Just as random events in Sol's life could (and perhaps should) be read as carrying meaning and significance (it's a poem after all), we're invited to see each moment of our life from the perspective of the author, as pregnant with religious significance, even if the moment was also a product of principled randomness.

8.7 Conclusion

We have canvassed various Jewish views of providence: (1) God extends particular providence to all creatures; (2) God extends particular providence to those intelligent enough to receive it; (3) God extends particular providence to those who deserve it; (4) God extends particular providence in the land of Israel; (5) God extends general providence which we can particularize; and (6) there is no particular providence (according to the secret-theory-theory).

All of these theories can be adopted by Hassidic idealism, but only in relation to our second question of providence: In the story of our world (i.e., at the level of reality in which we're real people), how far does God's particular providence extend? But what of our first question: How far does God's particular providence extend in the world as it is fundamentally? The Hassidic idealist can answer that however random events might be within the story of the universe, they are nevertheless entirely determined by the divine will. Hassidic idealism renders randomness theologically harmless.

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CHAPTER 9

Randomness and Providence in Christian Thought

Karen R. Zwier

9.1 Goals and Orientation

In this chapter, I will show that the problem of randomness and providence is not a new one that has only become apparent in the modern era, with Christian thinkers scrambling to contort theology to accommodate. Rather, there is a long history of sophisticated thought in response to this problem, and it can be called upon to address the problem in its modern scientific variant.

The chapter will be organized as follows. In Sect. 9.2, I will give a basic overview of Christian belief. The overview is sweeping and is intended mostly for those who are unfamiliar. Section 9.3 covers the concept of divine providence in Christian thought, concentrating on relevant pieces of Christian scripture and passages from some of the Christian Fathers. In Sect. 9.4, I cover, in historical fashion, how Christians at various points in

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history have grappled with the question of randomness in relation to God's providence. Finally, in Sect. 9.5, I propose my own way of thinking about randomness and providence.

9.2 Introduction to Christianity

In order to address the relationship between providence and randomness within Christianity, I first need to give an introduction to Christianity. I can only make an attempt at an introduction, and it will necessarily be brief. There are many things I won't be able to mention or explain, but I'll do my best to lay out the "fundamentals" of Christianity in a way that will hopefully illuminate some of the core ideas that will matter for Christian views on providence and randomness.

This introduction (and the entire chapter, for that matter) will be colored by my own perspective as a Christian of a particular denomination. I am a Catholic Christian. I'll do my best to represent the breadth and diversity of Christianity, but my Catholic perspective will at times influence the way I present things here. One way in which this influence will come out is in my emphasis on history. I will be employing a broadly historical approach here, and that is because I tend to see theology and history as strongly tied to one another. The historical continuity of Christian beliefs and institutions is of great importance (and comfort) to me. I ground my beliefs in a tradition and a community. To separate tradition and community from Christian theology removes, for me, one of the main reasons to take it seriously.

9.2.1 The Person of Jesus

The Christian faith centers on Jesus of Nazareth, who lived in the first few decades of the Common Era. The Common Era is, of course, dated roughly to the time of his birth, which is why we have the abbreviations "B.C." (Before Christ) and "A.D." (*Anno Domini*, Year of our Lord) (though his actual birth may have been a few years B.C.).

Jesus was born into a devout Jewish family in Nazareth in the region of Galilee in Northern Israel, which had its own distinctive political and religious context. The separation of the tribes of Israel had left Galilee geographically removed from Judea and, most importantly, Jerusalem. As a devout Jew, Jesus had something of an insider status, but as a Galilean, he would have also been regarded as an outsider by Judeans.

Jesus lived a quiet life until, at around 30 years of age, he began traveling around both Galilee and Judea, preaching publicly and healing the sick. The Jewish faith served as the background of his preaching: one God who is Creator, God's special covenant with the Jews as his chosen people, and the Torah as a set of sacred moral precepts. But there were also distinctively new elements to his preaching which went beyond literalist readings of the Torah and called for a higher standard of morality. For example, he condemned divorce, discouraged "eye for an eye" justice, and broke Sabbath rules in order to heal.

One of Jesus' central messages was the coming of God's kingdom. The meaning of this message appears to have been just as mysterious and ambiguous to Jesus' contemporaries as it sounds to us today. Those who interpreted him as a political revolutionary who would free the Jews from Roman rule would later be quite disappointed. It appears to have meant, for Jesus and his followers, that God was present and active in the world right then and there, and that God was calling his followers into a new kind of relationship with him.

Jesus' teachings earned him the consternation of some of the Jewish elite, who eventually brought him to the Roman authorities who had him executed by crucifixion. He was crucified on a Friday, right before the Passover feast began. On Sunday morning (after Passover had ended), when some of his followers went to his tomb to anoint his body, they found the tomb empty. Jesus later appeared to his disciples on a few occasions, in bodily form. The death and resurrection of Jesus became the focal point of celebration for the earliest Christians.

9.2.2 Early Christianity

The story of the first few decades and centuries of Christianity is a story of gradual self-definition. The earliest Christians—those who had known Jesus and walked with him—were deeply impacted by their experiences. These close followers carried with them a conviction that Jesus was inexpressibly different from ordinary human beings. They believed that he was the Christ, the messiah that God had promised to the Jews. But controversies arose, and these controversies led to efforts to further define Christian belief. What we inherit in our modern concept of Christianity is a result of early councils in which the members of the church sought to define who they were and what they believed.

Jesus' followers began as a community in Jerusalem and began to spread to other cities across the Roman Empire. In the beginning nearly all were Jews, seeing themselves as a sect within Judaism. But increasing numbers of non-Jews (called *Gentiles*) began to convert to the way of Jesus, which led to their first big controversy: to what extent was the way of Jesus linked to the ways of the Jewish faith? Specifically, did the Gentile converts have to steep themselves in the Jewish traditions and observe Jewish practices (e.g., circumcision, dietary regulations)?

After a council in Jerusalem, it was decided officially that Gentile Christians were not lesser than Jewish Christians. In fact, not only were the Gentile followers relieved of obeying Jewish law, but *no* Christian—even a Jewish Christian—was required to obey Jewish law in its entirety. The council directed followers to merely abide by certain minimal rules (i.e., avoiding unchastity, avoiding idolatry, and abstaining from blood). Jesus' death and resurrection carried redemptive power and the forgiveness of sins, and as followers of Jesus, obedience to the Jewish law was not considered redemptive. Jesus the Messiah come into the world meant a transformation in the way that God's people were called to live. Jesus' death was the one and final sacrifice, and his resurrection signaled the birth of a new era of life with God. Jesus offered a new "law"—a law of the spirit. Jews and Gentiles alike were elevated to status as children of God.

The Jerusalem council was the first major self-defining decision, and there were more to come. Amid these early controversies, it's important to note that there was no accepted set of authoritative texts (later called the canon) of Christian scripture other than the Jewish scriptures. (The first written gospel, for instance, is thought to be Mark, which was written shortly before the fall of Jerusalem in 70 A.D.) The churches throughout the Roman Empire communicated primarily through letters and traveling missionaries and representatives. These letters, which began to take on a special importance, were read at church gatherings. A special importance was assigned to the writings of those who had the status of Apostle (those who has been personally commissioned by Jesus). The canon of Christian scriptures (consisting mostly of these letters) came into place only gradually. The set of scriptures that we now call the "New Testament" was mostly settled by the early decades of the second century, with the definitive finalization around 380/390 A.D.

Structures of Christian authority also evolved gradually from the early days in Jerusalem. Apostolic succession (an unbroken chain of authority passed down from the apostles and transmitted by the laying on of hands) marked those who had the special status of bishop. Bishops were effectively "custodians" of the truth of the Christian faith, a duty passed on to them by the apostles.

I've now covered two of the three main doctrinal loci of the early Christian faith: the set of writings that would later form the canon of the New Testament and the teaching of the bishops. The third source of early doctrine was presented in various creeds. These creeds summarized the teaching of the apostles and were taught to followers of Jesus. Although these creeds varied slightly by region, they were in substance quite similar to the modern-day Apostles' Creed.

The central elements of early Christian doctrine still define core Christian belief today. I'll briefly describe three core doctrines that will shape some of my discussion below. These are: the incarnation, the Trinity, and salvation by Christ.

The Incarnation

Belief in the incarnation (enfleshment) is the belief that God became human in Jesus Christ. Although there was great controversy over the nature of Jesus, the accepted view is that Jesus is both fully human and fully divine—two natures (human and divine) united in one person. He existed as a divine person (the second person of the Trinity—see below) from all eternity, but at the moment of the incarnation, he took on a human nature as well. "And the Word became flesh and lived among us, and we have seen his glory, the glory as of a father's only son, full of grace and truth" (John 1:14). The incarnation, the revealing of God to humanity, is particularly significant against the backdrop of Jewish history. God had attempted to reveal himself to his people by a series of covenants, by law, and by prophets. But none of these could be as definitive (and effective) as God's own coming into the world. Is the incarnation mysterious? Absolutely. But "God so loved the world" (John 3:16) that he did the impossible—he bridged the gap between human and divine by becoming human himself, in order to reveal himself to humanity.

The Trinity

As if the incarnation were not mysterious enough, Christians also believe that God is a Trinity. God is one God in three persons: Father, Son, and Holy Spirit. Christianity sees itself as an emphatically monotheistic continuation of Judaism, but also carries with it the belief that Jesus, as God incarnate, revealed previously hidden aspects of the inner life of God. Christians understand each of these—Father, Son, and Spirit—as a distinct person of the Trinity, perfectly united in an eternal exchange of love.

Salvation by Christ
Humans (and the world as a whole) are fallen. The story of Adam and Eve's temptation and fall in the Garden of Eden (Genesis 3) is interpreted in a variety of ways by Christians, but the fundamental truth it communicates is that humans have an inherent tendency toward sin. Christians share the belief that Christ's death and resurrection effect our salvation from sin. His death on the cross is interpreted in the New Testament as the fulfillment of the tradition of sacrifices under Jewish law. As God-Man, he is uniquely capable of serving as the final and eternal high priest offering himself up in sacrifice to God (see Hebrews 7:11–28). His resurrection affirms his victory over sin and evil and the beginning of God's new creation (see Isaiah 65:17).

The details of how Christian salvation works are matters of substantial disagreement among Christians and, regrettably, a source of many divisions. Some Christians believe that salvation is obtained solely by faith in Jesus; others by a combination of faith and good works. Some believe that salvation requires explicit faith in Christ, while others hold that it has a more counterfactual character (i.e., salvation is extended to those persons who *would* accept Christ's offer of salvation if they *were* to have a deep encounter with Jesus and his teachings). Some Christians believe that salvation is attained once and for all by one's statement of faith; others believe that salvation is a lifelong process. Some Christians believe that Christ's sacrifice is a payment of the debt that humanity has incurred through sin, while others believe that Christ's sacrifice is a victory over the power of sin that offers a transformative power to Christians. And there is a variety of combinations of the above views.

I will say something about my personal stance on Christian salvation, because it is operative in my thoughts on providence and randomness. I believe that salvation is a gradual and lifelong process of transformation. While Christ's sacrifice makes such transformation possible, it also requires faith and participation on the part of the Christian herself.

9.3 Christian Thinking on Divine Providence

God's providence has been of central theological concern from the earliest moments of Christianity. Both the New Testament authors and a group of early church leaders (called "church fathers") concerned themselves with the nature of God's providence, as well as the theological problems and puzzles that arise when God's providence is affirmed. These teachings developed over time into a set of robust philosophical positions.

9.3.1 Providence in Scripture

The first and most obvious place to examine the Christian understanding of providence is the Bible. Consider the following passage from Psalm 104:

> 10. You make springs gush forth in the valleys;
> they flow between the hills,
> 11. giving drink to every wild animal;
> the wild donkeys quench their thirst.
> 12. By the streams the birds of the air have their habitation;
> they sing among the branches.
> 13. From your lofty abode you water the mountains;
> the earth is satisfied with the fruit of your work.
> 14. You cause the grass to grow for the cattle,
> and plants for people to use,
> to bring forth food from the earth,
> 15. and wine to gladden the human heart,
> oil to make the face shine,
> and bread to strengthen the human heart.
> 16. The trees of the Lord are watered abundantly,
> the cedars of Lebanon that he planted.
> 17. In them the birds build their nests;
> the stork has its home in the fir trees.
> 18. The high mountains are for the wild goats;
> the rocks are a refuge for the coneys.
> 19. You have made the moon to mark the seasons;
> the sun knows its time for setting.
> 20. You make darkness, and it is night,
> when all the animals of the forest come creeping out.
> 21. The young lions roar for their prey,
> seeking their food from God.
> 22. When the sun rises, they withdraw
> and lie down in their dens.
> 23. People go out to their work
> and to their labor until the evening.

This psalm gives a beautiful characterization of what Christians call *general providence*—the idea that God created the structure of the world in such a way that it provides for the well-being of his creatures. The psalm affirms that God has created the world in which we live and that God is both directly and indirectly active in providing for his creatures. On the one hand, he acts directly, making springs gush forth, watering the mountains, planting cedars. On the other hand, he acts indirectly by granting existence and making things what they are, to operate in certain regular patterns, such that the very things of creation provide with regularity. He causes grass to grow so that the cattle might eat it, plants so that people might use them, trees so that birds might build their nests in them. He makes the sun and moon to rise and set so that there might be seasons and daily rhythms from which animals take their cues.

The author of the psalm makes these assertions plainly, as if they are in need of no evidence. Although the passage is itself scripture, it claims the clear and straightforward knowability of God's providence. Accordingly, Christians take general providence to be evident in the world itself via "natural revelation," and as such, evident to all people. "Natural revelation" refers to the ways in which God reveals himself in and through the workings of nature (independent of any special revelation, like Scripture). Speaking to the Athenians, St. Paul attributes to them a vague recognition of the Jewish and Christian God, "the God who made the world and everything in it, he who is Lord of heaven and earth … [who] himself gives to all mortals life and breath and all things. From one ancestor he made all nations to inhabit the whole earth, and he allotted the times of their existence and the boundaries of the places where they would live" (Acts 17:24–26). Elsewhere, in his letter to the Romans, St. Paul affirmed that "what can be known about God is plain to them [those who do not acknowledge God], because God has shown it to them. Ever since the creation of the world his eternal power and divine nature, invisible though they are, have been understood and seen through the things he has made" (Romans 1:19–20).

The Christian scriptures also affirm providence in another sense. Over and above God's providing for his creatures by placing them within an overall structure designed to meet their needs, God also cares and provides for individuals in particular, detailed ways. This distinct type of providence, called *special providence*, holds that God's care is individualized in the form of plans for each person. Just as God had plans for the nation of Israel (Jeremiah 29:10–11), so he has plans for each person. And these plans are better than we, in our limited state, can possibly imagine: "What no eye has seen, nor ear heard, nor the human heart conceived, what God has prepared for those who love him" (1 Cor 2:9; cf. Isaiah 64:4).

God has a special providential care for the quotidian needs of each of his creatures. In the Gospel of Matthew, Jesus says, "Are not two sparrows sold for a penny? Yet not one of them will fall to the ground apart from your Father. And even the hairs of your head are all counted. So do not be afraid; you are of more value than many sparrows" (Matthew 10:29–30). Here we see that God's providence is not merely a general care to provide a structure by which creation is sustained, but extends to the meticulous level of providing for sparrows and counting the hairs on our heads.[1]

Alongside scriptural affirmations of special providence are warnings to not be overly concerned with the needs of the body.

> Therefore do not worry, saying, 'What will we eat?' or 'What will we drink?' or 'What will we wear?' For it is the Gentiles who strive for all these things; and indeed your heavenly Father knows that you need all these things. But strive first for the kingdom of God and his righteousness, and all these things will be given to you as well. (Matthew 6:31–33)

There is, therefore, a hierarchy of goods to be expected from God, with eternal spiritual goods being of higher value than the transient goods pertaining only to this life. St. Paul's letters develop a theology in which special providence reaches its highest and purest form as God's grace, which provides for the spiritual needs of humanity. If the ultimate goal and destiny of people is salvation, then the utmost form of providence is that by which God, through grace, grants righteousness and elevates a person to a shared life with him. While the providence that leads toward salvation is extended to all (cf. 1 Timothy 2:3–4), it is also particular to each individual (cf. 2 Thessalonians 2:12–13).

Inasmuch as salvation is the highest form of providence, it is the primary concern of God for us, and will sometimes outweigh our specific transient needs. In times when the Christian is afflicted with suffering and may be tempted to think that God does not care, St. Paul entreats them to recall the purpose of God's providence for them:

> [S]ince we are justified by faith, we have peace with God through our Lord Jesus Christ, through whom we have obtained access to this grace in which

[1] See also: Matt 6:26–34, 7:7–11; Luke 11:5–13; John 16:23.

> we stand; and we boast in our hope of sharing the glory of God. And not only that, but we also boast in our sufferings, knowing that suffering produces endurance, and endurance produces character, and character produces hope, and hope does not disappoint us, because God's love has been poured into our hearts through the Holy Spirit that has been given to us. (Romans 5:1–5)

It is through a firm confidence in God's highest form of providence, his love, and his grace, that St. Paul exhorts the Christian to persevere in times of suffering. In such times, God's providence may appear to be absent, but in reality is not.

> Who will separate us from the love of Christ? Will affliction, or distress, or persecution, or hunger, or nakedness, or peril, or the sword? For thy sake, says the scripture, we face death at every moment, reckoned no better than sheep marked down for slaughter. Yet in all this we are conquerors, through him who has granted us his love. (Romans 8:35–37)

In light of the scriptural texts above, I propose a third distinct label as we grapple with the Christian understanding of God's providence: *redemptive providence*. "Redemptive providence," in the case of a human being, denotes God's care for their eternal life and salvation as an individual. More generally, it refers to God's will to transform all of creation:

> For the creation waits with eager longing for the revealing of the children of God; for the creation was subjected to futility, not of its own will but by the will of the one who subjected it, in hope that the creation itself will be set free from its bondage to decay and will obtain the freedom of the glory of the children of God. We know that the whole creation has been groaning in labor pains until now; and not only the creation, but we ourselves, who have the first fruits of the Spirit, groan inwardly while we wait for adoption, the redemption of our bodies. (Romans 8:19–23)

Akin to the hierarchy of goods, we might affirm that there is a corresponding hierarchy of providence in which redemption is paramount. That is to say: redemptive providence is the most highly valued form of providence because it is oriented toward the highest good, and it will often outweigh special providence, which is oriented toward more transient goods. Furthermore, special providence will sometimes outweigh general providence, inasmuch as God's care for an individual creature's transient needs sometimes outweighs God's care for maintaining the overall structure by which the needs of creatures are ordinarily met. This hierarchy will inform some of the problems and questions we will encounter later.

9.3.2 *Fathers of the Church on Divine Providence*

The term "Christian Fathers" or "Church Fathers" refers to a set of particularly influential and authoritative Christian writers over the first several centuries of Christian history. The exact set of authors is ill-defined; Christian denominations disagree to some extent on which authors are to be included in the list, and whose writings should be emphasized. But despite differing views on the exact body of authors and texts, the need for some kind of category of authoritative early Christian thought is clear. For Christians, the set of Old Testament and New Testament scriptures constitute the revealed word of God. But scripture doesn't always carry its meaning on its face, and it lends itself to a wide variety of theological readings. As the early church faced a variety of controversies and disagreements, a core identity of shared belief and practice emerged and was gradually made explicit through various writings and councils. Thus, the writings of the Church Fathers over this crucial time period of development and definition stand as an important reference point for identifying core Christian beliefs.

Where scripture leaves certain questions about providence unanswered, therefore, we can turn to the fathers for more insight. The scriptural themes noted in the last section—of general providence, special providence, and redemptive providence—are further emphasized and reinforced by the Church Fathers (Fig. 9.1).

General providence is mentioned time and time again by the early Church fathers. Clement, writing around the turn of the second century, explained general providence in the following way:

> The heavens are moved by His direction and obey Him in peace. Day and night accomplish the course assigned to them by Him, without hindrance one to another. The sun and the moon and the dancing stars according to His appointment circle in harmony within the bounds assigned to them, without any swerving aside. The earth, bearing fruit in fulfilment of His will at her proper seasons, putteth forth the food that supplieth abundantly both men and beasts and all living things which are thereupon, making no dissension, neither altering anything which He hath decreed. Moreover, the

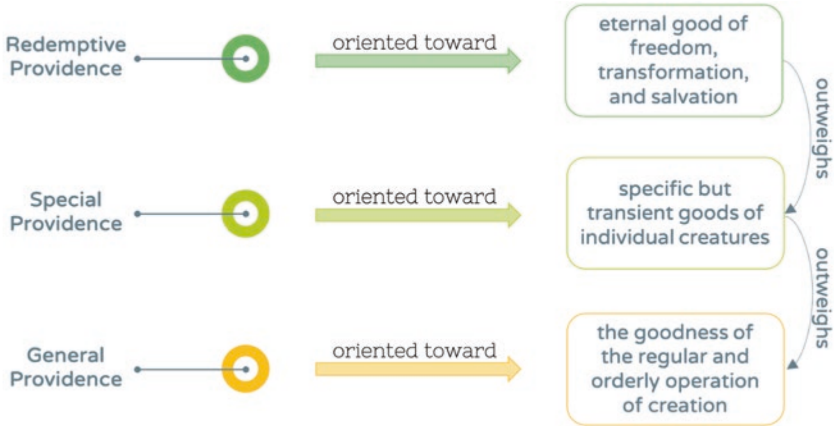

Fig. 9.1 Types of providence

> inscrutable depths of the abysses and the unutterable statutes of the nether regions are constrained by the same ordinances. The basin of the boundless sea, gathered together by His workmanship into its reservoirs, passeth not the barriers wherewith it is surrounded; but even as He ordered it, so it doeth. For He said, So far shalt thou come, and thy waves shall be broken within thee. The ocean which is impassable for men, and the worlds beyond it, are directed by the same ordinances of the Master. The seasons of spring and summer and autumn and winter give way in succession one to another in peace. The winds in their several quarters at their proper season fulfil their ministry without disturbance; and the everflowing fountains, created for enjoyment and health, without fail give their breasts which sustain the life for men. Yea, the smallest of living things come together in concord and peace. All these things the great Creator and Master of the universe ordered to be in peace and concord.[2]

Here we see an emphasis on the regularity, rhythms, and laws of creation as directly ordained by God. John Chrysostom, four centuries later, wrote similarly:

> [I]f you doubt [that God cares for all things], inquire of the earth, the heavens, the sun, the moon; ask the various irrational beings, the seeds, the

[2] 1 Clement 20, from Joseph Barber Lightfoot, tr. *The Apostolic Fathers* (London, Macmillan and Co., 1898).

> plants, the speechless fish, the rocks, the mountains, the valleys, the hills, the night, the day. For God's providence is as plain as the sun and its rays. In each situation and place, in the wilderness, in inhabited regions and uninhabited, on earth or sea or wherever you might go, you will observe the clear and sufficient, ancient and new, reminders of this providence; voices which speak more clearly than our rational voice and are conveyed from all places, teaching those who are willing to listen about his constant concern.[3]

And Theodoret of Cyrus, writing in the middle of the fifth century:

> Consider now at least, if you have not done so before, the nature of visible objects, their position, order, situation, movement, rhythm, harmony, gracefulness, beauty, splendor, utility, charm, variety, diversity, changeability, their regular return to the same place, their permanence in corrupt natures. [...] Behold providence manifested in the heavens and the heavenly bodies, the sun, the moon, and stars. Behold it also in the air and in the clouds, on land and in the sea, and in everything on the earth, in plants, grasses, and seeds; in animals, rational and irrational, footed and winged, swimming, creeping, and amphibian, tame and wild, domesticated and savage. (Theodoret 1988, 13–15)

In these passages, providential care and control of the regularities of creation are taken to be readily apparent. General providence is "plain," something to "behold," and in need of no rational argument or defense. The picture painted is beautiful and poetic.

But general providence poses a set of problems. We might wonder: why does God provide for us in *this* general way rather than a different general way? Some features of creation seem to be rather indirect or inefficient ways of providing for us. For example, why should God have created a structure in which thunder and lightning accompany the rain, which falls to the earth and waters the plants, so that we might have food? Why should he not instead have created a system in which food spontaneously pops into our hands, or for that matter, why not create our bodies in such a way that they automatically generate their own sustenance? Why this system rather than a *better* one, in which we are provided for more efficiently or more directly?

[3] Hall, Christopher Alan, tr. (1991). *John Chrysostom's 'On Providence': a Translation and Theological Interpretation*, p. 193.

Such questions suggest two objections to the idea of general providence. On the one hand, given that the structure of creation provides for us only in an indirect and inefficient manner, we might be led to think that *there is no providence*. We might think that these features of the world on which we depend are not the result of a provident God, but rather are products of chance, and it just so happens that we are resourceful beings who make use of them. On the other hand, we might admit that there is a providential design built into creation by God, but given its indirect and inefficient nature, conclude that human beings are not privileged with respect to that providential design. We are provided for, but no more so than God's other creatures. The rain falls equally on all: oceans, rocks, plants, animals, human beings.

These worries were confronted by Origen, a third-century Father, in a response to the philosopher Celsus, a critic of Christianity. Origen identified both of the aforementioned objections to general providence as serious affronts to Christian piety. To believe on the basis of the indirect way in which our needs are met that there is no divine providence is to have a small and selfish view. Why, Origen asks, should we be surprised that human beings are not the only objects of God's care? Why should God not be allowed to create an entire system of care that provides for the needs of all his creatures, without making us doubt his care for us? Should we not be all the *more* in awe of his providence in light of his care for other creatures, rather than *less* so? (Origen 1980, bk. IV 75).

Yet, for Origen, it is equally an error to focus so much on God's providence with respect to non-human creatures that we cease to believe in his special care for humans. In Origen's view, God's choice to provide for us in an indirect way is itself a way of fostering the development of our human capacities. Were God to provide for us directly, by simply placing food in our hands every day and meeting all of our needs, we would not be driven to garden, to care for livestock, to build, to create art, to invent, to philosophize. God "created man a being full of wants," Origen tells us, and accordingly placed us within a system where our capacities would be realized only through a process of fulfilling those wants. He does not do so for the irrational animals, who do not need to garden and who are given natural coverings such that they do not need to build shelter for themselves. And so the fact that he provides for us in this particular way (i.e., indirectly and inefficiently, such that we must work for our welfare) is precisely the proof that God has a special care for humans (Origen 1980, bk. IV 76).

What are we to make of Origen's suggestion? If God's providence manifests itself toward humans in this indirect and inefficient way, and if indeed this form of providence is purposefully oriented toward our good, then how exactly are we to understand that good? What is the nature of this good that God chooses for humans?

To answer these questions, we need to move from general providence into issues of special and redemptive providence. In the scriptural texts related to providence, we saw these varying "levels" of providence emerge, and we can see this again in the writings of various church fathers. Chrysostom, for example, expresses an idea similar to Origen's, where general providence is somehow especially suited for meeting human needs, both natural and spiritual:

> He created this praiseworthy and all-harmonious universe for no one else but you. For your sake he formed it so beautiful and so great, diverse, costly, completely sufficient for every need, useful, profitable in every way, apt for the sustenance and formation of the body, the growth of the spiritual life, and as a pathway toward the knowledge of God. (Hall 1991, 221)

But what does it mean, specifically, for the world to be created *for the sake of* human spiritual growth and knowledge of God?

> The present life is a wrestling school, a gymnasium, a battle, a smelting furnace, and a dyer's house of virtue. Therefore, just as tanners grasp the hides and first work them vigorously, stretching, striking, and dashing them against walls and rocks, and by countless other treatments render them fit for the reception of the dye—in this way they bring out the prized color; just as goldsmiths throw the gold into the fire to purify it, delivering it over to the testing of the furnace; just as coaches train the athletes in the wrestling schools with much hard work, attacking them more viciously than their opponents, so that every part of their bodies might be adequately prepared by exercise for the grasps of their enemies and for an easy escape; so in the same way God acts in the present life. Desiring to transform the soul into a serviceable condition for virtue, he works it, melts it, and delivers it over to testing of trials, in order to strengthen those who have lost heart and who

> have let themselves go, in order that those who have already been tested might be even more approved and unconquered by the plots of the demons and the snares of the devil, completely worthy for the reception of the good things to come. (Hall 1991, 366–67)

Chrysostom describes God as active in this process of salvation, redemptive providence, whereby God makes use of the trials and tribulations of this life to transform and redeem the Christian who undergoes the process.

9.4 What About Randomness?

I have now described most of the core ideas concerning God's providence that emerged over the first five centuries of Christianity. On the Christian understanding, God's providence is oriented toward a hierarchy of goods for creation: at the lowest level, the regular and orderly operation of the cosmos; at an intermediate level, the health and well-being of living creatures; and at the highest level, the salvation of human individuals. I have avoided one complicating issue: randomness. (Apparently) random events seem to present a challenge to the notion of providence. God's plan for providing this hierarchy of goods seems to require a certain degree of control, and randomness seems to oppose control.

9.4.1 Grappling with Preexisting Thought

Before discussing randomness and providence, we need to acknowledge the everyday phenomena that all people (Christian or otherwise, theist or otherwise) must grapple with. On the one hand, there is much in the world that is stunningly orderly and predictable. In the sky we see the stars and planets orbit with the utmost regularity; on the earth, biological organisms of every kind produce marvelous and intricate structures. On the other hand, apparently random occurrences present themselves as stark contrasts to order: leaves fall from trees every which way, with no obviously predetermined destination; a young child is unpredictably struck with cancer; a tornado spontaneously forms with little warning.

Since order and chance are obvious and seemingly contradictory, the dueling pair stands in need of explanation. The ancient Greeks and Romans grappled extensively with the problem. Popular explanations came from poetry and myth: unpredictable Tyche, goddess of chance and fortune, visited her whims upon the world, while the Moirai (the fates), who determined human destinies, established order and purpose. Both order and chance existed side by side in a world ruled by whimsical gods or forces. Plato, on the other hand, told a story of a Divine craftsman, the Demiurge, forming the world out of chaotic preexisting matter, in imitation of a perfect eternal realm. Thus, Plato attributed the order in the world to the Demiurge and the eternal realm that served as a model, while random and disorderly events were attributed to the recalcitrant material that the Demiurge was constrained to work with. Later Stoic philosophers argued that chance is illusory; the world is governed and determined by a divine order that is immanent in the world; the appearance of chance was the result of causes that were not understood.[4]

Early Christians grappled with this explanatory challenge against this backdrop of thought: how to reconcile God's creation in which order and randomness exist side by side, and how to explain how God can carry out his plan despite the random features of the world. In contrast to Plato's proposal of a Demiurge who shapes preexisting matter, Christians held that God created the universe *ex nihilo* (out of nothing), not out of preexisting matter. Since they could not attribute chance happenings to the chaotic and recalcitrant nature of matter, Christians found it difficult to explain chance as a phenomenon. After all, if God was not constrained by preexisting recalcitrant matter, why would God create matter with such recalcitrant properties? Could he not have created a more docile matter that naturally fell into order? If randomness is real, it would have to be part of God's design.

Some would reject genuine randomness. Perhaps events that *appear* to be random are actually determined and ordered at some imperceptible level. Perhaps a person's heart attack, even if it appears random, is actually the result of a series of hidden but determinate causes. Some Christians sympathized with this sort of a Stoic proposal. St. Augustine of Hippo, who was influenced by Stoicism, took something like this position.

9.4.2 The Augustinian Model of Providence

Augustine rejected the view that the earthly realm (as opposed to the celestial realm of the stars and planets) is subject to "the sport of chance and fortuitous motion." He responds to this philosophical view by introducing a commentary on Psalm 148:7–8.

[4] See (Miller 2016).

> Praise the Lord from the earth,
> monsters of the sea and all the deeps,
> fire, hail, snow, and ice,
> and storm winds fulfilling His command.

> Nothing seems to be so much driven by chance as the turbulence and storms by which these lower regions of the heavens (rightly included also under the term "earth") are assaulted and buffeted. But when the Psalmist added the phrase, *fulfilling His command*, he made it quite clear that the plan in these phenomena subject to God's command is hidden from us rather than that it is lacking to universal nature. (Augustine 1982, 175)

Augustine believes that chance is incompatible with nature's being subject to God's command; apparently "chancy" phenomena are ruled by a plan of God that is hidden from us. After all, there are many places where God's plan and providence are obvious:

> What more absurd or foolish opinion can be maintained, therefore, than to hold that the will of God and the ruling power of HIs providence are lacking in that whole region whose lowliest and smallest creatures are obviously fashioned by such a remarkable plan that a moment's serious attention to them fills the beholder with inexpressible awe and wonder? (Augustine 1982, 175)

But what does it mean for the world to fulfill God's command or follow his plan? In the chapter immediately following the above passages, Augustine argues there is a sort of finality inherent in God's creative act "in the beginning." But God's creative act is *also* gradual and continuous. He uses the analogy of a seed.

> In the seed … there was invisibly present all that would develop in time into a tree. And in this same way we must picture the world, when God made all things together, as having had all things together which were made in it and with it when the day was made. (Augustine 1982, 175)

So God's initial creative act, like the planting of a seed, instills God's plan into the world. (In fact, Augustine thinks of the six "days" of creation not as a succession of periods of time, but rather as the causal plans that he has established within the universe.) But there is more to God's creative act:

he continues to bring forth the metaphorical fruit over time. Just as a seed gradually grows into a tree, which in turn produces fruit, so the initial creative act of God instills in the world a set of causal plans that gradually give rise to all manner of goods: stars and planets, land and water, plants and animals, humans.

Augustine's view is not unlike Stoic determinism. There is a hidden plan that is responsible for all things, even when those things appear random. And while the transcendent Christian God differs from the immanent Stoic God, Augustine retains a strong sense of immanence. This seems to be an appropriate way of understanding the creative act of the God of Jesus Christ, who is both transcendent and immanent.

But puzzles remain with the Augustinian view.

Firstly, Augustine's seed-model *need not* be deterministic. Couldn't the natural tendencies implanted as seeds in creation be, well, tendencies that sometimes, but don't always, produce a certain result? For example, a hen might *tend* to lay an egg daily, but that doesn't mean that she will every day. Seeds of creation, so it seems, might evolve in "chancy" ways.

Secondly, it's not clear how God's causation relates to the natural causation of "seeds" on Augustine's model. If an efficacious (and deterministic) causal power is planted within creation itself, God needn't continually act and bring forth. Why couldn't he—or why doesn't he—just sit back and let creation act as it is wont to do? The model sounds like a case of "overdetermination," as it is called in contemporary philosophy. The setup seems redundant.

But perhaps that's the point. Perhaps it *is* redundant, because God isn't concerned with efficiency. Perhaps God simply *wants* to be present in the world in an intimate and causal way. Such a desire would be consistent with his overabundant love for creation, after all.

This ambiguity in Augustine's ideas becomes a locus for later Christian reflection.

9.4.3 Enter Aristotelianism

While Platonism and Stoicism exerted influence on Christian thought, many classical Greek texts, including the majority of Aristotle's writings, were lost to Christian Europe throughout most of the medieval period. During this period, Islam's so-called Golden Age of intellectual and technological flourishing found Muslim scholars studying and commenting extensively on many Ancient Greek texts, including Aristotle's works. Through the Islamic world a Christian Europe "rediscovered" Aristotle. From the mid-twelfth to mid-thirteenth centuries, many texts and their Islamic commentaries were gradually translated from Arabic into Latin. This became a momentous occasion for the development of Christian thought, particularly on the subject of God's causal relation to nature.

The most famous Christian thinker to engage with these new texts was Thomas Aquinas. I will focus on the aspects of his thought that are most relevant to providence and randomness. In the context of an interfaith book, it is worth noting that Aquinas was heavily influenced by the Muslim philosopher Ibn Rushd and the Jewish philosopher Maimonides.

Recall that, in our examination of Augustine's model of creation in the last section, we came to a puzzle over how God's causal power relates to the natural causal powers within creation. In particular, it seemed that the two causal powers were redundant, and that one or the other might be entirely superfluous. Aquinas developed an answer to this puzzle.

On Aquinas' view, every agent in the natural world has certain powers inherent to it because of the kind of thing it is. For example, fire has the power to heat and to burn, and a knife has the power to cut. However, just as every created being owes its existence to God, every created being *also* owes its causal powers to God. In other words, God's creative act is so powerful that it does more than simply bring a thing into being—it *also* imbues that thing with certain powers.

> Therefore, God causes each action inasmuch as he bestows the power to act, preserves it, and applies it to action, and inasmuch as every other power acts by his power. (Aquinas 2012, 58)

This is Aquinas' well-known teaching on primary and secondary causation. God is a *primary cause* of all of creation. Primary causation is creative causation; it is the power by which God gives existence and essence to all created things, including all of the causal powers inherent in those created things. The powers granted by God are called *secondary causes*, the causes built into creation itself.

But why the redundancy, when God could do things more simply by causing everything directly? According to Aquinas:

> Nor is it superfluous, even if God can by Himself produce all natural effects, for them to be produced by certain other causes. For this is not a result of the inadequacy of divine power, but of the immensity of His goodness, whereby He has willed to communicate His likeness to things, not only so that they might exist, but also that they might be causes for other things. (Aquinas 1991, sec. III.70.7)

God gifted his creatures with their own causal efficacy. As such, God relinquished some control over the exact results of that empowerment. Since God chooses *not* to "exclude from things the power of falling from the good," (Aquinas 1991, sec. III.71.3) God does not always prevent evil and corruption from occurring (possible consequences of the causal power he has granted to created things).

What about chance? Just as God does not prevent all evil from occurring, he likewise does not exclude contingency and chanciness from creation (Aquinas 1991, sec. III.72.1). Aquinas holds that chance events are possible because of creaturely limitations. Creatures control and determine their effects in varying degrees, and when their causal powers intersect, their effects may not be determined or intended (Aquinas 1991, sec. III.74.4–6).

Aquinas wrestles with the compatibility of chance with providence:

> Either, then, we must say that not all effects are subject to divine providence and, thus, that providence does not apply to all—but we showed earlier that it does; or else it is not necessarily so, that, granted providence, its effect must be granted, and thus providence is not certain; or, finally, it is necessary for all things to happen by necessity. For providence is not only in present or past time, but in eternity, since nothing can be in God that is not eternal. (Aquinas 1975, sec. III.94.3)

But Aquinas makes a startling claim: it is *good* that God has created creatures that are contingent in their action. He goes on to say: "It would be contrary to the meaning of providence, and to the perfection of things, if there were no chance events" (Aquinas 1991, sec. III.74.3). How could it possibly be contrary to providence for there to be no chance events? This puzzling assertion is worthy of consideration.

Aquinas' argument relies on his understanding of contingency: since contingency is contrary to necessity, something with no contingency would be necessary and incorruptible. A world without contingency would be a world without generation and corruption, birth and death, or any type of change, including motion. Such a world would be terrible, one that God would never will into being (Aquinas 1991, sec. III.72.4–6).

The reason that Aquinas thinks this way lies deep in the foundation of his philosophy. Aquinas holds that *action follows being*. This principle states that the behavior of a thing is always grounded in what it is; the essence of a thing determines the scope of possible actions and behaviors. Therefore, a contingent being is bound to act in contingent ways, and a being that does not act in contingent ways would not be a contingent being.

Those who are not convinced by this principle—and I admit to being one of them—may not find Aquinas' reasoning here altogether convincing. There seems to be nothing logically contradictory in the idea of a created thing being contingent—that is, radically dependent on God for its existence—while also having a temporal tendency to change. A lack of contingency does not have to preclude change. Moreover, it seems perfectly possible for a being to change, albeit in perfectly predictable and deterministic ways that are not subject to chance.

But might there be another way to defend Aquinas' claim that God's providence wills that there be chance in creation? I think there is, but it requires stretching a bit beyond Aquinas' thought.

9.4.4 Modern Science

Christians were wrestling with issues of chance and providence long before the advent of modern science, with a great deal of openness to the possibility of randomness in the world. But in the early modern period, with new scientific theories like those of Galileo, Boyle, and Newton, it seemed that more and more of the world could be explained through mathematical laws; randomness looked increasingly like an illusion that would be explained away with enough detailed information about the world. In one of the most grandiose moments of deterministic theorizing, Laplace hypothesized:

> We ought then to regard the present state of the universe as the effect of its anterior state and as the cause of the one which is to follow. Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it an intelligence sufficiently vast to submit these data to analysis it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes. (Laplace [1814] 1902, 4)

This god-like intelligence (later called "Laplace's Demon") symbolized the idea of complete predictability and deterministic causation. Intellectuals (including Christian thinkers) increasingly accepted a mechanistic and deterministic worldview. A single formula that governed everything in the world seemed just a matter of time.

Many Christian thinkers used the mechanistic and deterministic worldview as evidence of God's design and craftsmanship. Perhaps providence and randomness was a non-issue. Yet other problems lurked. The new worldview left little room for free will, and the problem of evil appeared to have worsened. For evil could not be an artifact of chance, but rather part of the predetermined design of God. A variety of "solutions"—from predestination to occasionalism—to these problems were proposed.[5]

In 1859, randomness dramatically re-entered scientific conversation with the publication of Charles Darwin's *On the Origin of Species*. Darwin proposed that chance was at the heart of biological forms and their history. Random variation in the characteristics of organisms, when paired with natural selection, explains the gradual changes that were apparent in the various patterns of biological diversity. His idea was controversial but compelling, and over the next century, as more details about inheritance were discovered, culminating in the discovery of the structure of DNA, evolution by natural selection became widely accepted by the scientific community.

Modern scientific theory also revived the problem of randomness through quantum mechanics.[6] Quantum mechanics emerged from a number of puzzling discoveries in the late nineteenth and early twentieth

[5] For more on this topic, see (Brooke 2016).

[6] There were other theoretical affirmations of randomness, including chaos theory and the statistical foundations of thermodynamics. Here I concentrate on the two most prominent loci in which modern scientific theories involved randomness.

centuries. It is currently our best physical theory for describing the energy and movement of systems at the smallest scale of atomic and subatomic particles. According to the theory, Laplace's thought experiment is wrong: the complete description of a given physical system does *not* determine a specific outcome. It can give us only a set of possibilities and probabilities, not a specific certain outcome. Unless scientists are mistaken, the world is ontologically random.[7] We can no longer determine what specific event will evolve from another.

Are these theories a problem for a Christian understanding of providence? Many modern Christians have thought so. Christian reactions to Darwin's theory in particular were negative. While some objections pertained to interpretation of the creation story in Genesis, others pertain to our topic here, rejecting the role of chance in Darwin's theory. What could random variations (or "mutations"), which provide the raw material on which natural selection acts, mean for God's plan? How could God have a plan for the world—a plan that culminated in human beings—yet leave the basic mechanism up to chance? With respect to quantum theory, how could God govern everything else if there is indeterminism at the most fundamental level of the world?

For Christian intellectuals who had become accustomed to a deterministic vision of the world and a narrowed notion of providence that required God's complete control over every event, the chanciness of this scientific picture was hard to swallow.

9.5 A Possible Solution

My goal in covering this sweeping history has been to give a broader context for the questions that modern Christians ask about God's providence and its relation to scientific randomness. Within this broader context, these questions are not new. They may have taken a new form, often expressed in technical and scientific language, but they are not new. These are not easy problems; they are not and never were easy to solve. But modern Christians can take some comfort in the fact that we are confronted

[7] This appears to be a strong possibility. Even if there is a hidden variable that renders the evolution of a quantum system deterministic, it has been proven that the hidden variable would have to be nonlocal, meaning that it violates the strongly-held principle of spatiotemporal locality. Such a hidden variable would require a revision of other fundamental theories, in particular the General Theory of Relativity.

with the same difficulties as Christians of every era; we have not encountered a new and unprecedented problem. And we can make use of the thought of earlier Christians as we confront the problem in our own historical time.

What is that age-old problem? Simply put, it is the question of how God can be provident over his creation while also relinquishing some control over it and allowing it to run its course in ways that are sometimes random. If God wills certain specific events to occur, and wills the good of his creatures, how can he relinquish control? How can he allow randomness to affect the course of events?

There are many ways of thinking about this problem and responding to it. Some are more satisfying than others, and individual Christians are bound to disagree, as there is much mystery in God's intentions and our speculations are bound to get things wrong. But to conclude this chapter, I will now propose my way of thinking about this problem. To do so, I will highlight various points that I have mentioned earlier in the chapter and try to weave them together.

1. God sees it as a great good for creatures to have a kind of autonomy in their own actions. Contingency (chanciness) of action is one manifestation of this autonomy. Just as God grants to humans free will, he grants to all creatures analogous degrees of autonomy. This extends all the way down to subatomic particles. (Subatomic particles do not have wills or intentions, but the analogy holds: their possibilities for behaving this way or that are *genuine* possibilities, and God allows their inherent indeterminism rather than impose his own outcome.) God is *that generous* with creation, through and through.[8]
2. From his eternal perspective, God can love and foreknow every detail about an individual human being (i.e., you or me). But that he loves and foreknows a person does not require that he controls every single event that led up to that person's existence and subsequent development. Again, he loves creation *that* much, to grant it some autonomy.
3. God allows evil things to happen in the world. This is consistent with the autonomy that he bestows on creation and the randomness that he allows to be a part of the causal structure of creation. The tradition of

[8] This point is inspired by Aquinas and his robust belief in secondary causation, but I have taken Aquinas' thought a bit further than he himself might like. He might object to the degree of indeterminism in the inanimate world that I suggest here.

Christian spiritual practices also presumes that he does choose to prevent *some* evils, according to his wisdom. We don't have any way of knowing how many evils he chooses to prevent or his specific criteria for doing so. However, redemptive providence is his utmost form of care for creation. And because salvation/redemption is a more important good than other transient goods, there are evil events that he allows creatures to endure in working out their redemption.

4. The Christian message consistently affirms that the means of our salvation is directly tied up with suffering. Jesus' death on the cross is the means of our salvation and furthermore, we are to emulate him by offering up our own sufferings. That a certain degree of randomness is inherent in creation is not only consistent with God's redemptive providence, but *conducive* to it. The struggle with a world that is sometimes random and unpredictable is an efficacious means of our coming to know God more deeply and be transformed in his image. God wills for us a life that is a "wrestling school" like the one that Chrysostom describes, as it brings about our redemption.

   Therefore, my beloved, as you have always obeyed, so now, not only as in my presence but much more in my absence, work out your own salvation with fear and trembling; for God is at work in you, both to will and to work for his good pleasure. (Philippians 2:12–13)

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CHAPTER 10

God, Cosmos, and Humanity: Muslim Perspectives on Divine Providence

Sajjad Rizvi

Consider this famous set of pronouncements concerns the nature of God, divine providence, and the human yearning for God and their inability to grasp God's transcendence:

> Praise is God's whom speakers cannot eulogise, and whose bounties cannot be enumerated by those counting, nor can one give Him His due despite the attempts of those striving to do so; the heights of intellectual endeavour cannot perceive Him, nor can the depths of understanding fathom Him. No standard can be established to describe Him, nor praise, neither in space nor in time that encompasses Him. He originated creatures through His power, dispersed the wind with Him mercy, and fixed His trembling earth with rocks.
>
> The beginning of the faith is acknowledging Him, the perfection of acknowledging Him is bearing witness to Him, the perfection of bearing witness to Him is belief and making Him One, the perfection of making Him One is sincere faith in Him, the perfection of sincere faith in Him is

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> negating attributes of Him, because every attribute is recognisably distinct from what it attributes and what is attributed is conceptually distinct from the attribute. Whoever describes God ascribes a like to Him, and whoever ascribes a like to Him makes Him two, and whoever makes Him two divides Him into parts ….
>
> A being but not after becoming, an existent but not after being privative, with everything without being identical to them, unlike everything without being distinct from them, acting without movement or instrument, seeing even though there is nothing in creation that gazes upon Him, absolutely One such that there is none that keeps Him company nor anyone whom He may miss in his absence. (al-Raḍī 2015, 39–40)[1]

This was uttered by ʿAlī b. Abī Ṭālib, the cousin and son-in-law of the Prophet Muḥammad (and the first Imam in the Shiʿi tradition) in a sermon from his time as caliph on the creation and the nature of God. They reflect the creative tension between the transcendence and immanence of God in the Islamic context; either the former can be stressed to the extent that causality is denied to other than God in an occasionalist cosmos as envisaged in the Sunnī Ashʿarī theological traditions, or the latter may be emphasized such that the mediation of 'divine humanity' is expressed in the worship and adoration of the mediating friends of the divine as one finds in the Nuṣayrī-ʿAlawī traditions. If God were so utterly unknowable, how could humans make sense of their cosmos, their purpose, and even understand God's purpose, wisdom, and theodicy? Similarly, if God were fully human, how could one understand the suffering of the divine within a world that suffers? This relatively short text could in itself become the basis for a theological reflection on the relationship between what Islam's sapiential traditions calls the three realities of God, the microcosmic human that is both the face of the divine and the reflection, the mirror, of the cosmos back to God, and the cosmos that manifests the signs of God in the horizons. Insofar as divine providence calls for humans to make sense of God, it nudges us toward both the horizons of the cosmos and the depths of our own souls so that we may know that 'He is the Real'

[1] Al-Raḍī (d. 1016), himself a descendent of the Prophet and ʿAlī, compiled this work, *Nahj al-balāgha* on literary parameters to collect the sermons, homiletic sayings and letters of ʿAlī. The gendered pronoun for God accords to the grammatical normativity of the masculine in Arabic, and some might assume that the male is privileged in Islam but there is also a gendered complementarity, the yin-yang in the famous postulation of Sachiko Murata 1992, between the divine names of majesty and of beauty, the masculine and the feminine.

(Qurʾan 41.53). One might even describe this as a phenomenological approach to the question of divine providence, human purpose, and theodicy. I will return to this. The purpose of this article is neither to provide a thick interpretation of a singular text nor to focus on the occasionalism that is often found in discussions of Islamic theological positions on providence (reflecting a Sunnī normativity) but rather to show ways in which Islam(s) are claimed in different theological contexts and philosophical accounts given for divine providence and theodicy.

One of my critical points is the plurality of Muslim voices, of interpretations on scriptural and rational grounds to understand the three realities. One key desideratum of the contemporary field of Islam (within religious studies) is to decolonize our ways of understanding by critiquing not only the master narratives of what Islam is and is not (that arise from the orientalist practice) but also to provincialize notions of the 'Islamic' by emphasizing the plurality of voices, claims, and contestations within the house of Islam historically. This involves a re-centering and re-presenting philosophies and rationalist theologies from the margins as well as taking seriously those doctrinal and hermeneutical positions not associated with hegemonic forms of Sunnī Islam, either in their historical or modern forms. The case of how the nature of God is understood and related to the nature of the cosmos and its nurture and development is a useful topic for that decolonization.

The Hellenic concept of providence (πρόνοια) as God's plan for creation, God's continuing care for creation and a theodicy to explain evil was quickly naturalized in Islamic thought by philosophers and theologians, mainly through the influence of Proclus (d. 485). Providence became a site for contestations within philosophies and theologies and scriptural exegesis, of engaging God's plan, understanding the human condition, and the problem of evil and suffering. What exactly is the function of divine providence? What does it help us to understand? Does it account for the problem of evil? Is there an incommensurability between these accounts and the broader theological accounts of the relationship between God, cosmos, and humanity and what we wish to understand in our contemporary age? I shall begin with a brief account of an Islamic system of metaphysics, cosmology, the nature of moral obligation, and eschatological implications that arise from scriptural and early canonical texts in order to provide a wider frame for the discussion of providence. One 'scriptural' model will be presented for understanding Islam and providence. I will examine two philosophical models for understanding divine providence: the first is the philosophers' account in Avicenna/Ibn Sīnā (d. 1037) in which providence explains how and why creation comes about and how we can explain the existence of evils and the significant mediation of prophecy as an expression of providence and God's facilitating grace; the second is the Safavid account of Mullā Ṣadrā Shīrāzī (d. 1636) and his theodicy of divine love. I cannot imagine that we can solve the problem of providence and evil once and for all, but I hope that we can understand the questions more adequately and some of the historical solutions.

10.1 What Is Islam? Or Inferring Providence from Scripture

I present a model for how we might understand Islam as a holistic way of life, an imaginative metaphysics, praxis, and affective community, a *dīn* as it is described in the Qurʾān (Q. 3.19: truly the religion [*dīn*] in the sight of God is submission [*islām*]),[2] as a religion in the term that we often use. While I recognize that the totality of the conceptual language used in the study of religion and indeed in philosophy of religion depends upon a normative basis in the study of Christianity, one needs to be aware of how elastic the concepts of theology, mysticism, religion, dogma, even providence and scripture might be. Here, I will use *dīn* instead of "religion" because it is a central term in Islamic discursive traditions. There are two ways of understanding *dīn*: the first focuses on etymology, the second focuses on antonyms. On the former, a number of possibilities are put forward: *dīn* derives from the Arabic root d-y-n which connotes mutual obligation and debt and stems from the idea that it is the response and relationship to God that is morally entailed by the recognition of God as creator and sustainer of the cosmos, a notion known in Islamic theological traditions as *taklīf* (moral obligation) (Frank 1983). A related sense of the same root is that of judgment (e.g., the Qurʾan talks of God as the 'Master of the day of judgement (*dīn*)' 1.4), of paying one's dues for the accumulation of one's actions (Q. 24.25: 'on that day, God will pay them their just due in full'). The terms "urbanity", "civility", and "being human" come from the same root and *dīn* connotes these senses as well. Thus, *dīn*

[2] All translations are taken from Nasr et al. 2015, here 135.

concerns the civil and affective ways in which we live our humanity through what we owe to God and to each other.

On the other hand, *dīn* is not *dunyā*. While much recent ink has been spilled on the implications on this distinction for the religious-secular divide and for an understanding of divine and human sovereignty and indeed of political theology in modern Islam, there is little quibbling that mutuality of *dīn* with the world and intimacy of our attachments that arise from embodiment remains such that the two cannot be truly distinct insofar as they construe facets of our humanity. *Dīn* is thus as complex a term as any used in any culture that might be classed under the term 'religion'. For our purposes, one point worth bearing in mind is how one might distinguish *dīn* and its propositional and ethical commitments to philosophy (insofar as, following Pierre Hadot (1993, 1995), it is a way of life and a set of spiritual practices as well); for many of the thinkers in the Islamic traditions that I will consider, the distinction is not categorical or essential but a matter of degree ranging from perhaps 'philosophical religions' to 'religious philosophies' (Fraenkel 2012; Corbin 1972).

The scriptural model for understanding Islam and divine providence is based on a purported saying of the Prophet and references the Qurʾan as the privileged signifier in theological reasoning. It provides a metaphysical explanation of the relationship between the three realities of God, the cosmos, and humanity, and puts forward understandings of the way in which the human acts as a mirror of the divine, as a microcosm through which one can infer the creative agency of the divine and the divine's sustaining relationship, as well as the cosmos as a mirror, as a macrocosm in which one understands God's existence and providential care for the cosmos and humanity.

The famous hadith of Gabriel describes the three dimensions of Islam—*īmān* (faith), *islām* (acts), and *iḥsān* (virtue or making beautiful) (Nawawī n.d., 4–6).[3] The story is set in the mosque of the Prophet. An unknown young man comes and asks the Prophet three things and then asks him about the portents of the hour (to indicate the eschatological and soteriological significance of understanding these three dimensions); once he's left, the Prophet turns to his companions and says, 'That was Gabriel who

[3] The text is found in numerous sources such as the *Jāmiʿ al-Ṣaḥīḥ* of al-Bukhārī (d. 870) (*Jāmiʿ al-ṣaḥīḥ*, *Kitāb al-īmān* hadith §50, I: 36–37) and Muslim b. al-Ḥajjāj al-Nīsābūrī (d. 875) (*Jāmiʿ al-ṣaḥīḥ*, *Kitāb al-īmān* hadith §1, I: 36–38).

came to teach you your *dīn*'. The three questions constitute the three dimensions of Islam as a *dīn*.

What is *islām*?

Islām is that you testify that there is no deity but God and that Muḥammad is his messenger, that you establish and perform the prayer, that you give alms, that you fast the month of Ramaḍān, and that you perform the pilgrimage to the house of God if you have the means to do so.

"Islām" is used in different senses in the scriptural traditions from submission, to the primordial faith and to the specific historical religious dispensation of Muḥammad. Here it indicates what a Muslim ought to do given their assent to God's existence and creation and his communication to humanity through the Prophet. It is the Prophet who teaches humans how to fulfill what they owe to God in terms of ritual prayers, fasting, alms, and pilgrimage. In the Shiʿi context, the list of 'five pillars' is different: prayer, fasting, alms, pilgrimage, and the *walāya* of the Imams who succeed the Prophet (al-Kulaynī 1972, II: 18–24). *Walāya* is the continuation of the mediating role of the Prophet and the recognition that in every age there must be a proof (*ḥujja*) for the existence of God, a protector of the Prophetic mission who guides humanity in their performance of what they owe God and indeed it is the recognition of their rank with God that gives meaning to the performance of those ritual acts and moral obligations that enact what is owed. God's commissioning of the prophets and the Imams as mediators is an expression of divine providence and care for humanity and for the cosmos, in order that humans may realize their true nature through their acts of piety.

What is *īmān*?

Īmān is that you believe and trust in God, his angels, her prophets, and the afterlife, and believe and trust in the divine measuring, both the good and the bad.

The scope of faith concerns those truth claims about God, the cosmos, divine providential communication of revelation and commission of prophetic missions, and the compensation in the afterlife as well as the fact that God creates what is good and what is evil and decrees the good and bad that befall humans in terms of moral and natural evils and goods. The mention of prophets in the plural and of angels indicates that revelation and God's communication to humanity is a continuous process from the beginning of humanity; the faith that the term Islam connotes therefore is a primordial one and hence previous Biblical prophets and extra-Biblical messengers are part of the same unfolding of God's plan for humanity. Significantly here is the mention of trust in God's 'measure' (or destiny as some would put it) with both elements of divine provision, the good and the bad. In a sense this is a tradition-based notion that divine providence leads to belief and trust even when things seem bad and suffering challenges our good opinion and comfort in God.

What is *iḥsān*?
Iḥsān is that you worship God as if you see God; and if you do not see God, know that God sees you.

This is the most important element for the spiritual traditions and has been much beloved of Sufis who find in this term the essence of their practice that goes beyond the moral obligations of the practice of the *dīn*. Acting and living in the presence of the divine as a comfort and as a guide to one's moral being lies at the heart of the notion of a spiritual path from and to God, of the desire to do and act for the best in the world, and especially to beautify one's world; the aesthetic element of life should not be ignored here and often explains the artistic impulses in and around the practice of 'religion'. Taken together this three-dimensional approach constitutes a popular providential account for the why, how, whence, and whither of the *dīn*.

10.2 Avicenna: Divine Creative Agency and the Mediation of the Prophet

Avicenna's theodicy is predicated on the Neoplatonic notion that providence concerns the intelligible design and order of the cosmos, God's creation and production of the good, and God's satisfaction with the best of all possible worlds (Ibn Sīnā 2005, 339; Inati 2000, 128). Providence concerns God's care for the cosmos or lesser beings such as us through the mediation of prophecy. Following the Proclean tradition, metaphysical (or essential) evil is a privation that is entailed by the lower status of matter as passivity and the source of discord (Inati 2000, 67–81). Moral evils, on the other hand, are accidental and existent, partly arising out of the fact of our embodiment:

> This existing apprehended thing is not evil in itself but in connection with this thing. As for the thing's lack of perfection and wholeness, this is not an evil simply in relation to [the thing] such that [this imperfection] would have an existence that is not an evil for [that thing]. Rather, its very existence is nothing but an evil in it, and in the [very] manner of its being an evil. For blindness can be only in the eye; and, inasmuch as it is in the eye it can only be an evil, having no other aspect in terms of which it would be an evil. As for heat, if, for example, it becomes an evil relative to the sufferer from it, it has another aspect in terms of which it is not an evil. Thus, evil in essence is privation, though not any type of privation but only privation of that to which the nature of the thing necessarily leads in terms of the perfections that belong permanently to its species and nature. Accidental evil [on the other hand] is the non-existent, or that which keeps perfection away from that which deserves it. (Ibn Sīnā 2005, 340)

Thus, (relative, broadly moral) evil is an accidental existence, as we see in this preceding discussion from the *Metaphysics of the Healing (al-Ilāhīyāt min al-Shifāʾ)*, book IX, chapter 6 on 'providence, showing the manner of the entry of evil in divine predetermination'. But he also mentions one important point that was raised in the Neoplatonic tradition, and as we shall see, was addressed by Mullā Ṣadrā, namely that there is on balance more good than evil in the cosmos because humans have free will as rational agents to choose to act and because often evils are relative entities that a good soul may choose with good intentions to good ends (Ibn Sīnā 2005, 341–42, tr. Inati 2014, 133, 144–58). This best of all possible worlds could not be otherwise even if we may conceive of a perfection existence that is devoid of evil. Avicenna states:

> This is not permissible in the likes of this pattern of existence, even though it is permissible in absolute existence as being one mode that is free from evil, which, however, is not this mode. This mode is among the things that have emanated from the First Governor and hence have [come] to exist in intellectual, psychological, and celestial things. This other mode, would, then remain in the realm of the possible. Refraining from bringing it into existence would not have been the same as in the case of that which exists because of what may be mixed with it by way of evil [that is such] that, if its principle did not exist to begin with, and [if the existence] of this evil is left out, this would result in a greater evil than it, so that its existence is the bet-

ter of two evils. Moreover, if this mode were not confined to the realm of possibility, it would then follow necessarily that the good causes prior to the causes leading accidentally to evil would not exist. For the existence of [the former causes] renders the others consequential on them. In this there would be the greatest fault in the universal order of the good. (Ibn Sīnā 2005, 343; see also Inati 2000, 147)

Avicenna therefore establishes a typology. Metaphysical evils are privative and derive from being a receptacle of matter and possibility, as well as dynamic realities that are necessary for the production and completion of the cosmos as it is. Moral evils are more relative and accidental, even contextual, some of which arise out of the desire of an evil soul afflicted by ignorance and inordinate concern for the pleasures of the flesh, and others out of the desire of a godly soul that intends the best.

Avicenna further addresses providence and the problem of evil at the end of *namaṭ* VII of his *Pointers and Reminders* (*al-Ishārāt waʾl-tanbīhāt*). Providence for him is God's knowledge of the whole cosmos (partly resolving the problem of God's knowledge of particulars) and its order and that knowledge is the producer of the good in the cosmos (Ibn Sīnā 2002, 333).

Remark

Things that are contingent in existence (*al-umūr al-mumkina fīʾl-wuǧūd*) include [1] things whose existence can be altogether free from evil, deficiency, and corruption; [2] things that cannot give their advantages except if they are such that a certain evil proceeds from them at the jamming of motions and the clashing of movable things. Further, in the division there are also [3] things that are evil either absolutely or for the most part (*immā ʿalā l-iṭlāq wa-immā bi-ḥasab al-ġalaba*).

If pure benefit is the principle of the emanation of good existence and befitting existence, then the existence of the first division must necessarily emanate, such as the existence of the intellectual substances and the like. Also, the second division must necessarily emanate. This is because in the privation of abundant good (*ḫayr kaṯīr*) and in the nonproduction of it, as a precaution against slight evil, there is great evil, illustrated by the creation of fire; for fire would not give its advantages and would not complete its assistance in perfecting existence unless it is such that it harms and hurts whatever animal bodies happen to collide with it. The same is true of animal bodies. They cannot have their advantages unless they are such that it is possible [A] for their states in their motions and rests, as is the case with the states of fire also, to lead to the coming together of clashes that harm; [B]

> for their states and the states of things in the world to lead to the occurrence of error from them in the knotting of harm for the afterlife and for the truth; or [C] for an excess of an acting predominant agitation, such as desire or anger that harms the possibility of the afterlife. The above-mentioned powers [such as fire] do not enjoy their richness unless they are such that accidental error and predominant agitation occur to them on the occasion of clashes. This is so in individuals that are fewer than those who are safe and at times fewer than those of safety. Because this is known in the prior providence, it is as if intended incidentally. Thus, evil enters the divine measuring (*al-qadar*) incidentally (*biʾl-ʿaraḍ*), as if it were, for example, pleasing [to God] incidentally. (Ibn Sīnā 2002, 333–35, tr. Inati 2014, 177–78)

Note evil accidentally pertains to the divine measuring or destiny (*qadr*) and not to the divine decree (*qaḍāʾ*); the latter concerns the divine realm of eternality while the former measures out what exists in the sub-lunary, temporal world of generation and corruption. The second division of contingents that are mixtures of good and evil must exist for the good to be done (Ibn Sīnā 2002, 336–37, tr. Inati 2014, 180). This is because of the erotic motion of the cosmos (as articulated in Avicenna's *Risālat al-ʿishq*), a point that Mullā Ṣadrā picks up when he argues that God decrees that all existents—whether intelligible, psychic, sensible, or natural—have ingrained within them a desire for perfection and movement toward completing the perfection appropriate to them; all these contingents lack perfection as such from their inception but all have the potentiality and the disposition to love and desire it and recognize the one who is higher in the hierarchy of being who can help them fulfill it (Šīrāzī 2004, VII: 197).

The account of how this providence provides for us as individuals takes us to the last chapter of his *Metaphysics* and the account of prophecy in which the prophet is a mediating figure, without whom nothing can be fulfilled or come to its full realization. Providence ensures that the act of grace and mercy that is the mediating prophet is available for humanity and the cosmos at large. The human mediation of the prophet and his historical contingency and particularity is also what ensures providence is particularized and not just universal, and reflects the specific care that God has for believers as well as the totality of humanity and the cosmos. God's providence does not leave humanity remote from divine transcendence but ensures a link through the 'divine humanity' of the prophet.

10.3 Mullā Ṣadrā on Providence, Evil, and Love

We now turn to the Shiʿi thinker Mullā Ṣadrā Shīrāzī (d. 1636). Providence pertains both to cosmological and epistemological approaches to understanding the nature of reality. It also provides a structured and ordered way of considering the question of why there is something rather than nothing and how things in phenomenal reality relate to one another hierarchically and how they seek their principle through the motivation of love. First, it might be worth contextualizing Mullā Ṣadrā's theodicy within the structure of his magnum opus *The Transcendent Philosophy of the Four Journeys of the Intellect (al-Ḥikma al-mutaʿāliya fīʾl-Asfār al-ʿaqlīya al-arbaʿa)*. The third 'journey' on theology proper is divided into 'stopping-points' (*mawāqif*) of which there are ten: the first provides the proof for the existence of God drawing upon the Avicennian tradition; the second considers the broad issue of the divine names and attributes; stopping-points III–VIII consider the 'essential' divine attributes such as omniscience (*ʿilm*, where the problem of God's knowledge of particulars is broached as well as his solution based on the identity thesis and presential knowledge), omnipotence (*qudra*), life (that God is *ḥayy*), perceiving and ever watchful (that God is *samīʿ* and *baṣīr*), and God's revelation and speech (that God is *mutakallim*). Stopping-points nine and ten pertain to extensions of providence: the former relates to the nature of the emanation of existence from God and the way in which the chain of being is related through the principle of 'nobler contingency' (*imkān ašraf*), and the latter is on the continuous care and munificence of the divine in the order of being as an expression of God's sempiternal power (*azalīyat qudratihi*).

At the beginning of *Mawqif* VIII on providence, Mullā Ṣadrā provides this crucial definition:

> There is no doubt that the Necessary Existence is the perfection of reality and above perfection, as is the case with some of the cherubim, the holy intellects perfect in their essences with their very ipseities conjoined with the True One. They do not do what they do out of purpose for what is below them in this cosmos. In sum, it is not proper for the higher causes to emanate actions purposes that would return those actions to them based on motivations prior to the act. If they were not perfect in word and essence but rather deficient relying for their perfection in a sense upon their effects, then this would be highly impossible. It is established that they do not have

a care for their actions nor any motivation that propels them nor any need that intervenes in their essences or a will additional to them; they are only led by the highest good and the loftiest most perfect light.

As for the True One, there is no purpose above him to which he looks for the effusion of the good and the radiance of the comprehensive mercy. In fact we witness in the existents of this cosmos and the parts of the order and the individuals of things—especially the flora and fauna, even in the universal archetypes among the spheres and the celestial principles—the beauty of governance and the generosity of hierarchy and the care for the optimal and the beneficial and the creation of powers and causes inclined to ends, repelling afflictions and corruptions. One cannot bear to deny the wondrous effects in the particulars of things, so how can one deny them of their universals?

Providence is the being of the One knowing through his essence what is in existence in the greatest good and the perfect order and being a cause through his essence of the good and of perfection to the greatest extent possible, and being pleasing. These three meanings—knowledge, causation and being pleasing—together constitute what providence means, all of them being his very essence, in the sense that his essence is knowledge of the order of the good and the same as the perfect cause for that order and the same as the pleasure from it—this is the eternal desire. His essence by his essence is the form of the order of the good in the loftiest and most noble sense because the True Being has no purpose, no limit in perfection beyond him. As it is so, then one can intellect the order of the good in the most complete form in the order and its perfection in contingency, so what one intellects as an order and as a good is emanated from Him.

This is the meaning of providence unadulterated by doubt and imperfection. Whoever believes otherwise such as those who claim that all is by chance as it attributed to some of the ancients or such as those who claim that the divine will is free of wisdom and end as is attributed to al-Ashʿarī or such as those who claim that there is a lowly end reverting to the creation, they have all been led far astray and are ignorant of the transcendence and simplicity of God the exalted: 'They do not consider God as is his due' (Q. 6:91). (Šīrāzī 2004, VII: 81–83)

Here one finds the definitions of providence already found in Proclus and Avicenna that stress why creation cannot be motivated by God's desire for what is ontologically lesser and how providence captures the intelligent design, the creative causation, and the satisfaction with the cosmos on the part of God. The stress in this passage upon divine wisdom (and not a passible desire for what is lower) for creating a providential order in the cosmos as it exists, is further glossed in five short chapters that are replete with scriptural citations in the middle of *Mawqif* VIII (Šīrāzī 2004, VII: 146–96). These chapters rehearse elements of cosmological and teleological arguments for the existence of God. Central is the discussion of the creation of the human in the most base of form as pure potentiality and matter but placing within that base thing a potentiality and disposition to seek perfection and perfect itself, drawing upon his principle of 'substance in motion' such that the human can be the best of the cosmos and its most noble aspect (Šīrāzī 2004, VII: 173–80). This is a deliberate play upon a reversal of the Qur'anic formula in *sūrat al-ṭīn* (Q. 95.4–5): 'verily we created the human in the best of form (*aḥsan al-taqwīm*), then we rendered him into the lowest of the low (*asfal al-sāfilīn*).[4]

In a critical chapter on the principle that the sensible and intelligible worlds are both created in the best of forms possible, Mullā Ṣadrā says:

> The Necessary Being (*wāǧib al-wuǧūd*) is the god of this cosmos (*ilāh al-ʿālam*) dissociated from any manner of deficiency, his existence is his essence and his reality is the most excellent of the modes of existence and the most perfect one (*wuǧūduhu allaḏī huwa ḏātuhu wa-ḥaqīqatuhu afḍal anḥāʾ al-wuǧūd wa-atammuhā*). In fact, his is the reality of existence and its quiddity. All save him is a ray and spark or shadow of him ....
>
> God knows everything other than Himself in the best manners because the knowledge-forms of things are His very essence. Things, therefore, have divine knowledge-forms before their actual existence, and these forms have a divine sacred existence. Whatever is a divine being is of necessity the most beautiful and magnificent (*fī ġāyat al-ḥusn wa-l-bahāʾ*). When the similitudes (*mithāl*) of these forms are actualized in the world of generation [and corruption] (*ʿālam al-kawn*), they must necessarily be the most magnificent and noble of what can be in the world of generation [and corruption]. (Šīrāzī 2004, VII: 142–44)

The supra-perfection and goodness of God and his non-teleological provision of existence and goodness constitute providence that is not selfish (Šīrāzī 2004, VII: 81). Divine providence requires each entity to arrive at its own perfection and the path that it may take is through prior shortcomings and 'evils'.

[4] For example, see Šīrāzī 2004, VII: 172–73, citing Q. 23.14, 40.67, and 76.1–2 on the way in which God's providential and wise creation of the human fluctuates between the two ends of the most base and the most perfect.

> An explanation that existents that revert and actual beings in the ranks of ascent in this world of composition are the most bountiful and in the most excellent order.
>
> The order of actualized things in this world pertain to the motions of the spheres and their positions and the order of the spheres is a shadow of the order of the world of the divine decree which as you have learned is the most perfect and complete. As it has been repeated and realized, these existents do not emanate by coincidence and by chance … nor by way of an arbitrary will … nor due to an incomplete will or an additional motive … nor due to nature or a consciousness that it has in its essence above its consciousness upon which it was emanated as the filthiest of materialists and atheists hold. Rather, the rational order which the philosophers call providence emanates from this existing order and it is the best and most excellent possible. (Šīrāzī 2004, VII: 150)

Everything in this order is necessary and natural to its disposition and neither arbitrary nor coincidental or by chance. Goodness in this sense is not the rational good of moral acts whose opposite is evil. Because the One is perfection and glory and ecstasy and pure light, everything is geared toward it especially since they are contaminated by evils. For Mullā Ṣadrā, evil as such, following the Neoplatonists, constitutes a privation in the essence of the thing or a privation or absence of perfection in a thing. Therefore, in itself, evil is privative even though we conceive of it as existent. He concludes the basic definition in this syllogistic form: If evil were an ontological thing, then evil would not be evil. Since the subsequent is false, therefore the antecedent is as well (Šīrāzī 2004, VII: 85–86). But what of those things that we consider to be evil such as death and ignorance and grief and pain and so forth? These are of two kinds, the first pertain directly to the one affected and harmed in the form of moral evils, and the latter are indirectly affected such as the clouds blocking the sun from benefiting us. Mullā Ṣadrā is more concerned with the former. They are so with respect to what the intellect and religion dictate (*al-ḏamm al-ʿaqlī wa-l-sharʿī*) but in and of themselves they are not evil. Mullā Ṣadrā says:

> The condemned moral characters that prevent human souls from reaching their intellective perfection, like avarice, cowardice, wastefulness, pride, and vanity, and such wicked acts as injustice, wrongful killing, adultery, theft, calumny, defamation, obscenity, and the like, are not evil in themselves but rather states of goodness emanating from being (*al-khayrāt al-wujūdīya*).

> They are [states of] perfections for natural entities and animal or vegetative powers that we find in the human. Their evilness is only in comparison to a higher and nobler power which, in its perfection, has command over the disobedient and noncompliant powers under it. (Šīrāzī 2004, VII: 88–89)[5]

In fact, some of the passions can be a good thing—we consider anger to be a negative trait and a passion. But insofar as it reflects the wrath of God it can be a good. Similarly, desire can be an evil if it leads one to fornication; but it is a good if it propels the soul toward what is better and acts as an erotic motivation (Šīrāzī 2004, VII: 140). He contends at the end of that discussion that there is nothing that is purely in existence or in the good that is condemnable, but it can only be considered so in a relative manner. What this raises is the distinction between two senses of evil: ontological evil or what we normally call *šarr*, and a rational consideration of moral acts that are called *qubḥ*.

Similarly, in his discussion of the meaning of the bounty of God in his exegesis of *sūrat al-Fātiḥa*, Mullā Ṣadrā considers a relative and perspectival approach to the question of good and evil. He begins by arguing that one can divide goods into those that are affected by themselves, those that are affected by another, and those that are affected by both themselves and others. An example of the first is the pleasure that arises from contemplating God and the felicity of meeting God. An example of the second is money because it is a means to something else. An example of the third is health. The second and the third must contain within the bounty and good a deficiency and an evil. From another perspective, he says that goods are of three types: beneficial, beautiful, and pleasurable. The first of these is ultimately useful, the second of these is good in all states, and the third is fleeting. Similarly, evils can be divided into harmful, ugly, and painful. Both good and evil are further divided into the absolute and the limited, with the former covering all three possibilities. An absolute good is knowledge which is beneficial, beautiful, and pleasurable. An absolute evil is compounded ignorance because it is harmful, ugly, and painful. However, on the limited side, we can have various compositions. For example, you can have something that is beneficial but painful such as the amputation of a diseased finger, or something which is beneficial but ugly such as stupidity because the stupid person feels contented (Šīrāzī 2010, I: 159–60). Similar to the latter case, in his exegesis on *Sūrat Yāsīn* is his

[5] See Kalin 2007, 199.

contention that something such as a satanic whispering may be a good in the here and now because it might be pleasurable but is an evil in the afterlife because acting in accordance leads to negative effects there (Šīrāzī 2010, VII: 362, 612).

Critical to Mullā Ṣadrā's notion that this is the best of all possible worlds with its mixture of perfections and imperfections in phenomenal reality is his notion of monism and the simple reality of the divine that is manifest in the role of the microcosmic human as the simple reality that brings all together. The totality of the cosmos as a singular person is the one thing that emanates from the True One; however, one can also consider the totality of the cosmos to be hierarchically arranged and gradually created as well. This goes to the heart of Mullā Ṣadrā's view of how the cosmos is contingent as a whole and a logical product of God but also in a process of gradually being created:

> If you were to claim:
>
> If the cosmos in its totality—I mean the macroanthropos (*al-insān al-kabīr*)—is one person who is the noblest of contingent beings because the cause of its instauration and the cause of its perfection is one thing, namely the Truth, then we would claim: this judgement applies to the first effect and in reality it applies to its similitude, therefore it follows that from the True One two things emanate which is impossible. It also entails that the existence of the two are of one species above the level of [the world of] generation [and corruption] and that also opposes the principle of philosophy.
>
> Its refutation is that from that it does not follow that there is multiplicity in reality, as we have previously verified that the perfection of the reality of a thing can only pertain to the level of its distant differentia which is the form in which all of its features are constituted. And you know that the thing in its form is that very thing and not in its matter. What emanates from the Truth is one thing which is the macroanthropos in its very personhood, but it can be considered in two senses—a holistic one and a more detailed one. And the only difference between these two modes of consideration is the mode of perception and not the actual thing perceived. If you consider the totality of the cosmos insofar as it is a simple reality you will judge that it emanates from the true One in a singular emanation and a simple instauration (*ǧaʿlan basīṭan*). And if you consider its detailed features one by one then you judge that what emanates from Him first is the most noble of its parts and the most perfect of its constituents which is the first intellect; since the intellect is all things—as has been mentioned—then all remaining things one by one are a hierarchy of nobler and nobler and more perfect and more

> perfect and similarly towards the more base in existence and the more weak in it [existence]. (Šīrāzī 2004, VII: 155–56)

Both the microcosm and the macrocosm are theophanies and one way to resolve the problem of evil is to consider this aspect of the created order. For Mullā Ṣadrā, it does not matter whether one considers the entirety of the cosmos as identical to the first thing emanated, the first intellect, or whether one looks at the detailed hierarchy and gradation within the order of the cosmos. Ultimately those 'rooted in knowledge' understand that the phenomenal multiplicity and the different stages of space and time do not violate the ultimate unity of what is created. It is the divine governance of the rational order of the cosmos that the lower and the imperfect seeks the higher and the more perfect, and that later plays a critical role in the perfecting of the former. So, for example, form perfects matter, and the intellect perfects the soul. Thus,

> [T]he manner of the True One with the intellect and the soul and the nature and all things in their constitution and bringing into existence and guidance and direction and providence and facilitating grace and mercy and munificence and grace is above all that. (Šīrāzī 2004, VII: 158)

It is because God is above the totality of the rational order that the goodness and perfection of that order reflects that of the divine. Thus far, Mullā Ṣadrā's theodicy seems akin to other Neoplatonic attempts to explain how evil can intervene in divine providence. But what makes his position more interesting is not only the further solution which re-introduces the role of *eros* into the cosmos but also his monism that arises from a deeper contemplation of divine simplicity.

In *Theophanies* (*al-Maẓāhir al-ilāhīya*), Mullā Ṣadrā contemplates the Avicennian notion of providence as an intelligible approach to the creation and knowledge of the entirety of the cosmos, because the 'simple intellect' (*al-ʿaql al-basīṭ*) that is the divine intellect encompasses all things and through its emanation of forms, it creates discrete knowledge that pertains to the essences of things that have issued from that simple intellect in their nature, in a manner that they—those things—are 'from it' and not 'in it' (Šīrāzī 1999, 46). This draws upon the presentation of the simple intellect in the *Theologia Aristotelis* and the notion of the perfection of the intellect (and indeed of it being above perfection—*fawq al-tamām*) (ps-Aristotle 1947, 110, 139–40, 156). In this context—as he often does—Mullā Ṣadrā quotes a Qurʾanic verse to justify: 'and with him are the keys to the unseen (*mafātīḥ al-ghayb*) none knows them but he' (Q. al-Anʿām 6.59) (Šīrāzī 1999, 47). The mediation is provided by the 'calamus' (*al-qalam*)—equivalent to the Neoplatonic *nous*—which like the divine is a simple intellect and a pure simple reality (*wāḥid ḥaqīqī basīṭ*). It is this that fashions the realities of things on the 'tablets of the souls and on the scrolls of hearts' (*fī alwāḥ al-nufūs wa-ṣaḥāʾif al-qulūb*). Although it is a lesser being than the true One, once again with reference to the revelation: 'there is nothing but that we possess its treasures' (Q. al-Ḥijr 15.21). Mullā Ṣadrā explains the synonyms of this first emanation: 'the first intellect, the great soul, and angel brought near and the most noble contingent … the Mother of the Scripture'—and as we have already seen, the perfect human, the microcosm. He relates this to the dual nature of providence that is explained in terms of the two aspects of who God decrees what exists in the created order through the theological notions of the 'measuring out' and the decree.

> There are … two levels to the functioning of the divine providence and its apportioning of the lot of contingents. The first is the intellectual measuring (*al-qadar al-ʿilmī*) out of the lot, which determines the forms of existents in specific spaces and times. The second is the extra-mental measuring (*al-qadar al-ḫāriǧī*) that pertains to the actual places and times of contingents. The higher intelligible realm of the *calamus* and the first nous is the locus of the divine decree (*al-qaḍāʾ*) but the lower level of the world of generation and corruption is where the measuring out takes place. (Šīrāzī 1999, 49)

In the *Wisdom of the Throne* (*al-Ḥikma al-ʿarshīya*), Mullā Ṣadrā puts forward a view that conflates the notion of divine providence with mercy that encompasses all things in his attempt to explain the existence of punishment in the hellfire—and we know that the ontological mandate of mercy is something dear to his version of apocatastasis. Just as the cosmos cannot exist without 'crude and rough souls, and extremely hard and cruel hearts', similarly because of the diversity and hierarchy of human souls, there is punishment in the hellfire that abides consistent with divine wisdom and providence (Šīrāzī 1981, 235–40). So it turns out that Mullā Ṣadrā collapses his understanding of divine knowledge and will, through the recourse to divine simplicity, into his presentation of providence.

For Mullā Ṣadrā, the created order is a monistic theophany.

> Every simple reality is all existential things except what pertain to all deficiencies and non-existences [in themselves]. The necessary Being—exalted is he—is a simple reality, simple in every sense and he is all existence just as the totality of him is existence. (Šīrāzī 2004, VII: 100)

The final section of the discussion of providence relates to the nature of love that God has made innate to all existents so that they desire and return to their principle. This section owes much to Ibn ʿArabī and earlier Sufi thinkers as well as the notions of Neoplatonic sympathy and motion inherited through Avicenna. Everything in the world of generation and corruption, every deficiency and imperfection has inbuilt the desire and love for what perfects and completes it. All beings are aware of this. As Mullā Ṣadrā puts it:

> It is necessary in divine wisdom and lordly providence and in the beauty of governance and the generosity of the providential order that in every existent there is love so that through that love it may acquire the perfection appropriate to it and a desire to acquire what it lacks. This is the cause for the whole of the order and the beauty of the hierarchy in the governance of every single individual. This love exists in every one of the things that exist necessarily such that it is concomitant to it and cannot be separated from it. If it were possible to separate it from it from one, then it would have need for another love which would preserve the first love. … So, love flows in all existents and in their parts. (Šīrāzī 2004, VII: 210–11)

Every beloved is the face of the divine and all love and desire for the beloved reverts back to God (Šīrāzī 2004, VII: 214–24). Love—erotic motion—accounts not only for the descent of being from God but also for its ascent and reversion. It also demonstrates the principle of accord and connection against discord and strife, overcoming plurality in search of unity. It resolves multiplicity as well as the problem of relative and parasitic evils. Mystics and Sufis have a major role in understanding this and indeed in teaching such a theodicy. It is therefore not surprising that Mullā Ṣadrā culminates his discussion with the grades of love and desire for God that the mystic has.

> Human love is of three kinds: the greatest, the middling and the lesser. The greatest is the desire for meeting God and yearning to grasp God's essence, God's attributes and God's acts. This yearning only occurs in mystics and

> the comparison of the loves, desires, and yearning of people to mystics is like the comparison of children's love and desire for games to adults in their pleasures and motivation. (Šīrāzī 2004, VII: 252)

All humans have love innate in their disposition as well as desire and the wish even to be dominant. The task is then to realize one's humanity to perfect one's rational soul so that one can achieve the highest sense of love. The mystic who has realized this then considers his paradise to be in the here and now—as well as in the afterlife—because his love has internalized the divine presence and therefore at times, he appears like the wise fool laughing at the commonality for their follies, their sins, their fear of punishment and of the hellfire and especially the folly of chasing after the material but fleeting pleasures of the world—false beloveds (Šīrāzī 2004, VII: 254–55). The task of the person who has realized her humanity in this life is to become like the lover who is purely focused on the beloved and does not become distracted by this world and its ephemeral attachments and carnal desires (Šīrāzī 2004, VII: 256–57). The lover understands that true pleasures are disembodied. It is not worthy of a creature of intellect and love to be like the beasts of the earth and desire the life of this world that will perish:

> The person of knowledge knows that the ways of the afterlife are more luminous, more ecstatic and more intense than the pleasures of this world since those things are real and everlasting while these this-worldly things are vain and perishing. The Prince of the Believers (ʿAlī), peace be with him, said: The hoarders of wealth die but the knowers are alive, everlasting over the duration of time, even while their persons are missed, their effect remain found in the hearts. (Šīrāzī 2004, VII: 258)

This quotation and the reference to ʿAlī brings us to the role of the mediation of the Prophet and the Shiʿi Imams as expression of divine love for humanity and the cosmos and the way in which our human attempts to love are channeled through love for them.

10.4 Concluding Remark

What can we draw from these historical accounts and from the archive of diverse Islamic thought? The neat coherence of these philosophical accounts do not necessarily speak well to most of us today. Perhaps, and this has been exacerbated by the current COVID-19 situation, the notion of a powerful loving God with care for the cosmos even in the face of the existence of moral and natural (and even horrendous) evils is a comfort more so if it attunes us to ethical imperative about care for self and for the other, for those around us and our communities. This is precisely where the notion of *iḥsān* comes back and remains a powerful idea that our agency remains in the sight and presence of the divine and the good in it is guided by that principle. The aspiration to do the best, to be the best, and to do what is beautiful becomes a moral inspiration that guides the life of a Muslim, that in a sense defines what is the best in the *dīn*, as a direct unfolding of divine providence in a motion back to God, ever-proceeding from Him and every-reverting to Him.

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PART V

Providence and Chance

CHAPTER 11

Reconciling Meticulous Divine Providence with Objective Chance

Robert C. Koons

11.1 Introduction

In the philosophical literature there are essentially two ways of defining randomness (Eagle 2018): as a characteristic of a chancy process and as a result with certain intrinsic characteristics (algorithmic or Kolmogorov randomness). In this chapter, I want to focus on the first way: an event is random just in case and insofar as it is the product of an objectively chancy process. By a chancy process, I mean one that has an objective probability of resulting in one of several alternative outcomes. This definition might be consistent with determinism, depending on our definition of objective chance: that is, it might be the case that a process is determined to have one specific result and yet also has an "objective chance" of having a different, counterfactual result. However, there is at least a prima facie tension between determinism and objective chance: it would seem reasonable to assign probability one to the result that is determined to occur and probability zero to all incompatible results.

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Some quantum physicists and philosophers of physics hope to do without objective probability altogether. This includes Quantum Bayesianism or QBism (Caves et al. 2002; Fuchs 2010). QBism builds on the work of earlier work of Jaynes (1968), de Finetti (1972), and others. The main problem for QBism lies in the interpretation of Born's rule, which directs us to assign a certain probability to certain outcomes, given a known quantum wavefunction. Jaynes tried to rely exclusively on symmetry considerations to derive their probabilities from quantum theory. However, as Fuchs explains, quantum probabilities go beyond classical probability's Principle of Indifference, since it constrains our judgments about both actual and counterfactual likelihoods (Fuchs 2010, 12). In addition, QBists face a dilemma. If probabilities are *merely subjective*—just autobiographical statements about our mental states—how can we "discover" probabilities by empirical study of external, physical processes? If, alternatively, QBists identify Born's probabilities with the normative probability of an *ideal* agent, we confront the similar problem of explaining how we can discover a normative truth through empirical method (Bacciagaluppi 2014). Fuchs even compares Born's rule to the Ten Commandments (Fuchs 2010, 8–9)! My own proposal (to be laid out in section 5) can be thought of as a way of making sense of QBism: identifying Born probabilities with normative truths anchored in God's intentions, and providing an account of how we can uncover facts about those divine intentions through empirical investigation.

Finding a satisfactory philosophical account of objective chance is a problem for everyone, but it is also a special problem for theists, especially theists who hold that God exercises a certain degree of meticulous providence over creation, that is, that God has in mind certain very specific, particular events that He intends, effectively, to bring about. Suppose, for example, that God intended for the astronomical, geological, and biological processes of creation to bring into being one particular human being, say Abraham, at a particular point in time. Since God is omnipotent, his intention could not fail to succeed. How, then, could Abraham's existence be, even in part, the product of chancy processes, processes with an objective chance of not resulting his existence (or the existence of any human beings, for that matter)?

There are two reasons for thinking this a serious question. First, it seems to be true that nature, as science reveals it to be, is filled with genuinely chancy processes. Quantum mechanics supports this idea in an especially acute fashion, since Bell's theorem rules out the most natural "ignorance" interpretation of quantum probabilities (i.e., the existence of local hidden variables). Second, many branches of science, including statistical mechanics and evolutionary biology, rely on statistical explanations of observed phenomena, explanations that presuppose that the phenomena in question are the products of chancy processes. If human beings exist because God effectively intended that they, specifically and in particular, should exist, in what sense could statistical explanations in evolutionary biology also explain why such a species as humanity should exist?

In a recent unpublished paper (Pruss 2016), Alexander Pruss discusses five ways of reconciling meticulous chance and meticulous providence that fail—or, at least, that fail in the absence of significant supplementation. These five ways are determinism, generalized Molinism, Thomism, divine luck, and the multiverse. We can also consider Peter van Inwagen's model for the existence of chance in a world sustained by God, which suffers from some of the same problems identified by Pruss. I will discuss these six failed reconciliations in Sect. 11.2. Pruss's own solution is a theistic version of David Lewis's best-fit theory of probabilistic laws. I present Pruss's solution in Sect. 11.3 and raise several objections to it in Sect. 11.4. My own proposal appears in Sect. 11.5: a divine command theory of rational credences, combined with the identifying of objective probability with a particular physical parameter (the square of the wave amplitude of the quantum wavefunction). I argue that this solution preserves the advantages of Pruss's account while avoiding my objections to it.

11.2 Six Failed Reconciliations

11.2.1 Determinism

We might first try a deterministic model of the universe. On this model, meticulous providence is easy to explain: God has simply to set the right initial conditions for the universe in order to obtain any possible history that he prefers. Given deterministic laws, his intentions are certain to succeed. But, as we saw, determinism seems prima facie inconsistent with objective chance.

However, this inconsistency might be only apparent. As Pruss points out, classical (pre-quantum) statistical mechanics made use of objective probabilities and statistical explanations, despite the fact that Newton-Maxwell dynamics were (almost) perfectly deterministic. Such classical statistical mechanics presupposes that we can identify objective probability with something like volume in a natural phase or state space: the larger the volume taken up by a set of states in that space, the greater its objective probability.

However, this underlying picture is inconsistent with meticulous providence. If God intentionally sets the initial conditions of the universe in order to achieve a set of preferred outcomes, then there is no sense in which volumes of initial conditions that would lead to outcomes incompatible with God's intentions had any finite probability. Pruss asks us to imagine a perfectly skilled coin-flipper, who is able to produce Heads or Tails at will. If the flipper produces a sequence that is close to 50% Heads, then the only explanation of this fact must go through the flipper's actual intentions. The fact that the Heads-producing and Tails-producing sets of initial conditions are approximately equal in volume is completely irrelevant.

11.2.2 Molinism

Molinism is the theory (based on the work of Luis Molina) that God knows all of the "counterfactuals of freedom," despite the fact that human free choice is always the result of an indeterministic process. That is, if C fully describes the relevant features of a possible human free choice F, then God knows (from all eternity) whether or not it is true that, if C were to obtain, F would result. Molinism also extends such divine "middle knowledge" to the realm of chancy processes. As in the case of determinism, it is easy to use Molinism to explain meticulous divine providence: God can once again obtain any specific result He wants, so long as the result is *feasible* (i.e., actually obtainable via chance processes, given the actual truth-values of the relevant counterfactuals of chance) by simply fixing the right initial conditions. But, also once again, generalized Molinism fails to secure the reality of statistical explanation for exactly the same reason that determinism fails to do so.

11.2.3 Thomism

We might reasonably suppose that the whole problem can be dissolved simply by relying on a central notion of Thomism: the distinction between *primary* and *secondary* causation. A result could be simultaneously chancy in the order of secondary causation (as produced by created causes) and completely determined in the order of primary causation (as specifically intended by God). I will argue in Sect. 11.5 that a variant of Thomism is part of the correct reconciliation, but Pruss points out an oddity that must be confronted.

For Thomists, the event that is C's causing E (for any creaturely cause C and effect E) coincides with metaphysical necessity with the event of God's willing that C cause E: any world containing one must also contain the other. Hence, if the objective chance of C's causing E is x, then the objective chance of God's willing that C cause E must also be x. Thus, we seem to be forced to attribute a kind of probabilistic propensity to God's own volitions, as though God contained a kind of chancy causal mechanism, like an internal dice-throwing process, which is surely inconsistent with God's simplicity and arguably inconsistent with divine aseity, freedom, and perfection. It is surely the case that God acts indeterministically, but to project a mathematical measure onto God's alternatives would seem to subordinate his decision-making process to something both internally complex and distinct from God's essence. It is also implausible, as Pruss observes, that any such internal divine propensities would coincide perfectly with physically based propensities discoverable by empirical science.

11.2.4 Divine Luck

On this model, God intends to bring about a particular event E. He sets up initial conditions that lead to a chancy process P, a process which has some probability of producing E spontaneously and some objective probability of not doing so. God intends to intervene miraculously if P does not produce E spontaneously. If God is lucky, E will result from P, in which case E's occurrence will have been, unproblematically, overdetermined. If God's intentions are highly specific and if the processes involved have propensities that are associated with probabilities significantly less than one, then God would have to be *very* lucky for this reconciliation to be successful.

11.2.5 Multiverse

The last model could be improved by adding many universes. With each additional universe, the chances of God being sufficiently lucky in at least one of them improve. With enough universes, the chance of sufficient luck in at least one approaches certainty. This would work, but it makes it very unlikely that we inhabit a universe in which God's intentions are realized.[1] In addition, we might well suppose that God intends particular events to occur in each universe, in which case the existence of additional universes is irrelevant.

11.2.6 Peter van Inwagen's Model

Peter van Inwagen (1988) argues that God can decree that the created world contains chancy processes, while simultaneously decreeing that these processes will eventuate in very specific outcomes. To simplify, suppose that there is just one process P, which undergoes a series of chancy transitions, T_1, T_2, …, T_n, with each T_i having a range of possible outcomes $E_{i,1}$, $E_{i,2}$, …, $E_{i,m}$ associated with objective probabilities $P(E_{i,1})$, $P(E_{i,1})$, …, $P(E_{i,m})$. These transition probabilities are particular, single-case facts about the outcomes—as we shall shortly see, they are not fully determined by the underlying physical or psychological symmetries. Ordinarily, we would think that the probability of the occurrence of some final (*n*-stage) outcome $E_{n,j}$ would be the product of the probabilities, $P(E_{1,j})\cdot P(E_{2,j})\cdot\ldots\cdot P(E_{n,j})$. However, in van Inwagen's model, these joint probabilities can deviate significantly from the corresponding products (i.e., objective probability is non-Markovian in van Inwagen's universe).

Suppose that God intends a *disjunction* of final events ($E_{n,1} \vee E_{n,2} \vee E_{n,3} \vee \ldots \vee E_{n,m}$). Ordinarily, we would take the probability of this disjunction to be the sum of the probabilities $P(E_{n,1}) + P(E_{n,2}) + \ldots + P(E_{n,m}) = \Sigma P(E_{n,i})$, which will be much less than one. However, van Inwagen imagines that God's decree can provide this disjunctive event with a probability of *one* (thereby elevating the probability of one or more of the disjuncts, and lowering the probability of contrary histories). Thus, God can decree that *some* event in the set $E_{n,i}$ occurs, without decreeing *which* member of the set it is that occurs. God can leave it up to chance, in effect, leave it up to the chancy process P, to determine *which* member of the disjunction is actualized.

[1] As Enis Doko has pointed out (in correspondence) this depends on assuming that each of the universes is equally real. God could create an infinity of simulated universes and then decide which of them to realize. This suggestion raises a new problem: what is it for a fully detailed simulation to become "real"? What are the unreal universes lacking? Can we tell that we have this indefinable element of "reality"?

Van Inwagen does succeed in giving us a world in which there are both objective chance and a limited degree of meticulous providence. It is essential to van Inwagen's model that God does not decree every detail of history. He can decree that specific *types* of events (although not, perhaps, particular events) occur at particular junctures in the history of the world, while leaving it to chance *how* these event-types are brought about. There is, however, a serious drawback to van Inwagen's model. The actual objective probabilities depend in a very sensitive way to God's specific intentions and might therefore deviate in some (and perhaps in very many) cases from the objective probabilities as we would ordinarily determine them in empirical science, that is, from observed frequencies of similar setups. It is hard to see how empirical science can incorporate into the boundary conditions facts about divine intentions relating to the remote future. In addition, the van-Inwagen-objective-chance of a particular event would not always be determined solely by the volume of a corresponding region in a natural state space but would rather also depend on which further events that event is likely to lead to and whether those further events are subject to God's decrees. This would seem to lead to a pervasive skepticism about objective chance.

Finally, we might reasonably suppose that God's decrees include the occurrence of particular events with particular participants and not just disjunctions of such particular events. For example, it seems plausible to suppose that God intended Abraham himself to exist, and not just Abraham or some Abraham-like counterpart. Such particular intentions would be incompatible with van Inwagen's model (except for intentions about the initial state of the universe).

11.3 Pruss's Solution: A Theistic Version of Lewis's Best-Fit Model

11.3.1 Lewis's Best-Fit Model

Pruss's new solution to the reconciliation problem builds on David Lewis's best-fit model of objective chance (Lewis 1980, 1994). Lewis's model was an extension of his own earlier work (Lewis 1973) on the Mill-Ramsey best-system theory of the laws of nature (Mill 1947; Ramsey 1978). According to the Mill-Ramsey-Lewis account of laws, a *law* is a theorem of the best axiomatic system of the particular natural facts of the actual world—the "Humean mosaic" of intrinsic qualities distributed across space and time. A system is *best* just in case it achieves the best combination of three values in relation to the actual mosaic: accuracy, comprehensiveness (strength), and simplicity.

The best-fit model of objective chance extends this model to include probabilistic laws. A probabilistic statement is a statement of objective chance (relative to the Humean mosaic of the actual world) just in case it achieves the best combination of intrinsic simplicity and fit to actual frequencies. The *degree of fit* between a probabilistic law and a corresponding frequency is simply a measure of the deviation between the two: the smaller the deviation, the closer the fit.

Lewis's best-fit model is a modification of the theory of frequentism of Hans Reichenbach (1949) and Richard von Mises (1957). Frequentism identifies objective chance with long-run relative frequencies. The fundamental problem with the simple frequentist model is that we expect there to be some deviation between objective chance and relative frequency, especially if the relevant class is relatively small. We would not be surprised if it turned out that 50.0000001% of radium 223 atoms decayed in 11.43 days, even if the objective probability of decay in 11.43 days was exactly 50%. However, the frequentist must insist that objective probabilities *always* coincide *exactly* with relative frequency. On Lewis's best-fit model, this conclusion is not forced on us. We can trade a slight deviation for a simpler probabilistic law.

11.3.2 The Explanatory Weakness of Lewis's Chance

However, Lewis's best-fit model does inherit another central problem for frequentism: Lewisian objective chance cannot *explain* actual frequencies, since it ultimately *depends* on them. Suppose we observe a relative frequency F that is very close to the Lewisian best-fit probability *r*. Can we use the Lewisian probability to explain why F is close to *r*? No, because the fact that F is close to *r* is part of the metaphysical explanation of why there is a probabilistic law assigning *r* (and not some other number) to the relevant class of events. To use Lewisian probabilities to explain statistical frequencies would thus be viciously circular.

Here Pruss and I are rejecting accounts (like those of Loewer 2012) that draw a sharp separation between scientific and metaphysical explanation. The two modes of explanation are probably distinct, but it is hard to accept mixed cases of circularity, that is, cases in which the fact that p scientifically explains the fact that q, while the fact that q metaphysically explains the fact that p. Realists about explanation have to suppose that any case of an explanatory relation involves a form of real, asymmetric dependency. (Thanks to Aaron Segal for bringing this to my attention.)

Here is where theism can help, as Pruss observes. Let's say that we have a probabilistic law of nature assigning an objective chance r to some class of outcomes E just in case God intends for the frequency of E to be close to r, as close as possible given his other aims and constraints. In other words, let's suppose that God intends for S (a system of laws, both deterministic and probabilistic) to be the best system of laws for the world as it actually comes to be. If it is a theorem of S that event E has probability r, then r is in fact E's objective chance of occurring.

Pruss imagines that we can talk meaningfully about the internal structure of God's intentions. God intends that certain facts should obtain for the sake of certain other facts. In the case at hand, God intends certain particular facts in the mosaic for the purpose of making a certain system of laws (S) the best system of laws for the resulting world. God has intentions about what laws the world exhibits, and not just about individual events, taken one at a time.

In Pruss's revised model, we can use objective chance to explain actual frequencies. The frequencies are (typically) close to value of the corresponding objective chance, and they are close to those values *because* the values represent objective chance, since God arranges things so as to make the fit as close as possible. The value of the objective chance depends on God's intention, not on the actual frequencies. The actual frequencies, in turn, depend on the chances.

11.3.3 Saving the Principal Principle

Pruss's revision also solves a serious problem that Lewis (1980) noted with his own best-fit model: it comes into conflict with a widely accepted principle that constrains the relationship between rational credences and objective chance, the "Principal Principle" of probability.

$$\textbf{The Principal Principle}.\ \text{Credence}\left(\text{E}/\left[\text{H}\,\&\left(\text{Chance}\left(\text{E}\right)=r\right)\right]\right)=r$$

Let's suppose that r is significantly greater than 0, for some event-type E. Let E^* represent a very large and improbable ensemble of n occasions for E-type events in the future (beyond the scope of H), in which the relative frequency of E-type events is much lower than r—for simplicity's sake, let's set it at *zero*. The chance of E*'s occurring should be small but finite, something like $(1 - r)^n$, assuming independence. Now, apply the Principal Principle. We can infer that our credence in E*, conditional on Chance(E*) = $(1 - r)^n$ and H, must itself be $(1 - r)^n$.

However, given the best-fit theory, it seems that E* is actually inconsistent with Chance(E*) = $(1 - r)^n$. It is metaphysically impossible for both to be true. In a world in which E* occurs, the relative frequency of E must be much lower than r, since the actual frequency of E in such world must be far less than r. The laws of probability ensure that the probability of one proposition conditional on a proposition inconsistent with it must be *zero*. Hence, the credence of E*, conditional on Chance(E*) = $(1 - r)^n$ and H, must be zero. But $0 \neq (1 - r)^n$ and H. Contradiction.

Pruss's model differs from Lewis's in this respect. It is *not impossible* in Pruss's account for the frequency of E and the chance of E to be far apart. Pruss's model stipulates that God must intend to make the frequency of E as close as possible to the chance of E, *given God's others aims and intentions*. It is certainly conceivable that in certain cases God might have overriding reasons, reasons that would lead him to permit a wide deviation of frequency from chance. We might even be able to conceive a world in which every frequency deviates widely from its objective chance.

Lewis (1994) thought that he had overcome this problem (or "bug") by focusing on the "admissibility" of the proposition Chance(E*) = $(1 - r)^n$. The Principal Principle can be applied only if the information on which the credence of E* is being conditioned is *admissible* at the time to which it is being applied. That is, we cannot condition on a proposition that contains (even implicitly) future information relevant to the occurrence of E*. But, given the best-fit model of chance, that is just what Chance(E*) = $(1 - r)^n$ does—it implicitly provides information about the *future* frequency of E, since a proposition encoding an objective chance is covertly a proposition about a global relative frequency (including the future).

But, as Lewis recognized, to his temporary dismay (Lewis 1994, 485–6), this seems to make any application of the Principal Principle fallacious, given the constraint on inadmissible information and the best-fit theory of chance. Lewis argued (Lewis 1994, 486–7) that he could get around this by seeing that admissibility is a matter of degree. The Principal Principle is never strictly and exactly correct, but it can be *approximately* correct, so long as the proposition about chance does not provide *too* *much* information about the future. And that is exactly what the proposition that Chance(E*) = $(1 - r)^n$ does in our present case, explaining the total failure of the application of the Principal Principle.

This was an ingenious solution but ultimately an unsatisfying one. As Lewis admitted, the Principal Principle is central to our concept of objective chance. Such a constitutive principle must be exactly correct—mere approximation is just not enough. Lewis's approximate solution is a bug, not a feature.

11.3.4 Pruss's Reconciliation of Providence and Chance

Pruss's model can be fruitfully combined with three of the attempted reconciliations: determinism, generalized Molinism, and Thomism. I prefer the combination of Pruss's model with Thomism. As Pruss points out, his model resolves the oddity that we noted earlier: the fact that the objective chance of an event's occurrence corresponds with the objective chance of a corresponding divine intention. Now we can ask: what is the truthmaker for the claim that the objective chance of God's intending E on occasion C is r? The answer is this: the divine intention has chance r because God intends that the frequency of such intentions be as close to r as is possible. This clearly does not involve attributing to God some peculiar, subpersonal machinery within his decision-making process. Hence, the oddity is resolved in a satisfactory manner.

The Pruss-Thomist model can now reconcile meticulous providence with objective chance quite easily. We can now see why it is possible to explain a particular event (like the existence of Abraham) *both* as the result of an effective divine intention *and* as the result of a certain chancy processes. God intended (and caused it to be the case, in a primary mode) that Abraham's existence be explained in terms of secondary causation, including statistical explanations involving objective chances. Objective chances do really explain actual results, via God's intentions that they should do so (i.e., his intentions that the actual frequencies should approximate chances as closely as possible).

11.4 Some Objections to Pruss's Account

Pruss's account is clearly an improvement over Lewis's, and I believe that it is at least on the right track. Nonetheless, there are two problems or apparent problems, which should motivate us to look for a revised model.

11.4.1 The Gambler's Fallacy

The Pruss model would seem to license a version of the Gambler's Fallacy. Suppose that I know that there are only k possible occasions for the occurrence of an event of type E, and suppose that I have observed the first $k - 1$ occasions. Suppose further that, on these first $k - 1$ occasions, an E-type event has occurred exactly $k/2$ times. Thus, I know that the relative frequency will be very close to ½. Given the value of simplicity, that gives me good reason to think that the objective chance is exactly ½, that is, that God has intended for the relative frequency to be as close to ½ as possible. If an E-type event occurs on the last occasion, the frequency will be somewhat over ½—it will be ½ + $1/k$. If instead a non-E-type event occurs, the frequency will be exactly ½. Thus, I have good reason to expect that we will *not* see an E-type event on the last occasion, even though the objective chance for the occurrence of such an event is ½. This reason need not be conclusive—*any reason at all* to prefer the non-occurrence of the E-type event to its occurrence on the last occasion is sufficient to falsify Pruss's model.

The Pruss model might be salvaged if we could identify a higher-order law or regularity that applies in this case. The first thing to note is that we should distinguish between objective chance and objective probability. An objective probability is a chance only when it is the conditional probability of an event-type conditional on *all causally prior facts*. See Pearl (2000) for details, especially chapters 1 and 2. So, in the aforementioned example, we need to consider the objective probability of an E-type event occurring on the last occasion, given that it has already occurred $k/2$ times on the previous $k - 1$ occasions. This defines a new event-type, which we can call type E^+. Given the hypothesis, there is only one possible occasion on which an E^+-type event can occur, so its relative frequency must be either 0 or 1. However, we might be able to find a more general class of event-types, call it F, that subsumes E^+ along with a large number of other, relevantly similar event-types. The objective chance of the occurrence of an F-type event will also be ½, so God will have good reason to make the relative frequency of F-type events as close to ½ as possible. Once I realize that the E^+-type event is a member of this F class, I have good reason to anticipate its occurrence with a credence of exactly ½, as required to avoid the Gambler's Fallacy.

Nonetheless, there still seems to be *some* grounds for being biased against the occurrence of an E-type event on this last occasion, given the value of matching perfectly a simple probability. But any bias will lead to a rational deviation of subjective probabilities from known objective chance, in contradiction to the Principal Principle.

11.4.2 The Credence/Chance Conceptual Gap

Finally, we can ask whether the Lewis-Pruss model is able to explain the normative bite that the Principal Principle represents. Why is it rational for us to apportion our credences according to the weights of objective chance? For both Lewis and Pruss, objective chance corresponds (at least approximately) to long-run, global relative frequency. But why should my subjective probability about any particular event correspond to global, long-run relative frequencies of similar events in similar circumstances? As John Maynard Keynes is supposed to have quipped, “in the long run, we’re all dead.” What would be *irrational* about setting my subjective probabilities about particular cases in a way that disregards such long-term facts and symmetries?

11.5 A Divine Command Theory of Rational Credence

11.5.1 The Model and Its Advantages

Robert M. Adams’s divine command metaethics built upon earlier work in philosophical semantics by Keith Donnellan (1966), Saul Kripke (1972), and Hilary Putnam (1975), work which demonstrated the existence of necessary truths that are neither analytic nor knowable a priori. For example, it is a necessary truth that Venus is identical to Venus, and so it must also be a necessary truth that the Morning Star is identical to the Evening Star, since both phrases are simply names of Venus (Kripke 1972, 97–105). Similarly, since water is necessarily identical to water, water must be necessarily identical to H_2O, since both “water” and “H_2O” are names for the very same substance (Putnam 1975, 196–290). Nonetheless, these truths are not analytic or knowable a priori. No amount of reflection on the meaning of “the Morning Star” or our concept of water could ever have led to the discovery that the Morning Star is the Evening Star, or that water is H_2O. These discoveries were empirical, learned a posteriori. Thus, we have a posteriori necessities and identities.

In a similar way, Robert Adams (1979) proposed that the property of being morally wrong is identical to the property of being forbidden by God.[2] Adams does not suppose that we can infer this identity by mere reflection on our concept of moral wrongness. The identity is discovered through a kind of theological and metaphysical inquiry that could be labeled "a posteriori" in relation to metaethics. Despite this conceptual novelty, Adams proposed that the property we are in fact thinking of when we think of moral wrongness is the property of being forbidden by God.

I propose adapting Adams's metaethics to the case of a certain cognitive or intellectual deontology, that is, the *rational necessity* of conforming our subjective credences to certain normative principles. In our intellectual lives, as in our moral lives, we encounter certain categorical imperatives (to use Kant's phrase): things that we must do or not do, regardless of their consequences in particular circumstances. We ought always to avoid logical inconsistency, and we ought to modify our credences in order to bring them in conformity to standard axiomatizations of probability (such as Kolmogorov's or Popper's). And, to come to the present case, we ought to conform our credences to our expectations of objective chance. On my theory of meta-normativity, these rational imperatives are in fact divine commands—things we are commanded by God to do in our intellectual lives.

I am assuming, for this model, that the relevant credences are subject to our voluntary control—that they consist in our making certain judgments of probability. Once we see that our judgments of probability are in conflict with the axioms of probability or with the Principal Principle, we are *obliged* (in a special, non-moral sense) to alter them in order to avoid the conflict.

How are these commands promulgated by God and known by us? Not, of course, by being carved in stone on Mt. Sinai. Rather, they are promulgated by being incorporated into certain normal operations and inclinations of the human mind. In this way, atheists and agnostics can be aware of the normative facts, without correctly understanding their metaphysical basis. In this respect, the laws of correct probabilistic thinking are like the natural moral law of Thomas Aquinas (see *Summa Theologiae* I–II, q90, a4).

[2] Adams actually writes "forbidden by a loving God," but since I assume that God is necessarily loving, I can omit this qualification.

In order to connect rational credence with objective chance, we have to suppose that objective chance corresponds to some real (possibly physical) parameter. In other words, God's command is that we apportion our credences to correspond to this chosen parameter. Since God is rational and benevolent, he has good reason to make the relative frequencies match the objective chance as closely as possible, since otherwise he would be issuing general commands that would lead rational agents to act suboptimally in the long run.

What is this special parameter? In classical mechanics, it would correspond to the volume of an event in a natural state space. In quantum mechanics, there is an even simpler and more concrete parameter: the square of an event's quantum wave amplitude.

Thus, the model has a three-step structure:

(A) God creates a special physical parameter (e.g., wave amplitude, in the case of quantum mechanics, or a coarse-graining of a state space, in the case of classical statistical mechanics).
(B) God commands that all rational creatures apportion their credences in accordance with some fixed function of that parameter (e.g., the square of the amplitude—the amplitude times its complex conjugates).
(C) God has good reason to make the corresponding relative frequencies fit the rational credences as closely as possible, so that rational creatures who conform to the divine command would act optimally in the long run.

As in Pruss's model, my model can use objective chance to explain actual frequencies, thanks to step C of the model. Step A clearly closes the chance/credence conceptual gap. The model also avoids the Gambler's Fallacy, since we have good reason to conform to sound probabilistic principles (in order to conform to divine commands), and God has good reason to make frequencies optimal for rational agents in all circumstances, including the peculiar ones outlined in my scenario. Finally, there is no problem with the Principal Principle, since the correspondence of credence and chance is guaranteed immediately by the identity of chance with divine commands.

Why is step (A) necessary? Couldn't God have simply issued commands concerning our rational credences, without introducing a particular physical parameter? (Thanks to Aaron Segal for raising this point.) In my model, step (A) is needed to provide the particular content of God's commands in step (B). Here's an analogy. Suppose God commanded us to love our neighbor, that is, to aim at promoting our neighbor's welfare. Such a command presupposes that there is such a parameter as individual welfare. In a similar way, step (B) presupposes that there is some variable, physical parameter upon which our rational credences are supposed to be based.

11.5.2 Objections

First, one might object that any divine command theory of normativity suffers from a vicious circularity. We would have to assume that there is a norm enjoining us to obey God's commands, but how can such a norm exist if all norms depend on God's commands? Robert Adams considered this objection in his essay, and he responded that his theory does not need any deontic norm directing us to obey God: it is sufficient if we have good reason to value such obedience. Not all reasons to act are constituted by deontic norms: there are also non-normative values to consider. In the case of God's commands, there are many reasons, independent of both morality and cognitive normativity, for valuing obedience. We value a good relationship with God, and, given the asymmetry in knowledge and character, such a good relationship depends on our obedience to his commands. Given God's creation of us and his subsequent generosity, we value our obedience as an expression of gratitude. It is aesthetically fitting that we should defer to God's commands, given the ontological asymmetry involved.

None of these reasons for obeying God's commands need be active in cases in which we feel bound by cognitive norms. It is sufficient that there exist good reasons to conform to those norms, whether or not we grasp what those reasons are. It is enough if we grasp the somewhat inchoate fact that there must be some good reason for us to conform to the norms we recognize, like the Principal Principle.

Second, there are grounds for worrying that my step C will not apply to cases that are beyond all human knowledge and concern. God's benevolence for us may give him reason to make relative frequencies stick close to objective chances within the bounds of human knowledge and concern, but what could motive him to do so beyond those bounds? In response, I could argue that human beings do form beliefs in the form of unbounded, global generalizations. Physicists may well form the belief that the cosmic relative frequency of physical events matches closely the probability amplitude of those events. If we assume that God cares about whether we believe or have high confidence in truth or falsehood, regardless of whether we are ever able to verify these beliefs empirically, and regardless of whether these beliefs are of any practical import to us, then God does have sufficient reason to bring all relative frequencies close to the corresponding objective chances.

Third, Jeff Koperski has raised (in correspondence) the following worry. What can I say about people who are ignorant about the relevant divine commands? Didn't people assign probabilities rationally (or irrationally) prior to the discovery of quantum mechanics, and even prior to the discovery of classical statistical mechanics? Certainly, they did. Remember, first, that I am building on Robert Adams's account of divine command theory, which is explicitly a theory of a posteriori identity. Probabilistic rationality and irrationality do not depend on being aware of God's epistemic commands as such (i.e., under that theological description). Moreover, one cannot be even *materially* (so to speak) in violation of God's commands relating to quantum wave amplitudes without being aware of those amplitudes. Thus, the discovery of quantum mechanics involved the uncovering of new norms, norms that are as a matter of metaphysical fact (but not as a matter of a priori intuition) grounded in divine intentions. Prior to the discovery of the physical foundation of statistical mechanics, people could still violate other norms of probability (such as those encoded in the Kolmogorov axioms), but obviously they could not act contrary to God's intentions vis-à-vis quantum wave amplitudes or state space volumes. Progress in normative knowledge is possible in empirical science, just as it is possible in moral or political theory. As I mentioned in the Introduction, my proposal can be seen as providing metaphysical foundations for the similar claims made by Quantum Bayesians.

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CHAPTER 12

Creatio Continua and Quantum Randomness

Emil Salim and Shoaib Ahmed Malik

12.1 Introduction

What does the doctrine of creation have to do with the issue of randomness? Orthodox Christian and Islamic traditions hold that God initially created the universe out of nothing. By itself, creation out of nothing doesn't dictate whether randomness exists or not in the universe. It is not God's act of creation that seems to be directly relevant to the existence of chance or fortune in the world, but God's governance.

Some schools of thought in the Christian and Islamic traditions, however, hold that God also continuously creates the universe after its initial creation out of nothing. In its most radical version, the doctrine says that God continuously recreates the universe out of nothing in each successive instant (Edwards 1970, 401–404). Although the doctrine of creation out

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of nothing (*creatio ex nihilo*) may not have a direct impact on the issue of randomness, the doctrine of continuous creation (*creatio continua*) surely does.[1]

This paper will discuss what we call The Common View of the doctrine of continuous creation that we offer as a common denominator between the Christian and Islamic traditions.[2] It will also discuss whether there is a place for ontological quantum randomness in the universe if the doctrine of continuous creation is true. Ontological randomness is different from epistemic randomness. The latter has to do with human cognition and its limitations. Events appear to be random because our minds do not have the necessary information to understand why things happen the way they do. By contrast, ontological randomness is independent of human cognition, but concerns the causal nexus of entities that is deprived of efficient or final causation. In this paper, we argue that The Common View of the doctrine of continuous creation would preclude ontological randomness.

For clarity, let's first distinguish two interpretations of the doctrine of continuous creation. First, "the doctrine of continuous creation *qua* recreation" (CC_{Rec}) says that continuous creation is conceptually equivalent to continuous conservation, but interprets continuous creation as continuous recreation. In this interpretation, objects constantly go out of existence and come into being by God's continuous *ex nihilo* recreation. Second, "the doctrine of continuous creation *qua* sustenance" (CC_{Sus}) also says that continuous creation is conceptually equivalent with continuous conservation, although it rejects that objects continuously vanish and are being recreated by God. In CC_{Sus}, continuous creation is merely continuous sustenance, without repeated *ex nihilo* creation. We also stipulate $CC_{Rec/Sus}$ as a blanket term for "continuous creation," which can be specified further into CC_{Rec} or CC_{Sus}.

[1] Pannenberg suggests that the concept of divine providence has three aspects: conservation, concurrence, and government (Pannenberg 1988, 8–9). In some theological traditions, conservation is considered equivalent to continuous creation. For this reason, the doctrine of continuous creation is very relevant to the issues of randomness and providence.

[2] This paper will not discuss the steady-state theory of Bondi and Gold, which was discounted by the presentation of the cosmological microwave background radiation that favors the Big Bang theory. This theory is sometimes called the "continuous creation" theory (Bondi and Gold 1948; Karimi 2011). For a panentheist-idealist version of the doctrine of the continuous creation, which will not be considered here, see Schultz and D'Andrea-Winslow 2017. Karl Svozil uses the term "creatio continua" to refer to "indeterministic" generation process that results in quantum randomness (Svozil 2016, 28). Svozil's usage of "creatio continua" is not how we understand the phrase in this paper.

Definition 1.1 $\mathrm{CC}_{\mathrm{Rec}}$[3] God continuously recreates everything *ex nihilo* in successive instant. Objects continuously come into being and go out of existence. Continuous creation is not simply continuous sustenance.

Definition 1.2 $\mathrm{CC}_{\mathrm{Sus}}$ God continuously creates everything, but objects don't continuously come into being and go out of existence. Continuous creation is simply continuous sustenance and not *ex nihilo* recreation of objects.

Definition 1.3 $\mathrm{CC}_{\mathrm{Rec/Sus}}$ God continuously creates everything, but "continuous creation" can be interpreted as either continuous *ex nihilo* recreation ($\mathrm{CC}_{\mathrm{Rec}}$) or merely continuous sustenance ($\mathrm{CC}_{\mathrm{Sus}}$).

We also need to note that when we use the word "conservation" without further specific information, we utilize it as a general term without specifying it as conservation qua continuous recreation or conservation qua mere sustenance.

12.2 The Christian Traditions

The Christian tradition has a long history of the doctrine of continuous creation, especially during the medieval and early modern periods. The doctrine also finds a way into contemporary analytic philosophy of religion.

12.2.1 Nicolas Malebranche

Malebranche (1638–1715) argues that God's continuous creation ($\mathrm{CC}_{\mathrm{Rec/Sus}}$) ranges over both (a) the existence and (b) the determinate properties of objects, including their spatiotemporal coordinates. His argument for (a), namely, for the continuous creation ($\mathrm{CC}_{\mathrm{Rec/Sus}}$) of objects, is the argument from dependence: since creatures are metaphysically dependent on their creator, there isn't a possible world in which creatures exist but their creator (*per impossibile*) no longer does.

[3] In Sect. 12.4, we will stipulate that $\mathrm{CC}_{\mathrm{Rec}}$ is identical to what we shall call "The Edwards-Ash'arite Thesis."

For Malebranche, continuous creation ($CC_{Rec/Sus}$) ranges over the determinate properties of objects, such as their location.[4] His argument is that because the universe and its complete features are immediately created by God in every successive instant, there couldn't be a previous (or a subsequent) time-slice in which the properties of an object can be determined by God other than in the very instant the universe is created (Miller 2011, 5). Instead, the imparting of all of the objects' determinate properties must be done by God simultaneously with the objects' coming into being, that is, at the moment of creation. It is simply inconceivable, according to him, that a chair exists unless it exists "somewhere, either here or elsewhere" (*Dialogues* VII.VI).[5]

12.2.2 René Descartes

Descartes (1596–1650) is another author who believes in the doctrine of continuous creation ($CC_{Rec/Sus}$). The Cartesian argument for continuous creation ($CC_{Rec/Sus}$) is an argument from the impotence of the objects to persist on their own over time. In the *Third Meditation*, he argues that an extended body does not have the power to ensure its existence in a future time. Because time is divisible into countless parts which are completely independent of one another, there is simply no guarantee that an object at time t_1 can assure its existence at time t_2 where $t_2 > t_1$. The existence of an object, then, must be caused by something external, "which as it were creates me afresh at this moment—that is, which preserves me" (Descartes 1984, 33). To continue existing, at every successive instant, objects must be recreated by God. Descartes concludes that conservation and creation are different only by virtue of a distinction of reason. Nevertheless, we do not have a way of deciding between the literal and non-literal reading of Descartes' aforementioned sentence. That is, we don't actually know whether Descartes embraces CC_{Rec} or CC_{Sus}.

[4] See Lee 2008, 557 and Pessin 2000, 420. As a side note, Pessin argues that Malebranche's version of continuous creation (which Pessin interprets as CC_{Sus}) doesn't entail occasionalism because continuous creation (CC_{Sus}) is consistent with God's having volitional incompleteness (432). Roughly speaking, occasionalism is the view that God is the only real efficient cause in the universe, while secondary causation is merely an occasion for God's causal activity.

[5] If Pessin is correct, then for Malebranche, all of God's volitions have particular content, including his will about the locations of each extended body (Pessin 2001, 86).

12.2.3 Jonathan Edwards

Like Descartes, Edwards (1703–1758) believes that existences are ontically bound to a particular time and place. Because of this fact, Edwards strongly argues that things cannot cause their own existence at a later time. Hence their existence at a later time must be immediately caused by an external agent, namely, the Creator.

What is absent in Malebranche and unclear in Descartes, however, is Edwards' explicit thought that objects continuously come into being and vanish, only to be recreated by God with gradual changes. In other words, Edwards clearly endorses continuous creation *qua* recreation (CC_{Rec}).[6] Since created objects (sometimes called "nature") are impotent to sustain their own existence, God must literally recreate them at every successive instant in their entire life span. Moreover, God not only recreates their existence, but also their "properties, relations, and circumstances" (Edwards 1970, 403).

12.3 The Islamic Traditions

There are several groups and thinkers in the Islamic traditions[7] but our focus will primarily be the Ash'arite school of thought because they famously offer a unique combination of occasionalism and atomism, both of which will be useful to think about our continuous creation model. We primarily discuss and utilize the works of al-Juwayni (1028–1085) and his student, al-Ghazālī (1058–1111), both of whom are well-known in the Ash'arite household.[8] Each of them wrote treatises that explicate the

[6] Compare this view to McCann and Kvanvig's, which suggests that the doctrine of continuous creation doesn't need to mean that the universe always appears anew every moment at its existence (McCann and Kvanvig 1991, 590). McCann and Kvanvig, however, still think that God determines both essential and accidental properties of objects (597). Another Christian historical figure other than Edwards who believes in the literal, "strong" view of continuous recreation of bodies (CC_{Rec}) is Leibniz's contemporary Pierre Bayle (Anfray 2019). One can also find a similar view in the early Leibniz's doctrine of transcreation (White 2000).

[7] For excellent references on the various schools, see Wolfson 1976; Jackson 2014; Taftazani 1950; Muhtaroglu 2017; Frank 1966.

[8] A caveat needs to be pointed out. In the contemporary literature there is a healthy debate over Al-Ghazālī's metaphysical worldview. Some maintain, as we do provisionally in this article, that Al-Ghazālī was an Ash'arite, while others argue he was a covert Neoplatonist. To familiarize oneself with the advocates and references for either side, see footnote 8 in Malik 2019.

Ash'arite doctrine. Al-Juwayni wrote *A Guide to Conclusive Proofs for the Principles of Belief* (Al-Juwayni 2000) and al-Ghazālī wrote *Moderation in Belief* (Al-Ghazālī 2013).

12.3.1 The Ash'arite Worldview

The initial bifurcation in their worldview is between Creator and the world, that is, anything other than God, where the former is a necessary being and the latter being entirely (and radically) contingent. The Ash'arites provide a systematic taxonomy on the metaphysics of the world. First, the world is divided into atoms (*jawhar*[9]) and modes (*'arad*). Atoms are indivisible, self-subsisting, space-occupying (*mutahayyiz*) units, while modes are properties that adhere in atoms. These properties include things like color, taste, odor, life, and death.[10] Modes cannot exist on their own and they need a locus to manifest themselves, which is why they subsist in atoms. In effect, atoms are simply indivisible scaffolds, similar to building construction. When atoms aggregate into various combinations, they form a body (*jism*).[11] Second, the Ash'arites classify four states or manners of being (*akwan*). These include (1) movement, for example, rotational or translational; (2) rest, where an entity remains in the same position for two or more moments of time; (3) combination or aggregation of atoms or bodies; and (4) separation of atoms and bodies (Al-Juwayni 2000, 11; Al-Ghazālī 2013, 27).[12] This forms the basic ontology of the Ash'arites upon which everything else is built.[13]

[9] In the *kalamic* texts, the word "*jawhar*" is sometimes equally used to refer to the atom and a body.

[10] These may seem archaic, which they are. It seems that macroscopic properties have been imposed on the microscopic world, something which modern physics may not agree with. For example, textures of macroscopic entities can be rough, but atoms themselves aren't "rough." By contrast, atoms have various properties specific to them which aren't visible in the macroscopic world, e.g., spin, charm, and strangeness.

[11] There is a disagreement among the *mutakallimun* over how many atoms are needed to combine to make a body.

[12] Al-Ghazālī doesn't discuss the *akwan* the same way that al-Juwayni does, but he has a discussion about rest and motion in general. See al-Ghazālī 2000, 31–33.

[13] For more information on this paradigm, see Erasmus 2018, 53–63; Sabra 2009; and MacDonald 1927. One could ask where the soul, angels, and demons fit in this scheme since they aren't material entities. To our knowledge, neither Al-Juwayni nor al-Ghazālī explicitly addresses the concern.

12.3.2 Motivation and Justification

There are two main reasons for why the Ash'arites hold such a worldview. For one, the Ash'arites are strongly opposed to anything that contradicts the laws of logic because God is bound by them, that is, God can do everything except the logically impossible. This is the full extent of God's capabilities (Al-Ghazālī 2000, 175).

This is important because it explains how and why the Ash'arites take atomism seriously. They hold atomism, or more broadly a discrete-based worldview, to avoid infinities in creation as they can lead to contradictions, and God cannot produce contradictions. A common example is the comparison of the seed and the mountain. If both these very different entities can be divided into smaller and smaller entities ad infinitum, it would result in an infinite regress, which would be illogical as it suggests that both the seed and the mountain have the same (infinite) parts (McGinnis 2018). Accordingly, there must be a limit to nature and a fundamental unit which forms the basic building blocks of the natural world.[14] For similar reasons, they hold discrete interpretations of space and time (Arthur 2012; Bulğen 2018; Altaie 2016, 17).

On this point, al-Ghazālī outlines three problems with an actual infinity. The first issue he raises with actual infinity is that it can never end, so to say infinity has passed is conceptually problematic (al-Ghazālī 2013, 37). The second problem he raises is related to counting of celestial properties with the passage of time. If infinity has passed, then it makes no sense to say that a celestial body has rotated an even or odd number of times. In effect, counting in temporal terms would be useless (37). The third problem al-Ghazālī raises is, *pace* Cantor, the existence of different sizes of infinities (38). Given these issues with actual infinity "neither in space nor in time can there be an infinity of extension, nor an infinity of subdivision, nor an infinity of succession" (MacDonald 1927).

The second reason for holding atomism is that atoms are the linking point between the natural world and God's power. If the very basic entities are under the command of God, then by extension everything else is.[15]

[14] It is along these lines that al-Ghazālī makes a distinction between atom and mode. A mode cannot subsist in another mode because then otherwise that second mode will need another mode and so on to infinite regress. There must be a stopping point or a locus within which a mode resides, which is the subsisting atom (Al-Ghazālī 2013, 34).

[15] Unless and of course God designed a bottom-up kind of emergence.

Though this isn't a tight logical argument, as God could still be in absolute control of everything in the absence of particles, it just goes to show how thoroughgoing the Ash'arites are in making sure that nothing escapes God's control. It should be stressed that occasionalism is a predominant theme among the Ash'arites.[16] The reason for this is because they don't agree with autonomy or agency existing out of God's control as it is seen to be theologically problematic (Jackson 2014; Farfur 2010). Everything outside of God relies on Him while He relies on no one. Furthermore, God doesn't decide what to do from one moment to another. Rather, because God is outside of time and space, God has already "decided" past, present, and future in a single timeless act. So, God has already fully determined each moment's existential posits, properties, relations, and circumstances.

12.3.3 Implications

The Ash'arite worldview has two very interesting implications. First, if everything exists momentarily in discrete time, and if everything in creation is contingent, that is, it could have equally existed or not existed, there must be a necessary being that wills it into existence over non-existence (*murajjih*) (and vice versa) at each moment in time (Al-Juwayni 2000, 12; Al-Ghazālī 2013, 42).[17] So it's not just that that atoms and their modes are sustained from one moment to another, rather everything is brought into existence from nothing and then annihilated into nothing in the next one, that is, CC_{Rec}. Reality, then, is fundamentally ephemeral. This contrasts with mere conservationism (CC_{Sus}) in which God merely sustains existences while nature/creation has some independence (Moad 2018), and process theology in which God evolves alongside nature in manifesting the development of nature/creation (Ruzgar 2016). In short,

[16] Plantinga 2016 distinguishes between *strong* and *weak* occasionalism. Strong occasionalism is the position that nothing in creation has any real authentic causal efficacy, including human free will. Weak occasionalism is the position that everything has no causal efficacy *except* the human will. The former was occupied by the Ash'arites and Maturidites but the latter was occupied by Mutazilites. See Jackson 2014.

[17] The reason is that any dependent series of contingent creations must rely on a necessary being.

Ash'arite metaphysics sees the entire universe being continuously recreated like the refresh rate on a computer screen.[18]

Second, nothing in the world is intrinsically necessary. Since God is literally recreating every atom and mode everywhere in each time-slice, it implies that that there are no internal potentialities to things. It is simply God's will that manifests reality moment by moment. That is why al-Ghazālī (and Ash'arites in general) famously denies any kind of inherent necessity in creation, be they in the form of passive powers (Al-Ghazālī 2000, 170) or active ones (166). That said, according to the Ash'arites God has chosen to manifest certain nomological laws in place (*sunnatAllah*), but there is nothing refraining Him from changing those laws if He chose to do so for the sake of performing miracles. So it is not impossible for God to convert a staff to a snake or split the seas or perform any other kind of nomological changes since they are all under the realm of logical possibilities.

12.4 The Common View

Both the Christian and Islamic traditions provide resources for constructing "The Common View of the Continuous Creation," which consists of five theses:

1. *The Conservation Thesis*: God continually conserves the existence of created substances.
2. *The Equivalence Thesis*: God's conserving created substances is equivalent to the continuous creation ($CC_{Rec/Sus}$) of the universe.
3. *The Edwards-Ash'arite Thesis* (CC_{Rec}): Objects vanish and are recreated by God *ex nihilo* at every successive instant.[19]

[18] Here it should be noted that there was (and still is) a debate about whether it was the atom and the modes that were being recreated or just the modes. For example, Altaie (2016, 17), a contemporary scholar of physics and *kalam*, seems to suggest that atoms are recreated alongside modes. By contrast, Ibn 'Arabi, a famous and classical Sufi theologian, is quite against the idea of substances as discussed by the Ash'arites as pointed out by Koca (2017). Regardless of what one makes of this debate, the key thing to remember here is that, at the very least, modes cannot endure more than a moment and are recreated. Interestingly, Adi Setia 2006, a contemporary scholar of Islamic intellectual thought, provides an explanation of this in that the atomism of the *mutakallimun* cannot but be thought of as a conceptual limit.

[19] Kim calls this sort of divine causation "vertical determination." He then uses the phrase "Edwards's Dictum" to describe the incompatibility between God's causation and creaturely

4. *The Bottom-Up Thesis*: God's creation of objects includes the creation of all of the objects' properties or modes.
5. *The Determinacy Thesis*: God immediately wills the determinate properties or modes of objects.

We will now assess the consequences of this view for the issue of randomness.

12.4.1 Conservation Without Determinacy

It is possible to adopt The Conservation Thesis, but not The Determinacy Thesis. That is, it is possible to think that God conserves the world without determining every single property that created objects have. At most, The Conservation Thesis entails The Partial Determinacy Thesis, which says that some properties of an object *x* are instantiated in virtue of *x*'s existence being sustained. In the same way, one might think that God only conserves the existence of the world without determining all of the countless properties that created objects have.

12.4.2 The Equivalence Thesis

The Equivalence Thesis says that there is no difference between God's act of continuous creation ($CC_{Rec/Sus}$) and his act of continuous conservation.[20] It is possible to adopt The Equivalence Thesis without embracing The Edwards-Ash'arite Thesis, and to claim that continuous creation is merely continuous sustenance, but not continuous recreation. This would result in CC_{Sus}. Kvanvig and McCann, for example, think that there is equivalence between conservation and continuous creation. They claim that what is proposed in The Edwards-Ash'arite Thesis should be rejected, and suggest that the use of the word "creation" in the phrase "continuous creation" is a terminological infelicity (Kvanvig and McCann 2005, 15).

diachronic causation (Kim 2005, 36–39).

[20] Craig, however, insists that creation must be distinguished from conservation (Craig 1998). Accordingly, he would reject The Equivalence Thesis.

12.4.3 The Edwards-Ash'arite Thesis

The Edwards-Ash'arite Thesis or CC_{Rec} might run into problem on the assumption that God is timeless. If we agree with Malebranche that there is a single and undivided act of creation, in what sense does God continuously or repeatedly recreate (CC_{Rec}) the world? Does The Edwards-Ash'arite Thesis require the assumption that God is actually in time instead of outside of time? If one assumes that God is in time, the doctrine of continuous creation (CC_{Rec}) seems to be unproblematic. God can simply recreate the world in each time-slice. If God is timeless, however, the continuous recreation (CC_{Rec}) of the world would have a different picture, perhaps one that includes space and time themselves to be a part of creation that constantly goes in and out of existence. At any rate, the problem about God's timelessness and its relation to God's creating act is not a problem unique for the doctrine of continuous creation (CC_{Rec}), but for the doctrines of creation and divine action in general. Even if one doesn't subscribe to the doctrine of continuous recreation (CC_{Rec}), one has to explain how a timeless God acts in the temporal world.

Another worry with The Edwards-Ash'arite Thesis is that it denies the persistence of objects and personal identity through time. The intuition is that an object never persists since at every moment it immediately vanishes. Quinn points out that this is problematic because if humans don't persist, they do not perform actions at all, which is contrary to both common sense and theistic orthodoxy (Quinn 1983, 63–67). One other significant worry here is that if there is no personal identity through time, then there is no conservation happening. If an object were to vanish, by definition, *it* would not have been conserved. If this were the case, then one couldn't equate continuous creation (CC_{Rec}) with conservation.

The claim that the doctrine of continuous creation (CC_{Rec}) precludes personal identity through time assumes either of the following premises. First, an object that has vanished cannot come into being again. Second, even if it could, it would not be identical to the vanished object. One way to address this issue is to adopt the exdurantist or stage theory view of persistence, in which objects persist in stages of short-lived entities (Haslanger 2003, 321).[21] In exdurantism, objects persist in virtue of having counterparts in other temporal stages. In each stage of its life, the

[21] Crisp thinks that Edwards' metaphysics of persistence is either the stage view or four-dimensionalism with temporal parts (Crisp 2016, 202). However, Edwards actually denies that there is identity or oneness in the successive instants of recreated substances (Edwards

object (i.e., a counterpart) is wholly present, although it comes into and goes out of existence at every successive instant. If identity requires that an object must continually exist through time, then exdurantism must bite the bullet and say that persistence doesn't require identity. As such, proponents of continuous creation (CC_{Rec}) must say that although conservation requires persistence, it doesn't require identity.

However, instead of conceding that identity is absent in exdurantism, perhaps it is better to say that only a less robust notion of identity is required for persistence, which is a theory of identity that doesn't require seamless continuity in existence. Two analogies might be useful here. First, a film roll has many frames, which depict objects. The objects depicted in one frame are strictly speaking neither identical to nor spatiotemporally continuous with the objects depicted in another frame. When the film is played, however, viewers (and the exdurantists) see that objects persist and maintain personal identity over time. In this way, there is no robust ontological identity in objects, but only in the perception or the mind of the viewers. This view is sometimes called "the cinematographical view" of identity.[22] Second, a patch of color persists through time but doesn't maintain identity due to the constant supply of photons needed.[23] A person, upon seeing a color patch, can say that the color patch persists over time. In reality, nevertheless, the color patch is constantly refreshed as new photons enable it to be perceived. In these ways, exdurantism can maintain persistence with identity, although the notion of identity is less restrictive.

One immediate question that might arise here would be of moral responsibility. How are persons morally responsible if they persist without a robust sense of identity? The cinematic image would be helpful to invoke again. Human beings that are recreated continuously are morally responsible for their action to the extent that villainous film characters are in a sense responsible for their actions, although they are in reality a bundle of different film frames.

Admittedly, the philosophical problems discussed earlier are indeed difficult to address satisfactorily. The solutions require the acceptance of controversial intuitions about change, rigid designation, existential inertia,

1970, 403). This seems to point us toward the stage theory of objects. Crisp himself says in his later piece that for Edwards, objects exdure (Crisp 2018, 12).

[22] See Bergson 1911, 304–311 and Crisp 2016, 203–204.

[23] See Edwards 1970, 404 and Descartes 1984, 254–255.

identity, and moral responsibility. However, we contend that seeing The Edwards-Ash'arite Thesis as a stage view can still be metaphysically defensible.

12.4.4 The Bottom-Up and the Determinacy Theses

The Bottom-Up Thesis says that God creates not only *x*, but also *x*'s modes or properties. The Bottom-Up Thesis, however, is not explicit about whether God meticulously determines the properties of *x*. The Determinacy Thesis strengthens The Bottom-Up Thesis by asserting that God not only creates the properties of objects, but also meticulously determines them. On this view, theistic determinism thoroughly reigns in the world. Every property of objects is determined by God, including the properties of quantum particles.

12.5 Continuous Creation and Quantum Mechanics

The intersection of The Common View of the doctrine of continuous creation (CC_{Rec}) and randomness includes the issue of the determinateness of properties. Suppose that God recreates the universe at every successive instant. Suppose that he also wills the determinate properties of each object, including its physical properties. How, then, would The Common View explain quantum weirdness in which particles sometimes are neither somewhere nor nowhere, but in a superposition? If The Common View is true, then the place of ontological randomness in the universe is questionable. Although there are two kinds of interpretations for quantum mechanics, namely, deterministic and indeterministic ones, in the following, we will only review the indeterministic Copenhagen interpretation.

Under the Copenhagen indeterministic interpretation of quantum mechanics, the wavefunction and its probabilistic character provide complete specification of a quantum state (Bohr 1935).[24] On this view, however, one can't always say that a particle has a determinate location or momentum, particularly when it is in a superposition. According to Heisenberg's uncertainty principle, a system cannot simultaneously possess perfectly precise values of position and momentum. Heisenberg

[24] The term "Copenhagen interpretation" is used loosely here because we would associate not only Bohr with it, but also von Neumann.

contends that there is something inherently indeterminate in the system. What is happening, then, when God recreates (CC_{Rec}) the world at every successive instant, including when some particles are in a superposition?

Two metaphysical strategies are available here to maintain that God recreates (CC_{Rec}) objects and properties. The first strategy is to see quantum properties as vague properties. Some philosophers think that there are problems in individuating macro-objects such as mountains and forests, for one doesn't always know where a mountain or a forest begins and where it ends. Sometimes there is no way to tell which trees can function as the exact boundaries of mountains and forests. The boundaries, in other words, are vague. Vagueness problem doesn't only plague objects, but also properties. Might quantum objects have vague properties? Lowe argues that quantum indeterminacy with respect to electrons is an example of real ontic vagueness in the properties of quantum objects such as positions and momenta (Lowe 1994, 114). Bokulich suggests that ontic vagueness in the properties of quantum particles obtains because they lack "space-time trajectories" and value definiteness in their positions, momenta, and so forth (Bokulich 2014, 463ff.). Unlike classical particles, quantum particles do not always have a determinate location, a definite spin, or an exact charge. This is especially true when they are in an entangled or superposed state. Perhaps some indeterminate quantum properties are vague properties and indeed display genuine ontic indeterminacy.[25]

The second strategy to maintain that God recreates (CC_{Rec}) objects and properties in quantum events is to posit holism in the quantum states. Holism is the view that "a whole is something more than the sum of its parts, or has properties that cannot be understood in terms of the properties of the parts" (Maudlin 2013, 46). Perhaps quantum states are irreducible to any smaller parts. Unlike the first strategy, the recognition of holism doesn't require one to posit vague properties in the quantum state. Rather, the quantum state itself has properties that might be determinate, although the properties of its parts are themselves unspecifiable or even are lacking of a physical state (58). Juxtaposed with the doctrine of continuous creation (CC_{Rec}), one can say that at some instants, particles become a part of a holistic quantum state. While no one could know for sure the nature of

[25] A metaphysical concept like vague properties might also be useful for the Ghirardi-Rimini-Weber (GRW) interpretation of quantum mechanics, where during collapses, wavefunctions are not completely localized. See Monton 2000.

quantum states, God would determine that some quantum states would contain a certain number of particles whose properties are not specifiable further. It is true that The Determinacy Thesis says that God wills that particles have determinate properties, but it doesn't follow from this that those determinate properties can be more determinate than *being superposed in quantum state Q*.

Adopting both the second strategy and The Common View might offer an explanation of how God acts in quantum events given the measurement problem in quantum mechanics. Von Neumann identifies that there are two processes by which quantum states evolve: the indeterministic and probabilistic process when a measurement occurs (Process 1) and the deterministic process in accordance with the Schrödinger wave equation (Process 2) (Neumann 1955, 417–418). In von Neumann's "orthodox" interpretation of quantum mechanics, the wavefunctions would "collapse" or "jump" during observations or measurements of particles, and the quantum states would undergo a process change from deterministic (Process 2) to indeterministic (Process 1) evolution.[26] The measurement problem is a problem because one doesn't know how and when a wavefunction collapse would occur.

Let's situate the measurement problem within the current discourse of how "non-interventionist divine action"—assuming the necessitarian reading of the natural laws—plays a role in quantum events. Saunders lists the four possibilities of such divine action:

1. God alters the wavefunction between measurements.
2. God makes God's own measurements on a given system.
3. God alters the probability of obtaining a particular result.
4. God controls the outcome of measurement. (Saunders 2002, 149ff.)

Saunders argues that these four possibilities are unsatisfactory because they require some kind of intervention on God's part (156).[27]

We argue that adopting The Common View and positing quantum holism can provide a better account of non-interventionist divine action in quantum events. To begin with, the strategy of positing quantum holism is not the same as altering wavefunction between measurements or

[26] The designation of Process 1 as indeterministic and Process 2 as deterministic follows Everett's exposition of the universal wavefunction in Everett 1973, 3.

[27] See different responses to Saunders' critique in Wildman 2008, 162ff.

manipulating probability distributions (options 1 and 3). In contrast to option 1, God doesn't have to change the wavefunction to ensure that the outcome accord with his will. The reason is that in continuous creation (CC_{Rec}), he can simply pick the initial quantum state to ensure it evolves into some later state via the Schrödinger equation (Process 2). In contrast to option 3, accepting quantum holism is not claiming that God quirkily manipulates the probability distribution of a quantum state to achieve a certain outcome. In continuous creation (CC_{Rec}), God only needs to create a certain holistic quantum state. Afterward, God will be able to determine the outcomes that fall within the probability distribution in the quantum state. The strategy is not the same as option 2 either because no measurements of the particle properties are made by God in the quantum state. Quantum holism concedes that some parts of the system are unspecifiable not because there is a lack of knowledge on anyone's part, but because of the very holistic character of the state.

Option 4 is only half-right. The strategy does say that God controls the outcomes of measurements because God creates the universe (CC_{Rec}) at every successive instant. Saunders is worried about this option, saying that if it is taken, then we need to move ontologically backward, namely, from the outcomes of measurements to the determination of the ontological probability of the quantum state (Saunders 2002, 154–155). But The Common View can escape this worry. First, in God's continuous creation (CC_{Rec}), the determination of the quantum state and its probability distribution at time t_1 is independent of the outcome at time t_2 where $t_2 > t_1$. Second, the outcome is entirely according to God's determination and needn't violate any regular scientific laws because God can ensure that the outcome falls within the acceptable probability range (Tracy 2008, 273). God can work within the physical parameter such as wave amplitude that God himself has established.

The strategy of falling back metaphysically to quantum holism, then, fulfills Saunders' requirements for a reasonable "non-interventionist special divine action" that the quantum probabilities must:

1. be ontologically prior to the measurement and thus represent some feature of the system in question; and
2. be modifiable by God *without* an intervention in the quantum wavefunction itself (which evolves deterministically under the Schrödinger equation). (Saunders 2002, 154)

We argue that embracing The Common View and adopting quantum holism allow us to fulfill the first requirement, since in God's continuous creation (CC_{Rec}), there is no need for a proleptic manipulation of the quantum wavefunction to match the outcomes. The probabilities can ontologically be determined before the measurements. The second requirement to modify probabilities is not applicable, since in continuous creation (CC_{Rec}), God can determine the outcome of the measurements simply to be within the range of the logical probability distribution in the preceding quantum state. However, from the physicist point of view, there can still be epistemic randomness.

12.6 Objections and Replies

One objection to our discussions would be to point out the obvious of the fact that the Christian and Muslim thinkers discussed in this paper lived before modern physics arrived. Why bother with juxtaposing the doctrine of continuous creation (CC_{Rec}) with quantum randomness? Isn't this an anachronistic endeavor?

Indeed, The Determinacy Thesis was proposed by the thinkers before the quantum revolution. However, the theological position under scrutiny is still relevant, that God is the meticulous ruler of everything. It is important to show that traditional theological understanding can be reconciled with new sciences. While we appreciate that the sciences keep evolving, it is important to observe how theology stands in their light, as well as to ponder the theological implications of the new sciences (Vanney 2015, 751).

Another objection would be to point out that our solution to reconciling continuous creation (CC_{Rec}) with quantum randomness (under the standard interpretations) is simply to move the problem to a different metaphysical plane, namely, by saying that ontic quantum randomness is precluded because there are new metaphysical entities such as vague properties and holistic quantum states.

In response, we argue that both the notions of vague properties and quantum states are independent of the issue of randomness itself. Our task is to provide ways for reconciling the doctrine of continuous creation (CC_{Rec}) with quantum randomness, which we have proposed already with these plausible metaphysical apparatus. It is also important to underline the fact that quantum states are weird and that the behaviors of particles might appear to be metaphysically beyond determinacy simply because they have an uncharted ontology.

A third objection might be that adopting quantum holism in which some properties such as spin, position, and momentum are momentarily inapplicable to particles is questionable. How is it the case that an electron at time t_1 has a position, but at time t_2 where $t_2 > t_1$, when it is in a quantum state, locative properties can't be attributed to it?

To answer this objection, one should remember that the assertion about the inapplicability of properties such as spin and momentum to particles when they are in a quantum state is something of a common acceptance already in physics. It is simply a weird quantum phenomenon. However, perhaps we can persuade the reader to consider that there is a sense in which objects momentarily lose their property applicability. Imagine a ball that is vertically thrown up toward the sky. In the initial half of the trajectory it has a property of moving up. There is a point, that is, the vertex, however, when the ball will momentarily stop and lose the property of *moving* before it starts moving down due to its gravitational pull. There is nothing odd here. Also, the doctrine of the resurrection of the body might require that persons in the intermediate state do not have any spatial location while still existing. While these two analogies may not be satisfactory, they can be a starting point for further discussion.

12.7 Conclusion

Our paper finds common ground between orthodox Christian and Islamic thoughts on the doctrine of continuous creation (CC_{Rec}). We reconcile the doctrine with the issue of quantum randomness and argue that if the doctrine is correct, there can't be ontic quantum randomness in this world. Under the standard indeterministic interpretations, the ontic quantum randomness is precluded if we buy into either the notion of vague properties or quantum holism, both of which are plausible metaphysical concepts to utilize. Lastly, we have also suggested that embracing The Common View of continuous creation (CC_{Rec}) provides a way to show that a non-interventionist special divine action is possible in quantum events, for God would be able to determine both the wavefunction of quantum states and the outcomes of the measurement that fall within a reasonable probability range.[28]

[28] Our thanks go to Kelly Clark, Robert Koons, Jeffrey Koperski, Isra Yazicioglu, Karl Svozil, Michael White, and David Glick for commenting on an earlier draft of this paper.

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CHAPTER 13

Causality, Indeterminacy, and Providence: Contemporary Islamic Perspectives from Said Nursi and Basil Altaie

Isra Yazicioglu

13.1 Introduction

In a treatise written for the elderly, Muslim theologian Bediuzzaman Said Nursi shares how getting old provoked an existential awakening/crisis. Worried about the transience of life, he asks, "since my physical self is mortal, what good can I expect from fleeting, mortal things? Since I am weak, what can I expect from these powerless things? I need an Eternal, Enduring One and an Everlasting, Powerful One who can solve my problem [of transience]." He seeks to turn to God for help, but notices some resistance:

> [m]y ego said to my heart: 'We live in a universe where natural causes effect things by their very nature. Everything is connected to a particular material cause. Therefore, for instance, you should expect the fruits from tree, and

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the harvest from the land. So, what is the point of praying to God for things, especially small things?' (Nursi 2021, 72)[1]

In a world governed by natural causes, Nursi asks, how can one pray to God to attend one's personal needs? If natural causes and laws of nature are the powers running the world, how can we talk about divine providence? In this chapter, I will engage the issue of divine providence in Islam in a way that is attentive to such questions.

The Quran repeatedly talks about signs/indications/clues in the world that point to the oneness of God and His eternal qualities such as power, wisdom, and knowledge (*al-asma al-ḥusna*). In Quranic discourse, claims about unseen reality are based on these 'signs' (*ayāt*) from the world. A robust Islamic understanding of divine providence, therefore, needs to be based on these signs in the world. Two salient features of our world signify divine providence: its regularity and its irregularity/inherent unpredictability. On the one hand, our world is extremely ordered, which allows us to conceptualize 'laws of nature' and predict phenomena in advance. On the other hand, we notice irregularity, uniqueness, and unpredictability. How do we make sense of these two intertwined aspects of our world? How can we understand divine providence in such a world? At first sight, it seems as if we must choose between two interpretations: determinism or 'God of gaps.'

Determinism claims that the regularity and consistency of natural phenomena result from necessary and unchanging 'laws of nature.' Apparent spontaneity or exceptions are actually events necessitated by laws, which we are unable to predict due to our imperfect understanding of nature. Determinism is often considered a good ally for religion: a God that created the world as a perfect and immutable system of laws seems more reasonable than a God who makes exceptions to the way He governs the world. On this view, genuine unpredictability and indeterminism (i.e. the idea that exact same conditions may not have same consequences) are threats to religion. Yet, determinism has been *rejected* by the majority of scholars in the Islamic context, though a small minority such as Ibn Sina (Avicenna) and Ibn Rushd (Averroes) supported it.

[1] For an alternate translation of this text see Nursi 1995, 306.

A deterministic interpretation has a major existential cost: the inability to relate the 'details' and unpredictable aspects of the world and our lives to God. Some Aristotelian Muslim thinkers even claimed that such messy aspects on the individual level are unfit for divine agency so, as such, God does not know the particulars.[2] Such a deterministic approach also has difficulty making room for human freedom or freewill. The existential price is too high: How do I cry out to a Creator who cannot know or care about my 'small' world of needs, yearnings, worries, and choices?[3] Moreover, disconnecting particulars from the Creator faces serious intellectual challenges. In an interconnected universe, the 'details' can't be neatly separated from the major things (Nursi 1995, 307–309). Furthermore, determinism is inconsistent with the empirical data that indicate indeterminism, for instance, as discovered in quantum physics. Finally, a religious endorsement of determinism sits uneasily with Quranic passages according to which God's will and choice encompass the smallest details and particulars:

> God's alone is the dominion over the heavens and the earth. He creates whatever He wills: He bestows the gift of female offspring on whomever He wills, and the gift of male offspring on whomever He wills. (Q. 42:49)

> And among his signs is the creation of the heavens and the earth, and the diversity of your tongues and colors: for in this, behold, there are messages [lit. signs (*ayāt*)] indeed for all who would know! (Q. 30:22)[4]

In contrast with determinism, some people regard irregularity as easier to connect with the divine. On such view, regularity makes the world seem less wonderful and less connected to the Transcendent. Our needs being met in consistent ways (say, our need of energy met through the regular movement of the sun) is not a sign of Transcendent power and care, but our needs being met in miraculous ways (say, a baby surviving in a hurricane against all odds) is a sign. But such focus on irregularity also has a hefty price: giving up regularity as a domain worthy of awe (a sign). Such an approach voids much of ordinary life of significance. It also contradicts

[2] Ghazali (2000) strongly criticizes them in 11th Discussion of his *Tahāfut*.

[3] For a discussion of how God's all-encompassing will and power make human freewill possible in light of Nursi's approach, see Yazicioglu 2017, 138–142.

[4] All translations from the Quran are based on Muhammad Asad's translation (1984).

the Quranic perspective that considers the ordinary as filled with signs of God.

Contra both views, this paper takes both the regularity and irregularity of the world seriously and interprets them in a coherent and existentially meaningful way. (I use the term ‘irregularity’ as an umbrella term for phenomena *from a human perspective*, in the sense of unpredictability, randomness, and spontaneity.) I explore how two contemporary Muslim scholars offer good examples of such an approach. I start with Nursi (1876–1960),[5] an important theologian who insightfully reads the Quran in light of nature and vice versa.[6] Next, I turn to Muhammad Basil Altaie, a contemporary quantum physicist interested in Islamic theological reflection and whose work I interpret in light of Nursi’s. I find their approaches promising for several reasons. First, they offer a holistic understanding of reality, attending to both its regularity and irregularity, attending to both its general features and unique particularities. Second, they hold that Quranic discourse offers cues to make sense of our experience of the world. Taking the Quran seriously, they reflect on the world and see how it bears witness to the Transcendent, rather than adjudicating theological statements ‘top-down’ or as assumptions accepted without empirical evidence. I start with Nursi, whose theological insights provide a helpful framework for enhancing Altaie’s contribution.

13.2 Said Nursi: Causality, Laws of Nature, and Indeterminacy as Signs of God

This section offers a closer look at Nursi’s views on natural causality, laws of nature, and Divine will, paying attention to his understanding of regularity and irregularity in the world in light of the Quran.[7] According to Nursi, one of the main purposes of the Quran is to cut through the ‘veil

[5] While Nursi’s works are extremely significant, political censorship, along with other issues, has limited the transmission of Nursi’s scholarship. Nursi’s works were been banned in Turkey for much of his career, and after his death, he was often left out of the histories of exegesis and theology of the late Ottoman/early Republican period in Turkish universities. See Tuna 2017, 313–318.

[6] For a background on Nursi and his Quranic hermeneutics, see Bouguenaya and Yazicioglu 2017.

[7] I am indebted to Dr. Yamina Bouguenaya for explaining Nursi’s views as well as her clarification of points on quantum physics, including her lecture on Islam and quantum physics at St. Joseph’s University (March 2019).

of familiarity' (*ulfa*) to make human beings recognize the agency and attributes (such wisdom, power, and the compassion) of the Creator.[8] Many Quranic passages invite reflection on nature, the way things come into being, and the way they are arranged and ordered so as to see how things point to and praise their Maker. The Quran offers encouragement and cues for such reflection to see the signs/traces/clues of the Divine in the world (Mermer 1996, 279–283).[9]

Nursi seems to start with the 'causal maxim,' the assumption that every new existent requires a cause. If something happens, especially in an orderly fashion, it must have a cause (Nursi 1995, 233–234). On the basis of the 'causal maxim,' we seek causes of events happening around us. Almost by default, we identify certain events or objects as the causes of other events that consistently follow them in time. For instance, when there is water, we see that the seed grows; when there is no water, it does not grow; therefore, we conclude, water gives life. While such inferences are common in everyday life, Nursi suggests that they are mistaken.

Nursi suggests, with other Muslim theologians and mystics, that the Qur'an invites us to dig beneath the surface for an accurate understanding of causation. When people take the time to reflect on the cues provided by the Qur'an, they will realize that what we regard as a causal relationship in nature is a mere conjunction (*iqtirān*) between natural events, not causation. Put in classical Islamic terminology, what we often regard as a cause is a *seeming cause* (*al-sabab al-ẓahirī*), which points to the real cause (*musabbib al-asbāb*, 'causer of all causes'):

> Heedless people are confused by the conjunction (*iqtirān*) of things. They assume that if two things appear together, it must be that one is causing and producing the other. This erroneous perception is reinforced by the fact that *when the supposed cause is removed, the blessing that came with it disappears*, leading people to mistakenly infer that the supposed cause must have created the blessing. With this misunderstanding, they direct their love and gratitude toward the supposed cause rather than to the Real Giver of blessings. (Nursi 1996, 182, emphasis added)

[8] The famous Muslim scholar, Rumi, Jalal al-din (1207–1273), says that the main message of the Quran and the prophets is to challenge and correct our mistaken understanding of causality (see, for instance, *Mathnawi*, Book 3, 2525).

[9] For an analysis of Nursi's view of causation in the context of Western thought and Islamic history, see Mermer 1996, 243–82.

Suppose we call such misunderstandings as ‘argument from absence,’ since it is built on the fact that when A is absent B is also absent. We employ such arguments from absence both in everyday life and in scientific theorizing. Most contemporary accounts of causality in Western thought—regularity accounts, probabilistic accounts, counterfactual accounts, interventionist accounts—are versions of this reasoning; they seek to define causality focusing on either the coexistence of two things (regularity and probabilistic accounts) or on the absence of one in the absence of the other (the counterfactual account). In contrast, Nursi finds such reasoning flawed. Why?

Argument from absence is misleading because what leads to absence of something is not the same as what leads to its existence. For instance, a garden flourishes when many conditions are present, such as, air, bacteria, sunlight, minerals, gravity, and so forth. Yet when only one of these conditions, say water, is absent, the garden does not flourish (Nursi 1996, 181–182). Therefore, co-absence of two things does not necessarily prove that one produces the other. In other words, the argument from absence is misleading, which shows that the fact that a garden *does not* flourish in the *absence* of *many things* cannot prove that these *many things cause* the garden. Nursi, here, makes a distinction between ‘conditions’ and ‘causes’: the fact that a garden comes into existence *under* certain circumstances is something we observe. But this observation does not demonstrate that the garden is caused or produced *by* these conditions (either one or many).

In both classical Islamic theology and post-Humean philosophy, the consistent appearance and disappearance of two things cannot demonstrate that one produces the other. It is possible and consistent with empirical evidence that the presence of all these natural things (e.g., sunlight, air, soil, water, certain temperature range, bacteria, movements of the earth and sun, etc.) are only ‘a customary condition’ for the real cause or agent to create the result.

According to Nursi, the evidence for inferring that divine will and power as the real cause is in the ‘mismatch’ between ‘seeming causes’ and their effects. The ‘seeming causes’ (e.g., sunlight, air, soil, water, certain temperature range, etc.) fall short of bearing responsibility for a well-ordered, well-balanced, alive thing, such as a garden:

> to attribute a well-ordered and well-balanced being which has unity such as [a living being] to the jumbled hands of innumerable, lifeless, ignorant, aggressive, unconscious, chaotic, blind and deaf natural causes, the blindness and deafness of which increase with their coming together and intermin-

> gling among the ways of numberless possibilities, is as unreasonable as accepting innumerable impossibilities all at once. (1995, 236)

In other words, 'seeming causes,' even when taken together, do not display the necessary knowledge, contrivance, power, mercy, or life observed in their effects. Nursi offers this reasoning as an exegesis of the Quranic verse: "Those you call on beside God could not, even if they combined all their forces, create a fly" (Q. 22:73).

In a treatise reflecting on nature as sign of God, Nursi summarizes his interpretation of natural causality in light of the Qur'anic discourse:

> We look at things which appear to be causes and effects in the universe and we see that the most elevated cause possesses insufficient power for the most ordinary effect. This means that causes are a veil, and something else makes the effects. To take only a small example out of innumerable creatures, let us consider the faculty of memory, which is situated in man's head. … We see that it is like a book so comprehensive—indeed, like a library—that within it is written without confusion the entire story of a person's life. What cause can be shown for this miracle of power? The grey matter of the brain? The simple unconscious particles of its cells? The winds of chance and coincidence? [Rather] that miracle of art can only be the work of an All-Wise Maker. … Thus, since they are comparable to man's faculty of memory, make an analogy with all eggs, seeds, and grains, and then compare other effects. (Modified translation, Nursi 2004, 711)[10]

While brain's gray matter is observed in conjunction with memory, it cannot be the creator of memory because of the mismatch between the seeming cause and the result. Conjunction and 'co-absence' (i.e., absence of the consequent upon the absence of the precedent) are factual: (1) one's memory comes into existence with the existence of certain conditions, such as brain cells, and (2) the memory is lost or damaged when any of these conditions is absent (e.g., if certain brain cells get damaged). But this observation does not prove that these natural conditions collectively produce a memory. In order to be the proper cause, one must also consider the alleged cause's attributes. An orderly and powerful result indicates purpose and is interconnected with the rest of the body and a person's lifelong experience in the world; so, either these natural causes are utterly

[10] Nursi claims that what we regard as ordinary is in fact extraordinary in that it goes beyond the capacity of natural causes. Altaie likewise suggests that the normal course of nature is miraculous in the sense of being constantly created and recreated.

wise, knowing, and powerful on their own (which they are not) or the cause is a real agent who has comprehensive knowledge, power, and care. Needless to say, Nursi's reasoning rejects the Darwinian claim that the purposefulness and organization in nature is the result of unintentional forces blindly interacting over time.[11]

Nursi also talks about the interconnectedness of created beings. He emphasizes that things come into existence in relation to most, if not all, things in the universe. Nursi notes, for instance, that the eye is in a constant organic exchange with the entire body (including the digestive, respiratory, and urinary systems) as well as with what is outside the body (such as sunlight, visible objects, air pressure, etc.). If things and events in the universe are interconnected, then what is required for the production of a thing or event is not just any knowledge and power but an *all-encompassing* knowledge and power (Nursi 1996, 307). Nursi again gets his cue for this argument from the Qur'an: "Creating and resurrecting all of you is only like creating or resurrecting a single person: God is all hearing and all-seeing" (Q. 31:28).

Nursi suggests that our observation of nature discloses that the Creator creates in two ways:

> The first is through origination and invention [*ibda'*]. That is, He [the Creator] brings a being into existence out of nothing, out of non-existence, and creates everything needed for it, also out of nothing, and places those provisions in its hand.
>
> The second is through composition, through art [*insha*]. That is, He forms certain beings out of the elements of the universe in order to demonstrate subtle instances of *wisdom*, like displaying the perfections of His wisdom and the manifestations of many of His Names. Through the law of Providing [*qānun al-razzaqiyya*], He sends particles and matter, which are dependent on His command, to these beings and employs the particles in them. (Nursi 1995, 253, italics added)

According to Nursi, these two forms of creations are observed within each other.

[11] Altaie also rejects this "blind watchmaker" claim by saying that "if a blind person can make a watch, certainly he is not blind" (Altaie 2014, 79). The endless evidences of purposefulness and comprehensive knowledge in nature is a major reason why the theory of evolution is received with much criticism in the Muslim world, including by many respected and sophisticated Muslim thinkers and scientists in the contemporary era, such as S. Hossein Nasr and Muzaffar Iqbal. For critical analysis of the theory, see Nasr 2009, 184–197, and Bouguenaya et al. 2018.

13.2.1 Nursi's Approach to Natural Causality in the Context of Contemporary Theories of Causation

Relying on the observation that A and B appear consistently together and B disappears in the absence of A, there are three options for explanation:

1. The regularity is a mere coincidence.
2. A and B are intrinsically/necessarily connected and A has the necessary qualities to produce B.
3. There is an agent outside of A and B that connects the two consistently.

Medieval Muslim philosophers, such as Ibn Rushd, considered only the first two options; the third option didn't seem to exist for them (Kukkonen 2000, 492). The first option didn't make any sense because if the order were "coincidental or accidental, it would not have continued always or for the most part without deviation" (Marmura 1965, 195). So, this minority of medieval Muslim scholars, such as Ibn Rushd, affirmed the second option: A and B go together consistently because A has the powers to necessitate or produce B (Yazicioglu 2013, 35). In contrast, Ghazali, and the majority of Muslim scholars, opted for the third option. Divine will (and power, and wisdom, etc.) connects seeming causes with their 'effects.' Nursi supports this explanation, as we have seen, because of the mismatch between a natural effect and its cause; natural causes cannot be real causes because they lack the knowledge, power, and purposefulness needed to produce their effects.

Steven Nadler notes that Hume's argument that there is 'no necessary connection' between a natural cause and its effect is fundamentally the same as Ghazali's critique of option 2.[12] However, having rejected 2, Hume did not affirm 3, either. Ultimately, Hume shied away from any explanation. Contemporary (Hume-influenced) theories of causation offer no alternatives to the three main options as they limit themselves to mapping the coexistence and co-absence of things.[13] Despite their sophistication and technical detail, contemporary theories of causation show that there is nothing new under the sun.

[12] Steven Nadler, *Occasionalism: Causation Among the Cartesians*, New York: Oxford University Press, 2011, 167. Hume's account is also similar to Autrecourt and Malebranche's.

[13] That is why, a variety of contemporary philosophical accounts, such as regularity theories of causation and counterfactual theory, are compatible with the occasionalist explanations (Quinn 1988, 55–64).

A common worry is that if we were to accept 3, we would lose scientific inquiry. Such worry is mistaken. Science is possible in 3 because divine agency isn't opposed to 'seeming causes.' Rather, 'seeming causes' are understood as conditions under which the Wise Creator chooses to create consistently. Finding out seeming causes remains important. In fact, Nursi suggests that obeying the 'protocols' of the natural order with the awareness that God is the causer of all causes is a form of worship (Yazicioglu 2013, 144–145), and having recourse to 'seeming causes' is a form of 'prayer' to God, who alone creates the results (Nursi 2021, 116–119). Can one accept 3 *without* inferring God's continuous act of creation? Could something else other than divine agency connect A and B consistently? We shall explore this in the next section.

13.2.2 Nursi on Laws of Nature

Few contemporary thinkers defend the notion that natural causes have intrinsic, agential powers to create things. Similarly, modern scientific theories assume natural laws, rather than essences, make things burn or the law of gravity makes things fall—an explanation often misconstrued as an alternative to divine agency.

According to Nursi, attributing agency to laws of nature is mistaken because laws of nature are theoretical constructs that describe—or attempt to describe—regularities observed in nature; they do not cause those regularities. Indeed, a natural law is a *description* of a regularly occurring event and the description cannot be taken as the *cause* of the event itself (Mermer 1996, 244). Consider a mother who makes pancakes every Sunday morning. Her child, noticing the regularity of this event, infers a "Sunday pancake rule" by which he successfully predicts the Sunday breakfast menu. However, the "Sunday pancake law" is not independent of the mother's agency; the law has no efficacy on its own. It would be folly for the child to suggest that the "Sunday pancake law," not his mother, makes the pancakes. Nursi would agree with American philosopher Charles S. Peirce (1839–1914) who noted that "No law of nature makes a stone fall, or a Leyden jar to discharge, or a steam engine to work." As Peirce puts it:

> a law of nature left to itself would be quite analogous to a court without a sheriff … let a law of nature—say the law of gravitation—remain a mere uniformity—a mere formula establishing a relation between terms—and *what in the world should induce* a stone, which is not a term nor a concept but just a plain thing, *to act in conformity* to that uniformity? (Peirce [1903] 1931–58, 5.48, emphasis added)

Regularity in the world needs an agent to make things happen: either the stones know the formulas and have the power to act accordingly or an agent with comprehensive knowledge, will, and power puts these 'laws' into effect. Laws of physics are descriptions of the regularities by which the world is governed by the Creator; while such formulations are helpful for making predictions, they cannot replace the need for a Creator.[14]

In addition to arguing that 'laws of nature' cannot operate on their own, Nursi notes that they do not describe the world completely. That is, exceptions to the laws of nature are not impossible; all laws of nature, Nursi notes, have exceptions (say, the virgin birth, a miracle, to the 'law of reproduction'). Nursi's approach here is reminiscent of Peirce's principle of 'tychism,' according to which there is a degree of 'spontaneity' in nature, and that natural laws are not absolute. Peirce notes that the empirical data, such as diversity, consciousness, and growth, support tychism rather than determinism or necessitarianism (Yazicioglu 2013, 110–111).

Nursi states similar points when responding to a question about a Quranic verse, known as 'the verse of the five unknowns' (*al-mughayyabāt al-khamsa*): "Truly, with God alone rests the knowledge of the Hour, and it is He who sends down the rain; and He knows what is in the wombs. No soul knows what it will earn tomorrow, and no soul knows in what land it will die. Truly, it is God who is all-knowing, all-aware" (Q. 31:34). Nursi contends that there are two types of occurrences in the universe: (1) the ones that come into existence according to a regular pattern, like the sunrise; and (2) the ones that come into existence without a regular timetable, like rainfall. *Regular* events in the universe point to God's power and wisdom and show that things do *not* happen haphazardly, that there is a purposeful and wise creator creating them in order. At the same time, the *irregularity* and diversity in the world point to divine choice and will. In other words,

> The All-Powerful & All-Knowing One, the All-Wise Maker, shows His power and His wisdom and that chance can in no way interfere in His works through the *order* and *regularity* with which he governs the world. Such order and regularity manifests in the form of laws [in nature.] At the same time, through *exceptions* to the laws, the *breaks* in established patterns,

[14] Otherwise, we would have to explain how "mindless bits of matter behave in a consistent and coordinated way" (Frederick 2013, 269). The minority who claim that laws of nature do have agency (such as Nancy Cartwright) acknowledge that such a view makes sense only if there is a divine agent.

> *changes* in appearances, *differences* in *individual* characteristics, and *changes* in the emergence [of blessings], He shows His *volition*, *will*, *choice*, and *that He is an agent with choice, and He is under no restrictions whatsoever.* (Nursi 2004, 217, emphasis added)[15]

Using the example of a baby in the womb, Nursi explains how regularity and uniformity complement the irregularity and uniqueness of phenomena in the world which together point to the names of God. On the one hand, there is a uniform aspect, a regular pattern to the growth of a fetus, from which we reliably predict that a human fetus will share basic features with other human beings. On the other hand, there is a non-uniform aspect to each fetus, such as her specific features, personality, and unique potentials. These special aspects of the fetus, which cannot be known in advance, point to the free will and choice of its Maker. In sum, from a Quranic perspective, irregularity in the world—such as the timings of rainfall, the particular life journey of a human being, the hidden potential of a baby in the womb, or the life span of each individual—discloses the special will and choice of their Maker and shows that His mercy and power are not limited.[16]

After having explored Nursi's approach to order and irregularity in nature in light of the Quran, let us now engage with Muhammad Basil Altaie's work.

13.3 Quantum Physics Interpreted: Altaie on Laws of Nature, Indeterminism, and Causality

As a quantum physicist, Altaie holds that quantum indeterminacy supports Islamic theism.[17] According to Altaie, like for Nursi, our world is both highly predictable—hence we are justified in talking about 'laws of nature'—*and* indeterministic—which enables us to appreciate that these laws are not absolute.[18] He sees the order of nature as a sign of Divine

[15] Modified translation. See original text in Nursi 1996, 76.

[16] What are the implications of continuous creation for 'the problem of evil'? For a discussion of classical Islamic theology in this context, see Yazicioglu 2017, 137–138. For Nursi's views, see Bouguenaya 2014. See also Yazicioglu 2021.

[17] Altaie uses "indeterminacy" similar to my use of "irregularity" or "spontaneity" when discussing Nursi's approach. Altaie means indeterminate in the sense of not being predictable by human beings, not in the sense of being uncaused by any agent.

[18] Altaie seems not to have read Nursi as there are no references to Said Nursi in his book.

wisdom and the unpredictability as an indication of continuous creation. In what follows, I unpack how he arrives at these conclusions.

13.3.1 Genuine Indeterminacy in Nature

Altaie interprets indeterminacy of nature in light of an Islamic theological framework.[19] According to most quantum physicists the world is in some ways *genuinely* irregular, not just apparently so due to our ignorance of relevant laws (Koperski 2015, 160–161). Altaie agrees, noting that quantum indeterminacy is well-established on the basis of empirical data:

> This indeterminism is not an artifact of the theory, it is something that is inherent in natural phenomena. … For example, the observation that particles behave like waves is an experimental fact that has been shown through particle diffraction experiments in laboratories. The fact that electrons tunnel through potential barriers that are higher than their energies is a fact that is observed in semiconductor devices, without which our mobile phones and computers would not work. Even the superposition of states and their non-locality, entanglement and the most bizarre phenomena have all been observed in laboratories. (Altaie 2016, 75)

While some physicists resist the indeterministic implications of the empirical data, Altaie affirms the dominant view that the natural world is genuinely ontologically indeterminate (not simply epistemically indeterminate).

Quantum mechanics, Altaie notes, applies both to microscopic and macroscopic reality. Indeed, he writes, "on a highly detailed scale, all systems behave quantum mechanically, it is only that we cannot feel the quantum effects on a large scale" (Altaie 2016, 77). Macro- and micro-level physics are perspectives on the *same* reality. Noting this is helpful from an existential perspective in that, as Nursi suggested earlier, the entire universe including its details must be connected to the same Creator.

According to Altaie, quantum indeterminism suggests that the world needs more than just an agent to get it all started (unlike Aristotle's prime mover). Indeed, indeterminism indicates that the world needs to be created and recreated at every moment. According to determinism, the prior

[19] Altaie's method of starting with scientific data and exploring their metaphysical implications reminds me of Peirce's search for "a properly executed metaphysics" or "scientific metaphysics." See Yazicioglu 2013, 152–156.

conditions necessarily determine the events that take place; once the prior conditions are set, the next steps issue from them without need for an agent.[20] In contrast, "by moving away from classical determinism, we discover that *the making of an event or a process takes much more than the required conditions and goes beyond the power of the individual entities that contribute to the event*" (emphasis added). In other words, through quantum physics we recognize that prior conditions are insufficient to determine what comes next and that reality is interconnected with the rest of the universe. Therefore, there must be "*an agent* that dominates the whole universe with a *plan* and … *power* that makes it possible to have an ordered world ruled according to present laws that we recognize by watching the world's phenomena" (emphasis added). Since a simple 'operator' to switch between several options would prove inadequate, we need an all-knowing and all-powerful being to sustain the world within this dynamic, indeterministic, and yet overall consistent reality (Altaie 2016, 37).[21]

In order to appreciate Altaie's interpretation of quantum indeterminacy as indicating an all-powerful and all-knowing God, we must understand what he makes of natural laws and natural causes. Would he agree with the view that the laws of nature and causal powers of the objects decrease or even obviate the need for a Creator to continuously create the world?

13.3.2 Altaie on Laws of Nature

According to Altaie, there are two problems with the claim that the laws of nature explain the world without the need for a Creator. First is "the problem of operation." Like Nursi and Peirce who pointed out the laws of nature have no agency, Altaie notes that laws of nature cannot operate on their own: "Some agency has to drive these laws in accordance with the algorithm they describe" (Altaie 2014, 30). Second is "the problem of coordination" because physical laws "often contradict each other" and cannot coordinate each other, yet we see that they are coordinated for "a fruitful result" (Altaie 2005, 80). "Fruitful result" likely refers to

[20] Determinism may be why some claim that the nature is 'autonomous' or operates on its own after having been created. Such a view is difficult to reconcile with the theistic belief that the world is constantly dependent on the Creator. As Quinn suggests continuous creation is more compatible with theism than often assumed (Quinn 1988 and Freddoso 1988).

[21] According to Altaie, while scientists need not to talk about such a being, human beings can and should (Altaie 2016, 37).

purposeful results, as in the fine-tuning of the world for life and the wise planning of living beings. Laws of nature do not have “the power, intelligence, planning and hindsight to act and produce the results that they are acting for” (Altaie 2016, 43).

Altaie also makes an interesting distinction between ‘laws of nature’ and ‘laws of science’ (e.g., laws of physics). He uses ‘laws of nature’ to refer to the regularities in the world, while ‘laws of science’ are human attempts at representing the former in mathematical terms. While there is a correspondence between the two, the latter is always an incomplete task due to what humans do not—or cannot—know. There is also sometimes dissonance between the two. For instance, mathematical equations in laws of science are time-reversible but the phenomena they describe are not time-reversible (Altaie 2016, 34). Similarly, a formula may be deterministic but its represented reality may not be, such as the Schrodinger equation describing indeterministic quantum phenomena (Altaie 2016, 47).[22] While the distinction between ‘laws of science’ and ‘laws of nature’ is not essential for this paper, it is still helpful. It enables caution about metaphysical claims. Just because a scientific theory works well by allowing us to predict things accurately and build new technology, does not mean that it provides a good understanding or explanation of reality.

13.3.3 Causality: First and Second Level of Analysis

For Altaie, seeking causal connections between events is *the* business of science, and without identifying causes and effects we would not be able talk about the order in the world. We infer causal connections on the basis of the regularities we observe in world events, such as “the free fall of a stone toward the center of the earth, the igniting of a material as it nears a source of heat, or the recovery from illness after taking medicine,” which indicate that there are “essential parameters and conditions [which] are causes of the occurrence of the related effects” (Altaie 2016, 51). Yet, it is clear to me that Altaie goes beyond such first-level discussions of causality, in which he uses the term “cause” in a practical sense (as a superficial understanding of causality), and addresses a deeper level, where he explores

[22] Just because our formulas are helpful doesn’t mean naturalistic assumptions we happen to hold are true. Moreover, theistic interpretations need to be humble because our limited and imperfect representations of nature in mathematical formulas should not be taken to represent ‘the mind of God’ (Altaie 2016, 48).

the "real" cause that produces or creates the effects. If the first level were explanatory, deeper or second-level analysis would not be needed, but, according to Altaie, the first level is not satisfactory *as explanation*, even if it may be useful in predicting events and obtaining benefits.

According to Altaie, the identification of an object or event as a cause of another is never certain, because it is hard, if not impossible, to identify all the contributing causes to an event (Altaie 2016, 55). Besides, the regular association of A with B and temporal precedence of A to B do not necessarily equal causation, as there are cases where this obtains and yet A is not the cause of B (when both are caused by something else, as in the case of celestial positions and climate) (Altaie 2016, 57–58). Moreover, if by 'causality' we mean identifying a prior set of necessary and sufficient conditions for an event, such identification is always open to revision. For instance, according to Newton's theory of gravity, the necessary condition for two bodies attracting each other is that "both should have a mass and that they should be separated by finite distance." Such conditions are not necessary in Einstein's theory of gravity. Therefore, while the cause of attraction between bodies is the masses of the objects in Newton's theory, in Einstein's theory the cause is the spacetime curvature (Altaie 2016, 55). From a *technical* perspective (the 'first level' or superficial analysis of causality), such revisions are not a problem. Newton's theory has served us well and continues to serve well in dealing with macro structures, while Einstein's theory serves us well in predicting cases where the object—such as a light wave—has no mass. However, from an *interpretive* (deeper/explanatory analysis of causality), such revisions are instructive. Such shifts in identifying causes, or *seeming causes*, illustrate that the helpfulness of identifying them does not prove that they are the actual cause. Therefore, it is not surprising that Altaie raises the question whether natural causes are the 'real' causes: "Without [natural] causality, the universe becomes a chaotic one where nothing is predictable. However, the *most important* question in this topic is: Do causes produce their effects directly? Is the cause just a *representation* of the reason for what happens, *without being effective itself*, or is the cause actually the agent producing the resulting effects?" (Altaie 2016, 56, emphasis added).

In other words, Altaie is affirming causes in the practical, superficial sense (*al-asbāb al ẓāhiriyya*)—as ways of mapping the order of nature and as a heuristic device for predicting and making use of the natural order—*and* asking the core question of Islamic context: are these causes efficacious on their own or are merely conditions/formalities/occasions within which the real cause ('Causer of all Causes') creates?

From a determinist perspective, a cause acts *necessarily*. The idea is that "once an efficient cause exists, all things being equal, its characteristic effect *must* occur. This means not only that the effect does occur as a matter of fact, but *that it cannot fail to do so*, because it is necessitated or compelled to occur" (Kogan 1985, 3, emphasis added).[23] Similarly, Hume highlighted that necessity is part of the definition of cause; cause is that which precedes the effect and *necessarily* so. Within such deterministic framework, therefore, indeterminacy is considered a major challenge: how can the same conditions not yield the same results?

In contrast, according to Altaie, natural causes are not effective on their own but are simply conditions under which God chooses to create certain results. By God's *sunna* or custom of creating order we can expect regularity—*without* claiming that particular order is absolute. The fact that certain things are indeterministic is therefore not a problem, rather it is instructive; indeterminacy teaches us that the Creator is a free agent. According to Nursi, recall, the indeterminacy of events discloses the *choice* and *will* of the Creator. Similarly, according to Altaie, the indeterminacy of quantum mechanics provides reason to believe that the universe is continuously created and recreated at every moment by divine will—as prior conditions are unable to determine what happens next.

13.3.4 Re-creation: An Interpretation of Indeterminism

Altaie suggests that puzzling features of quantum physics such as the measurement problem, quantum entanglement, non-locality, and quantum coherence comport well with the classical Islamic notion of continuous creation, according to which the world is recreated by God at every moment. He suggests that if we were to form postulates inspired by continuous creation, we would make better sense of the quantum world and may even find venues to further our exploration of it. He offers two such postulates: "all physical properties of microscopic systems are subject to continued creation" and "the frequency of re-creation is proportional to the total energy of the system" (Altaie 2016, 105). Altaie discusses how

[23] Ghazali (and Nursi) questioned such an approach and argued that such necessity cannot be proven only on the basis of constant conjunction. What we take to be causes are merely the conditions under which God consistently creates certain results; if God so wishes, He can disconnect the two—though given His wise plan for this world (*ijra al-ʿādah*), God seldom does. For a discussion of the possibility of science and common sense in Ghazali's thought, see Yazicioglu 2013, 32–26.

the explanatory power of such postulates is stronger than current interpretations of quantum theory, such as 'the hidden variables interpretation' or 'multi-world interpretation,' both of which also make metaphysical assumptions—assumptions that lie beyond observation (Altaie 2016, 116).

In interpreting indeterminacy, Altaie proposes the term 'contingent' to replace the term 'random.' This switch suggests that events in the quantum world are not random in the sense of being uncaused, haphazard, or unintended. Instead, they are contingent, in the sense of being dependent on Divine will and power at all times. As the metaphysical explanation that "provides the driver for these laws [of nature], God is not a spectator but a fully active driver who re-creates, prescribes laws that He respects, and … selects the outcome" (Altaie 2016, 110). Altaie rightly concludes, that God "is not playing dice, but the outcome of His actions causes the dice play" (Altaie 2016, 114).

13.4 Conclusion

Understanding divine providence requires understanding the natural order and our place in it. Such inquiry leads to a rethinking of what we usually construe as explanation, especially the causal explanations we employ in everyday life and in modern science. Nursi offers an insightful example of how to do that rethinking and Altaie's analysis of quantum mechanics supports it. In light of cues from the Quran, one can pay attention to empirical data and offer interpretations that are intellectually and existentially compelling.

Nursi and Altaie analyze both the capacities of natural causes and the 'agency' of laws of nature. They interpret the regularity and predictability of the world as a sign of a Transcendent agent with comprehensive wisdom, knowledge, and power. They also resist reifying regularity into absolute laws. Instead, they welcome the unpredictability of the universe as a sign that reveals divine will. Certain things are inherently unpredictable *from our perspective* because they are dependent on the will of God.[24]

[24] Ghazali (on divine will) 2000, 22–24. Similarly, Nursi notes that choice without a determinant is possible, the "function of will is precisely that" (Nursi 2004, 365, modified translation). In the context of making hard choices, Ruth Chang suggests the same: our freewill means our ability to choose without any reasons, which "frees us from the dictatorship of given reasons" (Chang 2017, 20).

Consider the existential implications. Divine freedom frees us from slavery to impersonal, deterministic laws of nature. We can turn to the Creator in our everyday circumstances with our particular needs. This is a world which is governed according to "universal laws and general principles" so as to manifest Beautiful Names (*al-asma al-husna*) and there is also room for flexibility because "within those universal and general principles [the Creator] has *special favours, special succour, special manifestations,* so that *everything* may seek help from Him and look to Him *at all times* for *every* need" (Nursi 2004, 684–685, modified trans., emphasis added). To answer Nursi's question that the paper started with: yes, it makes sense for human beings to cry out to God about their particular needs. Indeed, from an Islamic perspective, only the one who sustains the world in its details can hear and respond to human heart's yearning for eternal happiness.[25]

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CHAPTER 14

Divine Action and the Emergence of Four Kinds of Randomness

Robert C. Koons and Rana Dajani

14.1 Modes of Divine Action

We suppose that God intends particular events and outcomes in the history of the world: God's interests are not limited to general facts or patterns. Nonetheless, it seems clear that God does value the preservation of regular patterns—if He had no such interest, science would be impossible. As many philosophers and theologians (e.g., Thomas Aquinas, C. S. Lewis) have pointed out, the valuing of regular patterns does not preclude the possibility of miracles, in the sense of pattern-breaking interventions. Lewis argued in *Miracles: A Preliminary Study* (Lewis 1947) that in some cases it is the breaking of the pattern that is the central point of divine action.

If miracles involved the "violation of natural law," as David Hume argued, that might count as a powerful objection to them. However, it is

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easy to agree with Thomas Aquinas that no such violation of the laws of nature is required, since it is built into the very nature of every creature to respond concordantly with every divine intention, whether general or particular (*Summa Contra Gentiles* 3.100).

Nonetheless, even if miracles are a real option, it makes sense to explore non-miraculous possibilities for particular divine interventions. Since God obviously values the uniformity of microphysical patterns, we can expect that He would act wherever possible in ways that preserve that uniformity. One alternative is the front-loading of His specific intentions into the universe's initial conditions. This is a real possibility also, but it does face certain potential difficulties. First, a thoroughly deterministic world would rule out creaturely free will or autonomy (unless we assume compatibilism). If we preserve free will and incompatibilism by allowing rational creatures to interfere with the deterministic pattern of the physical world, then we again face a world in which the beautiful microphysical patterns are often spoiled. Second, any dramatic event produced by such fine-tuning of initial conditions (like the simulation of an audible voice from thin air) would involve such dramatic departure from average, statistically expected processes as to constitute a disruption of thermodynamic and other macroscopic regularities.

Consequently, there is good reason to explore the possibility of a third option. Philip Clayton (2006) and Arthur Peacocke (2006) have argued that the phenomenon of *emergence* provides such an additional option for divine action. What is emergence, and how might it be relevant to the possibilities of divine action?

Our three-way distinction divides divine actions into those (i) that break the laws of physics, (ii) that use the laws of physics (by setting initial conditions), and (iii) that transcend the laws of physics (through emergence). This distinction should not be confused with a more traditional distinction between different definitions of "miracle." Thomas Aquinas defined a miracle as a direct divine action that exceeds the causal power of every created agent (*Summa Theologiae* I, Q100, a4). Peter van Inwagen (1988) has defined a miracle as God's acting indirectly by *altering* in an ad hoc, lawless way the fundamental causal powers of some created thing. A third possibility would be to define a miracle as God's building (in an ad hoc, lawless way) a special or extraordinary event into the causal powers of particular things from the very beginning (e.g., giving certain fundamental particles at the Big Bang the power to sustain the weight of Jesus when they form some water in the Sea of Galilee). Our distinction is largely independent of these categories. Miracles in any of these three senses could be cases either of breaking or of transcending the laws of microphysics. God's using the laws of physics (our second category) would be non-miraculous (by all three definitions).

14.2 The Metaphysics of Emergence

"Emergence" is a term that dates back to Samuel Alexander (1920) and that was used to label the group of thinkers called *The British Emergentists* (McLaughlin 1992), which included, especially, C. D. Broad (1925).[1] The germ of the idea can be found in J. S. Mill (1872 [1843], Book III, Chapter 6, section 1). The term is currently used by both philosophers and scientists in a variety of meanings, many mutually exclusive. The notion of emergence is supposed to indicate both a measure of dependency on the microphysical (the higher level emerges "from" the microphysical) and a measure of independence (the higher "emerges" from the microphysical). The confusion enters in trying to make sense of how to combine these two elements without contradiction.

Some philosophers and scientists speak of a merely epistemological, computational, or conceptual emergence of higher domains (like chemistry, biology, and psychology) from microphysics, where this means simply that we are incapable of reconstructing or predicting the higher from the lower, due to limitations in our abilities to observe, measure, and (especially) compute higher-level facts from lower-level ones. Such epistemic or anthropocentric emergence is real but irrelevant to our concerns in this paper. What we need is ontological emergence, implying a measure of real independence and autonomy of the "higher" levels from microphysical facts.

The most common approach to making sense of ontological emergence is to suppose that higher-level facts *supervene* with nomological but not with metaphysical necessity upon the lower-level facts. The modern notion of supervenience was introduced by G. E. Moore (1922) and R. M. Hare (1952) to describe the relationship between evaluative and descriptive or

[1] Although the concept of emergence is a relatively late arrival, philosophers in the Abrahamic tradition have long been influenced by and contributors to an Aristotelian tradition that attributes real natures and causal powers to organisms and other relatively large-scale entities. Philosophers like Avicenna, Maimonides, and Thomas Aquinas exemplify this tradition.

"natural" facts: the evaluative facts supervene on the natural facts, in the sense that, once all of the natural facts are given, the evaluative facts follow with metaphysical necessity. In this version of supervenience, there are no two metaphysically possible worlds with the same natural facts but different evaluative facts.

It is possible, however, to have a weaker notion of supervenience: one in which there may be metaphysically possible worlds that agree in the base facts but disagree in the supervening facts, but there can be no pairs of "nomologically" possible worlds that do so. In other words, we have to suppose that there exist "laws of emergence" of some sort, which are metaphysically contingent but which nonetheless impose some kind of regular dependency of the higher levels on the lower.

However, this form of ontological emergence is still of no help to us in the present context, since higher-level facts are still tied rigorously and inflexibly to the lower-level laws or patterns, the breaking of which would constitute miraculous intervention. Consequently, ontological emergence of this kind introduces no third option for divine action.

In the last thirty years, a new form of ontological emergence has appeared—a *causal* notion, which dispenses entirely with the constraint of supervenience altogether. Timothy O'Connor (O'Connor 1994; O'Connor and Wong 2005) and Paul Humphreys (1997) are the leading figures in this movement. In this model, the higher-level facts are *causally* dependent on the lower-level for their initial appearance in nature, but they can subsequently evolve with independent causal power. If the higher-level causal powers are indeterministic in character, then the domain of higher-level facts can evolve into states that violate supervenience (in both senses).

This sort of causal emergence might seem to provide a third option for divine causation, if we can assume that God can directly influence the exercise of the causal powers at the higher level or directly add or subtract causal powers at the higher level. However, on reflection, this mode of divine causation is once again easily assimilated to the category of the miraculous. Nothing in the O'Connor-Humphreys model rules out the possibility that causation at the higher levels is deterministic, in which case God would once again have to disrupt regular patterns in order to intervene. It is the indeterminism, if there is any, and not the emergence, that is doing the real work in making space for divine action.

We can, however, modify the causal model of emergence slightly in order to secure a genuinely new route for divine action. We have to focus on the causal *laws* by which the lower-level facts determine the higher-level facts. We will argue in Sects. 14.3, 14.4, 14.5, and 14.6 that there is good reason to suppose that the causal joints between the lower and higher levels are genuinely random and un-patterned. If so, God would be free to fine-tune this nexus in such a way as to produce particular events at will without disrupting any regular or general patterns.

What do we mean by *random* in this context? We propose using recent mathematical definitions of product or algorithmic randomness, and then we apply these definitions to the causal "laws" or constraints by which the lower-level facts cause and sustain higher-level facts. That is, we will seek to define what it is for a causal law to be *random*. A random causal law is one that does not impose any general or regular pattern on the causal nexuses that it underwrites. Consequently, God is free to jury-rig a random causal law in such a way as to produce specific and particular events in history, without sacrificing any regularity of pattern.

Random sequences of events are much more common than non-random ones. The set of random sequences has measure *one* in the space of possible sequences. A measure one randomness property corresponds to the absence of a *measure zero property* (a property had by only the members of a special or unusual subclass of sequences). Martin-Löf (1966) proposed that we could define a random sequence as an infinite sequence that cannot be effectively determined to violate any measure *one* randomness property. By *effectively determined*, Martin-Löf meant determined by a computationally effective (recursive) procedure. So, a random sequence is one that cannot be effectively proved to belong to any such special subclass (Dasgupta 2011).

Random sequences are highly incompressible. The only effective description we can give of such a sequence is simply to list the members of the sequence one by one.

We can now state that a causal law (such as the law by which lower-level states cause and sustain higher-level ones) is *random* if and only if there is an infinite sequence of ordered pairs of states (the first belonging to the lower level and the second to the higher level) such that each pair instantiates the law and such that the sequence as a whole is Martin-Löf random. A pair of states *instantiates* a causal law just in case it represents a causal transition that conforms to the law, and neither state includes any features that are causally irrelevant to the transition. For example, suppose that we assign numbers to possible states of a system by means of an effective code—something like Gödel numbers for the description of the state in an appropriate scientific language. A causal law is random if there is an infinite random sequence of pairs of numbers (one for the lower-level states and one for the higher-level states) that instantiate the law.

Non-random causal laws reflect real regularities or patterns in nature. Newton's laws, Einstein's laws of general relativity, the dynamics of quantum mechanics—all of these are highly non-random. Sequences of the kind mentioned in the last paragraph that conform to these laws would be highly compressible, if we let the ordered pairs represent prior and posterior conditions of an isolated system. Given the first number in any ordered pair, we could use the general equations of force and motion to deduce the second member. In the case of random laws, this would be impossible. The correct result in each case would be entirely ad hoc, not computable from any more general law.

If the causal laws by which lower-level facts cause higher-level ones are *random*, then God would have been free to jury-rig these laws in order to produce very specific outcomes in the history of the world without disrupting any regularity or pattern, since the laws of emergent causation are in any case pattern-free, whether jury-rigged in this way or not. We can suppose that the random laws of emergent causation are also highly non-local, that is, the emergent higher-level state depends on the totality of lower-level states at the time in question throughout the universe (or throughout the backward time-cone of the higher-level state, if we take relativity into account). This would give God maximum flexibility in adjusting the laws of emergent causation to produce in particular cases the precise higher-level fact that He intends—so long as exactly the same lower-level condition (at the cosmic scale) never recurs, the adjustment of the random law in each particular case would have no implications for any past or future case of emergent causation. God could have arranged "in advance" (i.e., from eternity) for a vast menu of possible interventions, in anticipation of the variety of future contingent events. Alternatively, God could intervene directly or indirectly at the emergent level without violating any non-random pattern, since the laws of emergence are in any case random.

In order to give God a truly free hand, one more condition needs to be added. If, as on the O'Connor model of causal emergence, we allow for horizontal causation at the higher level (i.e., the direct causation of some later higher-order facts by other, earlier ones), then we will have to stipulate that at least some of the horizontal higher-order causal laws at each level must be themselves random (and perhaps also indeterministic).

Otherwise, there would be exhaustive and deterministic patterns at the higher level that would exclude non-miraculous divine action.

There is one more difficulty to consider: the threat of epiphenomenalism. A domain of emergent facts is *epiphenomenal* if its members lack the capacity to influence lower-level facts. Where the emergent facts are epiphenomenal, all causation goes in one direction: from the lower level to the higher, and not vice versa. If the emergent levels are epiphenomenal, then jury-rigging the random laws of causal emergence gives God some real control over the higher levels of facts, but the influence would remain very subtle, non-public, and probably ephemeral and modest, since the influence could never precipitate down to influence the flow of physical events without disrupting the regular and deterministic patterns at that lowest level. We will suggest a way around this problem in Sect. 14.7, exploiting certain facts about emergence in quantum mechanics.

To summarize, we can define a precise model of emergence—*causally random emergence*—that would provide God with a third option for action in particular cases. The world exhibits CR (causally random) emergence if and only if there are two disjoint class of possible facts, the "lower-level facts" L and the "higher-level facts" H such that:

1) Both sets of facts are fully real—they are not merely useful fictions.
2) Neither set supervenes on the other with metaphysical necessity.
3) Whenever a fact *f* from H is realized at time *t*, it is either *caused by* some plurality of facts from L (if there were no other H-facts in *f*'s immediate backward time-cone) or caused by some other fact from H and *sustained* at time *t* by a plurality of facts from L.
4) The lower-to-higher (bottom-up) emergent causal laws (the vertical laws of emergence) that underwrite condition (3) are Martin-Löf random (in the sense described earlier).
5) If there are any horizontal higher-level causal laws (laws connecting higher-level facts at one time to later higher-level facts), these are also random.

Is there any reason to think that causally random emergence actually occurs? In the following four sections, we will provide four cases that suggest that it does.

14.3 The Emergence of Meaning, Intentionality, and Mathematical Knowledge

There is good reason to think that the behavior of human organisms (considered biologically) is finite in complexity, whether considered individually or collectively. That is, the total set of our behavioral dispositions (including our linguistic dispositions) is finite. There are only finitely many internal states that our brains can be in, only finitely many perceptually distinguishable situations a human community could find itself in, and only a finite number of muscular contractions that could result from internal decisions. Thus, human society at any point in time could be modeled as a finite automaton.

It is well known that no finite set of linguistic dispositions can fix the semantic meaning of our languages, so long as our language includes the basic notions needed for arithmetic: natural number, 0, successor, +, ×. Thanks to Gödel's incompleteness theorems, we know that no effectively computable axiom system can capture all of the truths of arithmetic. And, thanks to Gödel's completeness theorem, we know that any consistent system that is incomplete can be given non-standard models, models in which "number," "successor," or other terms are given disparate mathematical interpretations. Thus, our behavioral dispositions are not sufficient to provide unique interpretations to our arithmetical notions, as was observed by Ludwig Wittgenstein (1953) and developed by Saul Kripke (1982).

Since the sub-intentional realm, if we include within it all biological, chemical, and physical facts, is not causally connected with the Platonic realm of natural numbers, there is nothing in that realm that is sufficient to ground determinate mathematical meaning. Nonetheless, it seems obvious that we know what we mean by terms like "number" and "successor." All of mathematics, including mathematical logic and formal semantics, presupposes that we are able to think determinate mathematical thoughts. Consequently, there must exist a higher-order domain of meaning and intentionality, a domain that cannot supervene with metaphysical necessity upon the sub-intentional domain. Moreover, the causal laws by which the sub-intentional domain causes and sustains this domain of mathematical intentionality must be Martin-Löf random, since if those laws were computable, the non-intentional domain would be, contrary to our demonstration, sufficient to fix determinate meanings. Thus, the realm of mathematical intentionality must be CR-emergent, relative to the realm of sub-intentional facts.[2]

There is, in addition, another argument based on Gödel's theorems, an argument introduced by J. R. Lucas (1961) and defended by Roger Penrose (1994). Gödel's incompleteness results show that any consistent, computable axiomatization of number theory is incomplete. In particular, no such consistent, computable axiomatization can be capable of proving its own consistency or soundness. Suppose, for *reductio ad absurdum*, that human mathematical cognition is computational, that is, it can be accurately modeled by a Turing machine, by a system of recursive functions. If so, human mathematical insight would be recursively (effectively) axiomatizable by some formal system *S*. Now, suppose further that if such a system were to exist, we could in principle recognize that *S* axiomatizes at least some of our mathematical insight. Suppose, finally, that our mathematical insight represents real knowledge and that we can know that it does so. From these assumptions and Gödel's theorem, we can prove a contradiction. If we can recognize that *S* axiomatizes (some of) our mathematical insight and we know that that insight constitutes knowledge, then we can also recognize that *S* is sound (i.e., that all of the theorems of *S* are true). This implies that *S* is consistent (since any set of truths is consistent). Hence, we can prove that *S* is consistent. But, by hypothesis *S* axiomatizes *all* of our mathematical insight, then *S* itself must prove that *S* is consistent. By Gödel's theorem, this is possible only if *S* is inconsistent. Contradiction.

There are only three possible ways to avoid this contradiction. We have to suppose that at least one of the following theses is true:

1. Human mathematical intuition is not in fact computable (and so cannot be modeled by a recursively axiomatizable system).
2. We cannot know that we have any mathematical knowledge.
3. We cannot know that the system that actually and exhaustively axiomatizes our mathematical intuition is a representation of any of our mathematical knowledge.

[2] Our argument would suggest that machine learning and artificial intelligence are intrinsically limited, because they lack the sort of ontological emergence required for true insight. Artifacts like computers can only emulate or mimic the knowledge of truly rational creatures with emergent natures.

Thesis 1 supports the CR emergence of human cognition from the computational functioning of the nervous system. Thesis 2 seems utterly implausible. So, the only real alternative is thesis 3. However, it is hard to believe that if our mathematical insight is generated by an algorithm, it is generated by one that is utterly alien and unrecognizable—one that does not correspond in any intelligible way to mathematical truths that we can recognize.

Mathematical intentionality is plausibly connected with the human capacity for free will. There is a long tradition within the Aristotelian tradition that includes ibn Sīna and Thomas Aquinas of associating free will with the rational soul, and the rational soul with our capacity to grasp universals, including the universals of mathematics. From a reductive point of view, human behavior can be described as random, which on the level of intentionality can be redescribed as "free."[3]

14.4 The Emergence of Phenomenal Qualia

In an important but often overlooked essay, Robert M. Adams (1987) has argued that the phenomenal qualities (called "qualia" in recent philosophy of mind literature) of sentient experience are emergent relative to the non-phenomenological facts of physics and chemistry (and biology, for that matter). As it turns out, the sort of emergence that Adams adumbrates fits precisely to our definition of CR emergence.

Adams points out that we believe both that there are certain ways that things appear to us in vision, smell, taste, hearing, and touch, ways that correspond to our perception of colors, flavors, sounds, and so on, and that these ways of appearing are correlated with and caused by certain biophysical facts, such as brain states. Red things appear in vision in a certain way to us, a way that differs from the way yellow things appear in vision, and from the way roses appear in smell. Moreover, red things tend to look the same way over time, and they do so because our experiences of red are somehow caused by the same sorts of physical and biophysical conditions.

However, Adams points out, when we try to explain these facts, we find that any causal laws that we can imagine will turn out to be *random* laws,

[3] Such freedom need not contradict God's perfect knowledge, because He is outside the dimensions that restrict human life, including the dimension of time. We are constrained by the dimension of time, but He is not, so He can know the future without interference.

in the sense defined in Sect. 14.2 (i.e., algorithmically random). According to Adams, a more general, non-random causal law would have to take something like the following mathematical form L (Adams 1987, 255):

$$(\mathrm{L})(\forall \mathrm{p})(\forall \mathrm{q})\big(\text{if } \mathrm{F}(\mathrm{p}) = \mathrm{S}(\mathrm{q}), \text{ then p causes q}\big)$$

Here "p" would be a variable ranging over a class of physical (non-phenomenological) states, and "q" a variable ranging over the entire class of phenomenological facts. "F" would have to be a function that, when applied to an arbitrary physical fact, yields in an effectively computable way some number or other mathematical value (vector, matrix, or whatever). Similarly, "S" would have to be a computable function that, when applied to an arbitrary phenomenological fact, yields a mathematical value of the same kind. When the two values match, for some p and q, the general law would enable us to deduce the particular causal law that p-situations cause q-situations.

However, as Adams convincingly argues, it is simply impossible to believe that there is any function like S.

> There is no plausible, non-ad hoc way of associating phenomenal qualia in general with a range of mathematical values, independently of their empirically discovered correlations with physical states. The independence requirement is crucial here. … [In its absence, the "explanation"] would merely restate the correlation of phenomenal and physical states. (Adams 1987, 256–7)

In other words, a function like S would be possible only if we used the specific correlation facts to associate the phenomenal facts with such a mathematical value, but in that case, S itself would be algorithmically random, not effectively computable.

So, we have reason to suppose that phenomenal qualia are CR-emergent, relative to the class of biophysical, non-phenomenological facts. If this is right, we face an interesting question: what is the relationship between the domain of meaning and cognition, on the one hand, and sensory phenomenology, on the other? It seems pretty clear that sensory phenomenology could not help in fixing the meanings of our mathematical sentences or in guiding our mathematical intuitions. It's also hard to see how facts about meaning or cognition could determine the phenomenal qualia associated with biophysical conditions. It seems that we have here two distinct domains of CR-emergent fact: the domain of thought and intentionality (especially mathematical thought) and the domain of phenomenology and sensation.

We could think of the sentient *soul* as the causally emergent product of interactions of millions of neurons in the organ (the brain) of an organism. As species evolved to produce evermore complex organisms with higher number of neuron cells and higher connectivity between the cells, the sentient soul as an entity appeared. This entity, the soul, does not exist in a single cell. These single cells or small groups of cells are “alive” but do not contain a soul (as the seat of sentience). If the brain is dead through the loss of a sufficient number of cells and their connections, the organism is a vegetable, that is, without such a soul. The organism in this case is alive only. Animals have souls, but plants don’t because they lack the connectivity between cells to reach the threshold of the creation of the sentient soul.

It can be observed that as the number of cells increase in any one organism the complexity increases along with the cellular division of labor (Herculano-Houzel 2009). Most notably in higher forms the brain is the one organ whose number of cells increases logarithmically compared to other organs relative to body size. This increase in number of brain cells can be seen in mammals and in primates. The increase is not only in number of brain cells but more importantly in the connections between these neurons and how they are organized, that is, the architecture or neuronal wiring (Hoffman 2014). Our hypothesis is that the entity what we call a soul emerges as a result of the complex numbers and interactions and architecture among the brain cells. When an organism dies, the cells are still *alive* by definition, since they are still metabolizing, dividing, and interacting with the environment, but no one would claim the cell has a soul. The difference between multicellular life and the life of the individual cells is a case of random emergence. Similarly, as the number of brain cells and connections increase within mammals the rational consciousness emerges in humans and their species compared to other forms. This also can be lost when a person’s higher brain functions are destroyed, even when the sentient soul persists.

There is a further emergence of certain rational or superrational feelings or attitudes and their manifestation, such as love and altruism. These emerge again as a result of increased connections between cells. All of these emergent features appear gradually in evolutionary history. It is not a matter of all or none, although there may be a go/no-go threshold within the evolutionary tree of species that are now extinct. We hypothesize that there are random mathematical functions that describe this emergence, similar to the use of fractal scaling to describe the brain's organized variability. An important feature of fractal objects is that they are invariant, in a statistical sense, over a wide range of scales (Hoffman, *Evolution of the Human Brain*). Such invariance or regularity at one level of description is consistent with the randomness of the complete functional relationship.

14.5 The Emergence of Life

Teleological language and concepts are ubiquitous and ineliminable in biology. *Enzymes* are proteins with the natural function of catalyzing certain chemical reactions. *Genes* are chains of nucleic acid with the function of coding for the production of certain enzymes. A *nucleus* is a molecular structure with the function of housing and facilitating the function of genes, and so forth. If we suppose that these teleological functions are merely "heuristic," we have to ask, heuristic for what? To what further discoveries do teleological models lead? Only to still more biological knowledge, that is, to more teleological knowledge. It would be crazy to suppose that all of biology is merely a fiction, useful only as a tool for additional chemical and physical discoveries. In fact, physics and chemistry can do quite well on their own: they stand in no need of biology. Biology exists for its own sake, and biological inquiry never escapes from the teleological domain.

As Georg Toepfer has put it:

> *teleology* is closely connected to the concept of the organism and therefore has its most fundamental role in the very definition of biology as a particular science of natural objects. … The identity conditions of biological systems are given by [teleological] functional analysis, not by chemical or physical descriptions. … This means that, beyond the [teleological] perspective, which consists in specifying the system by fixing the roles of its parts, the organism does not even *exist* as a definite entity. (Toepfer 2012, 113, 115, 118)

This was recognized by the Neo-Kantians of the early twentieth century:

> We even have to define this science [biology] as the science of bodies whose parts combine to a teleological 'unity.' This concept of unity is inseparable

> from the concept of the organism, such that only because of the teleological coherence we call living things 'organisms.' Biology would therefore, if it avoided all teleology, cease to be the science of organisms as organisms. (H. Rickert 1929 [1902], 412, cited and translated by Toepfer 2012, 113)

The chemist and philosopher Michael Polanyi (1967, 1968) also recognized the emergence of life from physics and chemistry.

Evolution itself presupposes a strong form of teleology in the very idea of *reproduction*. No organism ever produces an exact physical duplicate of itself. In the case of sexual reproduction, the children are often not even close physical approximations to either parent at any stage in their development. An organism successfully *reproduces* itself when it successfully produces another instance of its biological kind. This presupposes a form of teleological realism (Deacon 2003).

The most plausible attempt to remove teleology from biological science is that of functionalism, as developed by F. P. Ramsey (1929), David K. Lewis (1966), and Robert Cummins (1975). In this tradition, biological functions are identified with complex, recursively specified behavioral dispositions. In a recent paper, Alexander Pruss and one of us argued (Koons and Pruss 2017) that such an identification cannot succeed. We made use of a thought experiment that was created by Harry Frankfurt (1969) to refute the idea that freedom of choice can be analyzed in terms of the availability of alternative actions: namely, the thought experiment of *the potential manipulator*. We are to suppose that we have an organism with certain biological teleo-functions. We introduce into the thought experiment a potential manipulator who (for some reason) wants the organism to follow a certain fixed behavioral script. If the organism were to show signs of being about to deviate from the script, then the manipulator would intervene, altering the organism's internal constitution and causing it to continue to follow the script. We are to imagine that in fact the organism spontaneously and fortuitously follows the script exactly, and, as a consequence, the manipulator never intervenes.

Frankfurt introduced such a thought experiment to challenge the idea that freedom of the will requires alternative possibilities. Koons and Pruss used it to show that the existence of biological functions is independent of the organism's functional organization—its system of behavioral dispositions, which links the dispositions to inputs, outputs, and each other. It is obvious that the presence of an inactive, external manipulator cannot deprive the organism of its biological functions. However, the manipulator's presence is sufficient to deprive the organism of all of its normal behavioral dispositions: under the circumstances, it is impossible for the organism to deviate from the manipulator's script. If the manipulator's script says that at time $t + 1$ the organism is to be in state S, then that is what would happen, no matter what state the organism were in at time t.

Moreover, biological malfunctioning is surely possible as a result of injury or illness. A functionalist reduction of biological teleology cannot incorporate the effects of every possible injury or illness, since there are no limits to the complexity of the sort of phenomenon that might constitute an injury or illness. Injury can prevent nearly all behavior—so much so, as to make the remaining behavioral dispositions (both internal and external) so non-specific as to fail to distinguish one teleological function from another. Consider, for example, locked-in syndrome, as depicted in the movie *The Diving-Bell and the Butterfly*. Therefore, the true theory linking teleology with behavioral dispositions must contain postulates that specify the *normal* connections among states.

Without resorting to realism about teleology, our only account of normalcy would be probabilistic. Thus, a system *normally* enters state S_m from state S_n as a result of input I_m provided it is *likely* to do this. However, serious injury or illness can make a malfunctioning subsystem rarely or never do what it should, yet without challenging the status of the subsystem as, say, a subsystem for visual processing of shapes. And, again, an inactive but potential Frankfurtian manipulator, whether external or internal, can change what the system is *likely* to do without *actually* manipulating the system in any way.

So, we have good reason to think of biological teleology as something both real and non-supervenient on the underlying physics and chemistry. We can, therefore, reasonably adopt the thesis of the causal emergence of biology. Moreover, the possible existence of a wide variety of environments and evolutionary histories for any given biochemical structure, as well as the potentially infinite number and varieties of illness, defect, and injury that prevent any simple deduction of biological purpose from actual functioning, together make it very likely that the laws of causal emergence in this case are algorithmically *random*.

What is the relationship between the emergence of thought and sensation, on the one hand, and biological teleology, on the other? In this case, we have good grounds for seeing some kind of downward causation at work: causation from mind to biology.[4] The content of our mental states, the operations of mathematic cognition, and the phenomenal states associated with neural functioning are all highly relevant to determining the true biological function of the relevant neural processes.

14.6 The Emergence of Thermodynamics and Chemistry

Finally, we turn to the case of thermodynamics and chemistry, in light of the quantum revolution of the early twentieth century. One of us has recently argued (Koons 2018b, 2019, 2021) that quantum thermodynamics provides some good reason for suspecting that chemistry and thermodynamics are causally emergent from the underlying quantum mechanical physics (whether traditional particle physics or quantum field theory).

We can plausibly derive the dynamical laws of quantum statistical mechanics from the dynamical laws of ordinary QM, but the *space of possibilities* defined by QSM is not reducible to the space defined by ordinary QM (Ruetsche 2011, 290). Hence, quantum statistical mechanics, and related quantum theories of thermodynamics, solid-state physics, and chemistry, are real and do not supervene (with either metaphysical or nomological necessity) on the quantum-mechanical facts of the constituent particles.

In classical mechanics, in contrast, the space of possible boundary conditions consists in a space each of whose "points" consists in the assignment (with respect to some instant of time) of a specific location, orientation, and velocity to each of a class of micro-particles. The totality of microphysical assignments in classical physics is both complete and universal with respect to the natural world. As long as we could take this for granted, the reduction of macroscopic laws to microscopic laws seemed sufficient to ensure the nomological supervenience of the macroscopic world on the microscopic. However, the quantum revolution has called

[4] Such downward causation is consistent with the randomness of the biological domain, so long as it is also governed by random causal laws. What we're calling downward causation here is a form of what we defined as horizontal causation above: causation of some emergent facts by other emergent facts. In Sect. 14.7, we'll address the problem of how far "down" such downward causation can go, consistent with our model.

into question the completeness of the microphysical descriptions, opening up the possibility of causally emergent phenomena at other levels of scale.

In the case of quantum *thermodynamic* systems, the whole is greater than the sum of its parts—in a very literal sense. Any mere collection of fundamental particles has, in itself, only finitely many degrees of freedom (as measured by the position and momentum of each particle), while thermal systems (as modeled in quantum statistical mechanics) have *infinitely many* degrees of freedom (Primas 1980, 1983; Sewell 2002). In fact, the models of quantum statistical mechanics are infinite in any even stronger sense: they consist of infinitely many subsystems, represented by a non-separable Hilbert space. This inflation of degrees of freedom would have been extremely implausible in *classical* statistical mechanics, where we know that there can be, in any actual system, only finitely many degrees of freedom, since the particles (atoms, molecules) survive as discrete, individual entities. In quantum mechanics, individual particles (and finite ensembles of particles, like atoms and molecules) seem to lose their individual identity, merging into a kind of quantum goo or gunk. Hence, there is no absurdity in supposing that the whole has more degrees of freedom (even infinitely more) than are possessed by the individual molecules, treated as an ordinary multitude or heap.

In algebraic quantum thermodynamics, physicists add new operators that commute with each other (forming a non-trivial "center"). These new "observables" are represented by distinct representation spaces, not by vectors in a single Hilbert space, and are thereby exempted from such typical quantal phenomena as superposition and complementarity. The von Neumann-Stone theorem entails that only algebras with infinitely many degrees of freedom (and non-separable spaces) can contain such non-quantal observables (in a non-trivial *center*). These new observables can then be used to define key thermodynamic properties like temperature, phase of matter (solid, liquid, etc.), and chemical potential. The thermodynamic properties do not supervene with metaphysical necessity on the quantum wavefunction for the world's fundamental particles and waves, since any model of the latter is separable and finite, lacking the non-quantal observables needed for thermodynamics and chemistry.

Are the causal laws by which thermodynamic states (modeled by infinite algebraic models) emerge from pure quantum states *random*? Quantum statistical models depend on selecting an appropriate GNS (Gelfand-Naimark-Segal) representation, one based on a particular vector in the Hilbert space (Sewell 2002, 19–27). The discovery of an appropriate GNS representation in each application involves an element of creativity and judgment on the part of the physicist: there is no simple and general recipe or algorithm. Hence, it is at least possible that the emergent causal law is random.

In the case of horizontal causation at the level of thermodynamics, Primas (1990) has shown that in the most important cases, we can show that the dynamics is nonlinear and stochastic. The horizontal causal laws are, therefore, random in the algorithmic sense, as required.

Is there downward causation from biology to thermodynamics and chemistry? Without a doubt, the general direction of biological thinking, from the time of the synthesis of urea by Friedrich Wöhler in 1828, has been to emphasis "upward" causation, explaining biological function in chemical terms. However, the holism of quantum mechanics provides a real avenue for the determination of chemical form by the wider "classical" environment of each molecule, including the biological environment. Molecules can "inherit" or "acquire" classical properties (including stable molecular structure) from their environments, despite the fact that they can be observed in superposed quantal states when isolated. It is only the molecule as "dressed" by interaction with its environment that can spontaneously break the strict symmetry of the Schrödinger equations, and it is only a partially *classical* environment that can induce the quasi-classical properties of the dressed molecule. In order to produce the superselection rules needed to distinguish stable molecular structures, the environment must have infinitely many degrees of freedom, due to its own thermodynamic emergence (Primas 1980, 102–5; 1983, 157–9). It seems possible that the shape of such thermodynamic emergence could be molded in a top-down fashion by persistent biological structures and processes.

R. F. Hendry, a leading philosopher of chemistry, agrees that a molecule's acquisition of classical properties from its classical environment, thereby breaking its microscopic symmetry, should count as form of "downward causation":

> This super-system (molecule plus environment) has the power to break the symmetry of the states of its subsystems without acquiring that power from its subsystems in any obvious way. That looks like downward causation. (Hendry 2010, 215–6)

14.7 Downward Causation in Modern Quantum Theory

How far down does downward causation go? How far down does it have to go, for the RC-emergence model to provide a viable option for divine action? In order to answer these questions, we must first ask the following: What domain constitutes the lowest level of nature? One plausible answer would be that the lowest domain consists of the interaction of fundamental particles (electrons, quarks, photons, and so on) or of quantum fields. In order to distinguish this lower level from that of thermodynamics and chemistry, we would have to suppose that the correct models for the fundamental interactions would involve only finitely many degrees of freedom, as in standard, finitary models whose dynamics are defined by the Schrödinger equation. Quantum cosmologists contend that we should model the evolution of the entire cosmos by means of a single quantum "wavefunction."

Such models are strictly deterministic (in fact, the Schrödinger evolution of the quantum wave is much more strictly deterministic than was classical, Newton-Maxwell dynamics). However, they face a serious problem: they define (via Born's rule) the probability of detecting any particular result of any measurement, but such measurements seem to involve a kind of interruption (a "wave collapse") in the seamless, deterministic evolution of the wavefunction. The "measurement problem" concerns how to reconcile such apparent collapses with the underlying dynamics, and how to define when and how such collapses occur (if at all).

The Everettian or many-worlds interpretation attempts to do away with the measurement problem by denying that any such collapse ever occurs. Instead, the seamless evolution of the wavefunction according to Schrödinger's law represents a constantly branching world, one in which all possible results of each measurement are observed on different macroscopic "branches." Everettians have difficulty explaining the meaning of the probabilities generated by Born's rule: it seems that every result occurs with probability *one*, not with a probability corresponding to the square of the amplitude of the wavefunction at a corresponding vector.

Alexander Pruss (2018) and one of us (Koons 2018a) have argued that the best way to fix this problem is to take all but one of the Everettian branches to represent mere *potentialities* (as Heisenberg 1958 had proposed). The one *actual* branch is actualized by the exercise of causal powers by "substantial forms" at the chemical, biological, and personal levels.

The Pruss-Koons model can be called the "traveling forms" interpretation (the world's forms travel together along the branches of the macroscopic tree structure of the Everettian model). The addition of the parameter of actuality renders the Everettian model consistent with causal emergence: although the whole system of branches supervenes on the microphysical quantum wavefunction, the fact of which branch is uniquely *actual* does not.

On the traveling forms interpretation, downward causation never reaches the level of the evolving quantum wavefunction, but this is relatively innocuous, since that wavefunction represents only the physical potentialities of the world's matter: it does not exhaust what is true of the actual state of the world. So long as God can influence the emergent levels, He is free to determine which of the Everettian branches is actualized at each point in time. Hence, the influence of God's action through causal emergence can be public, significant, and long-lasting.

14.8 Some Theological Reflections

Many miracles in the Abrahamic tradition might be best thought of as cases of emergent intervention. It is striking that many divine actions can best be thought of as altering only human intentionality or experience. For all three traditions, one of the most important divine actions is that of inspiring prophetic knowledge and proclamation. This can be realized at the purely intentional level, or, in the case of visions and audible voices, at the level of phenomenal qualia. Similar accounts could be given of such miracles as the prolongation of daylight at Jericho (Joshua 10) and for King Hezekiah (2 Kings 20), Moses' burning bush (Exodus 3), Elisha's floating ax-head (2 Kings 6), Balaam's speaking donkey (Numbers 22), and the star of Bethlehem (Matthew 2).

In the Islamic tradition, prophetic inspiration is the most important and central form of miracle. Ibn Sīna (980–1037 C.E.) placed the emphasis on the purely intentional level: God provided Mohammed with knowledge and discernment, and Mohammed's own mind was responsible for transposing this information into the linguistic or symbolic level (Renard 1994, 6). Other thinkers, such as Mulla Sadra (1572–1641 C.E.), insisted that divine action encompasses the symbolic or imaginative level as well, which would correspond to the emergence of sentience (Rahman 1973, 242). This combination of intellectual and imaginative action was probably also involved in Mohammed's Night of Power, the Mi'raj, in which he had a vision of the fourth heaven.

Miraculous healings often occur at a bio-functional and teleological level: curing of paralysis, epilepsy, mental illness, blindness, and deafness. Many other healings, such as the elimination of leprosy, might also be purely biological in nature (via, perhaps, the re-tooling of the immune system). Alterations in animal behavior would be placed in this category, as in six of the ten plagues of Egypt in Exodus, and Daniel in the lion's den (Daniel 6).

At the level of chemistry and thermodynamics, we could place Jesus' turning water into wine, the manna in the desert of Sinai (assuming that this did not have a natural explanation), the rendering harmless of poison and snakebite (2 Kings 4, Acts 28), and the unburnable napkin associated with the life of Mohammed (Renard 1994, 143). Miraculous rain and its absence might be explained in thermodynamic terms, as might Mohammed's transformation Muqawais' stony ground into fertile soil (Renard 1994, 143).

The miracles that violate physical patterns are the exception rather than the rule: the three men in the fiery furnace (Daniel 3), Jesus' walking on water, the feeding of the five thousand, the multiplication of the widows' oil (1 Kings 17, 2 Kings 4), and the bottomless water skin of Mohammed (Renard 1994, 143). We would probably have to include all of the various resurrections: for example, the Shunnamite's son (2 Kings 4), the widow of Zarephath's son (1 Kings 17), Lazarus (John 11), the widow's son at Nain (Luke 7), the daughter of Jairus, and Tabitha (Acts 9), since these would have involved more than merely chemical alterations (especially in the case of Lazarus, who had been dead for four days).

Clayton (2006) and Peacocke (2006) argue that emergent intervention supports panentheism, a more naturalistic and immanent conception of God than is compatible with classical theism. This conclusion is based on the premise that God can alter emergent phenomena only by changing the ultimate, cosmic *context* of local events. However, we have argued that God can obtain these results by jury-rigging random laws of causal emergence. This model is fully compatible with the classical theism of ibn Sīna or Thomas Aquinas, with their timeless and utterly transcendent God.

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CHAPTER 15

God et al.— World-Making as Collaborative Improvisation: New Metaphors for Open Theists

Mark Steen

15.1 Introduction

The *Qur'an*, *Hebrew Bible*, and *New Testament* are full of metaphors. Theologians and philosophers frequently use metaphors to try to understand God, as well as God's relation to humanity and the created universe.[1] Metaphors, thought experiments, and imagination have played crucial roles in the history of science, and are often used to understand

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philosophical views[2] and scientific theories.[3] Scientific practice is informed by models which are, strictly speaking, fictional and imprecise (e.g., ideal gas laws, 'selfish' genes), and are useful partly because of imprecision.[4] Metaphors are important.[5]

Metaphors often play an *ampliative* role, acting as key components in arguments by analogy. If this is legitimate, then thinking metaphorically can not only help us grasp certain theories or phenomenon, but can extend our knowledge. If our metaphors are infelicitous (usually by being un-isomorphic), then they can lead us astray. So, while buyer beware, we may not be able to avoid shopping.

We should craft our metaphors to match certain presuppositions, prevent certain key misconceptions, and so forth. But the point of developing metaphors is not just to act as heuristics or illustrations for the unlearned. Metaphors help *develop* theories at least as much as they can express theories.

Which metaphors should we employ in thinking about God, and His relation to us and our cosmos? I have witnessed the unsurprising fact that most of the metaphors about God and His relation to the world support, and are supported by, Classical Theism, as opposed to more unorthodox theories like Open Theism (OT). But I am an Open Theist and metaphor-lover, and think Open Theists should be invited to the Metaphor Party. So I decided to explore some novel metaphors after canvassing those for Classical Theism.

This paper is not a direct argument for Open Theism (OT). I rather hope to show how improvisational metaphors illustrate the OT picture, whereas traditional metaphors are unsuitable. I also will show how

[2] One example is the Crossword Puzzle analogy of Susan Haack for understanding 'Foundherentism.' See Haack 1993.

[3] Think of how Einstein imagined chasing photons or riding inside space ships in order to develop Relativity Theory, or how Galileo trounced Aristotle's theory of gravitational acceleration being a function of mass (see Gendler, *Thought Experiment*, and Frigg "Models and Fiction"). Also, all of us who took high school physics remember Newtonian physics being illustrated by non-existent frictionless Euclidean planes, perfect spheres, and General Relativity by thinking of a planet bending space like a bowling ball on a blanket. There is also 'Hilbert's Hotel' with regard to mathematics, and so on.

[4] A model must be simpler than what is a model *of*, given human limitations and our need for practicality. (C.f. Frigg 2010).

[5] In ways both bad and good. Think of the result of depicting 'the other' as vermin, rats, viruses, contagion, and so on.

understanding them makes OT more plausible and coherent with traditional models of God's authority. Plus, they're fun to think about.

15.2 Classical Theism and Its Metaphors

Open Theism holds that God is (at least partly) temporal and does not know which future contingent events will occur. This includes free choices as well as undetermined natural events. This view is the combination of theism with the doctrine that the future is 'open' or not settled—either by God or by the laws of nature.

Classical Theism holds that God is outside of time (in 'eternity'), and knows everything which will occur (even future contingents). The following chart will give a somewhat caricatured flavor of the differences between these views.

Question	*Classical Theist*	*Open Theist*
Does God know everything that will happen?	Yes	No
Is God temporal?	No	Yes (in some sense)
Does God change?	No	Yes (except in His character)
How sovereign is God?	Meticulously so	Allows free will and randomness
Will all of God's purposes be fulfilled?	Exactly as planned (according to the most precise plan)	As planned (but not according to the most precise plan)
Does God take risks?	No (no contingency plans needed)	Yes (with contingency plans)

15.2.1 The Bird's-Eye View

Aquinas developed the theological metaphor of the Bird's-Eye View.[6] While some travelers on a twisty mountain road can't see around the corner ahead, a bird in flight can, with its privileged view from above. If we make the bird analogous to God, the road to time, and us to the travelers, then the result is somewhat obvious. God sees all of time, including the future, laid out at once, while we are bound to a road segment at a time.

[6] *Summa Theologica*, part I., Article 13.

Something like the road analogy, the notion of the 'Block Universe,' is employed in non-theological contexts. We are asked to view the Universe as shaped like a stick of butter, with 2D slices of the butter representing actual 3-dimensional "time-slices" of a world, with the length of the stick representing the fourth dimension, time.[7] Space and time aren't distinguished on this view—there is only space-time. The Block Universe view (also called "Eternalism") is often held to be supported by Relativity Theory, not theology, but science-minded folk of a certain theological bent can find in this yet more support. On this kind of view the present is in no way privileged, all times are equally real, and time does not really 'flow.'

This type of metaphor is ubiquitous, as it is simple, powerful, and visual, and the idea of God 'above' looking 'down' at all of space-time laid out in an instant gives an idea of God in eternity sufficient for most folk purposes.

According to this picture God does not act in time, nor does He need to. *One* act, *sub specie aeternitatis*, is sufficient to both create the world and commit all acts of particular providence, since He foreknows and responds accordingly beforehand.[8]

15.2.2 God as Instantaneous Author

A common metaphor for how God stands to the world is as how an author stands to their novel. 'Author,' etymologically overlaps 'authority,' and it has long been held that the author is the best authority on their work. Not merely in the *interpretation* of it, but, tautologously, in the *writing* of it. Authors just lay down, by *fiat*, what happens in their stories. And God speaks it, and it is. As Susan Lanser remarks, "It is not accidental that we use the term *author* to refer to God or that the root of the word 'authority' links it to the notion of the creator or promoter" (1981, 84).

[7] See, for example, Sider, *Four Dimensionalism,* or Heller 1990.

[8] While sitting in a seminar of Eleonore Stump's, I saw her use a pretty ingenious metaphor. Imagine a long table covered with a long tablecloth and place settings. By tugging on one end one can affect every object on the table at once, hence having causal effects where one is not present. Metaphorically, making times analogous to places on the table, God can 'tug' the world just once and affect every subsequent time, without being 'at' those times.

Sam Lebens, in "God and his imaginary friends: a Hassidic metaphysics," entertains the idea that the world is God's lucid dream, or a story He's imagining.[9]

> I call it 'Hassidic idealism,' since the idea *isn't* that the world doesn't exist. …The idea is that for anything other than God to be *real* is for it to exist in the story that God is spinning in his mind. This is a radical form of idealism. (2017, 163, italics his)

It's a gripping and rich analogy to compare world creation to book creation. Books, whether fictional or not, seem to describe some of the world.[10] Anna Karenina may not exist, but she *could* have, and those fictional events could have occurred.

Sometimes a novelist is called a 'world-maker', and we talk about "the world of Dickens" and such, and it has become common for fantasy and sci-fi authors to construct 'magic systems' or extraterrestrial cultures.

While non-fictional works represent the actual world, what do fictional works represent? Many have thought they represent 'possible worlds,' or, ways the world could be. What are possible worlds? According to Leibniz they are compossible sets of possibilia (and possibilia are 'complete concepts' in the mind of God), but many[11] have treated "possible worlds" more metaphorically, as 'World-Books,' that is, maximally specific and exhaustive sets of propositions. The idea that 'possible worlds' are like Fictional World Books, whereas the Actual World's Book is the only one representing a real thing, is an extremely popular one.[12] There are many different views in this neighborhood, but the shared idea is that worlds are identical with, or represented by, consistent sets of sentences or

[9] In this he is inspired by Hefter's (2013) interpretation of Rabbi Leiner (1995). Lucid dreams occur when one is aware that one is dreaming, and can consequently direct it to some extent.

[10] An alien archaeologist, far in the future, finding a copy of *Napoleon: A Life* (by Andrew Roberts), could be forgiven from thinking this is fiction, or that *Dangerous Liaisons* (an epistolary novel by Pierre Choderlos de Laclos) is a collection of actual letters.

[11] Mostly semanticists or modal logicians, who often regard 'possible worlds' in a merely functional or heuristic manner.

[12] You can find over twelve theories comparing possible worlds to books (or linguistic entities). See Divers 2002, 178–179 for details.

propositions. John Divers calls such proponents “Book Realists.”[13] These possible worlds are not like those of speculative cosmology and physics. There is no spatiotemporal path from our world to these, and they are fundamentally different kinds of entities.[14]

For the Classical Theist Book Realist, God authors these books, outside of time. ‘The book’ which represents the world is authored instantaneously. God knows any way a world could be, since He knows all the possible objects and properties, aggregates every possible combination of them, and picks one world to ‘actualize,’ where every last detail is settled. Every possible world-book, including what will become the actual world, is already ‘written.’

15.2.3 God: The Lone World-Artist

A ubiquitous metaphor is that God stands the world as an artist to their work of art. But which kind of medium is the world best viewed as? Like a painting? A song? Maybe a film.

Regardless of the metaphor, the Classical Theist adheres to two main points. First, the World Artwork is not a collaborative project, and the only artist is God Himself. Second, the artwork is birthed complete and entire. God is in eternity; He does not fiddle about in time. His creations may exist in time, but their past, present, and future are all equally known to Him. His difference-making contribution to the world is completed upon creation.

15.2.4 Problems with the Metaphors

For the Open Theist these metaphors just won’t do: they don’t reflect the world as she sees it, God as she sees Him, nor do they capture the relations between Him, the world, and us.

For example, on the Bird’s-Eye View metaphor, the ‘journey’ is all laid out, and our future is just another part of the Block Universe, just as real as the present. A completed book is one where, while the protagonist is deciding on one page, the decision is already settled on a later

[13] Divers, *Possible Worlds.*

[14] At least, according to most. Some people are ‘modal realists’ who think that all possible worlds exist in the same way, and ours is not privileged in any way. See Lewis, *On the Plurality of Worlds.*

page—hence not free. Completed books, films, audio files—if made instantaneously—could not have evolved differently. By collapsing the distinction between completed films and *filming*, they end up with films whose constituents could not have made the film any different than it in fact is.

These concerns are used, not to argue against Classical Theism, but to help construct desiderata for metaphors amenable to the Open Theist. I believe the OT'ist should consider the following five desiderata which are in bold.

Metaphors for the Open Theist should shed light on how **petitionary prayer can change God's mind**. That is, they should support a model where something occurs which would not have occurred had the petitioner not prayed, where it was open before the prayer whether it would be prayed or not. So, this leads to the **open future** desideratum, which is also necessary in order to allow Libertarian free will in general.

The metaphors should also shed light on **how providence works**, both in general and in particular instances, whether miraculous or not. The metaphors should show both **how God takes risks, while allowing us to have confidence in Him and His plans**.

A corollary to some of the aforementioned for Open Theists who, like myself, accept quantum randomness is that **randomness** must be compatible with, or illustrated by, the metaphors.

15.3 Metaphors for Open Theists

I will briefly cover two discussed metaphors amenable to OT, but I'm mainly interested in the two I will propose, which share the feature of improvisation. The main point of this essay is that improvisational metaphors more accurately capture the spirit of OT, which sees God and free agents as unequal collaborators in making the world be the one that it is and will become.

15.3.1 The Shrinking Tree

Storrs McCall (1994) makes use of a branching model of time in order to lay out a hybrid 3D/4D view which invokes the metaphor of a 'universe tree.' The rough idea is that we can think of the past as like the trunk of a tree, and all the possible futures are like branches.[15] The present is the point of the trunk where the bottom-most branches join the trunk, and we can envision it like a saw blade. As it moves up the trunk, it lops off unactualized branches. Suppose that event e1 can be followed by (mutually exclusive) e2 or e3. If e2 occurs, e3 is simultaneously 'lopped off' by the saw of the present. It is no longer possible. As time moves on, the future possibilities get lopped off, and, while the 'tree' shrinks, the 'trunk' of the past expands.

Before the 'saw of the present' chops off the other branches, there is nothing ontologically privileged about the future which will come to be, since it was not determined that it would come to be. If it was determined that a branch would not occur, then it wouldn't be a 'choppable' branch in the first place.

I find this model and metaphor extremely helpful and plausible, since it gives a surrogate for God's knowledge of the future in Classical Theism, namely, God's knowledge of all possible futures.

15.3.2 More Dynamic Metaphors: 'Books-in-Progress' and the 'Growing Block'

Static Classical Theists don't necessarily have a monopoly on the novel metaphor. A Dynamic Open Theist could employ it in a different way. They may have a different view of what novels *are*.

Static theorists see novels as sequentially ordered sets of propositions. But one could, and maybe should, see it differently. The writing of a book is an *event*, and the reading of a book is an *event*. Words, by themselves, just sit there, just like individual film cells on a motion picture reel. In order to work, the novel needs movement and perception just as much as the film does (and, arguably, more active imaginative involvement). Novels are a means to an end in a certain medium, the end of having certain *experiences*.[16] The squiggles on the novel's pages are a means. Toward what end? The generating of certain imaginings and representations in the reader. One could view the writing of a book more dynamically. That is how authors experience the writing and readers the reading. Texts, when used as directed, *move*. Read, turn page, repeat.

[15] Which themselves have branches, *ad infinitum*, unless there's a final moment.

[16] And *thoughts*, if you think the term 'experience' doesn't capture propositional content.

So, book metaphors need not be the sole province of Static Classical Theorists. God stands to the world as an author does to a book she is *writing*. Half-finished novels are no less real than finished ones.[17] So, just like half-finished houses being built are not half-real completed houses, but rather real half-built houses, so are half-finished novels not half-real completed novels, but rather real half-finished novels, or, we could say, *books-in-progress*.[18]

And perhaps we are characters in the world-novel being written which could 'possess' God in the way that characters possess authors.[19]

One further metaphor which can act as an adjunct to the book-in-progress metaphor is a view of the nature of time—the Growing Block.

C.D. Broad thought of space-time in a way akin to Eternalism, but with a crucial caveat. The block is *growing*—growing into the future. "Fresh slices of existence" keep getting added to the block, which accounts for the flow of time.[20] For Broad, the past and present are real, but the future is not. It does not yet exist. Combined with a denial of determinism, which slice will be added next is not settled.

The theistic Growing Blocker can see God as either adding each slice or setting up the block as grow independently, or some blended view. While a Growing Block theorist has flexibility with regard to dynamism and determinism, their view will invariably be more dynamic than any Eternalist view.

15.3.3 God as Collaborative Improvisational Director-Participant

According to the most apt metaphors I find for God in relation to the world, He is an improvisatory director and co-performer. I will examine in particular the metaphors of God as a jazz ensemble head, and as an improvisational play director-participant.

[17] Relatedly, how one sections a long book or series is somewhat arbitrary, and so whether one is finished with a book or in fact working on a sequel is somewhat arbitrary too.

[18] C.f. Szabo-Gendler 2008.

[19] In terms of surprising the author. I'm not supposing that we are pushing God around. There is a well-known phenomenon that fiction authors deal with, called 'character possession,' where it seems that the characters are telling the author what they will do rather than the other way around. Just to be clear, I don't think this is literal possession.

[20] Broad 1923, 66. Note that the issue of determinism is orthogonal to the question of the growing block.

Since it is a component of both metaphors, we can begin by laying out some of the elements of improvisation.[21]

Spontaneity
Spontaneity in performance is the soul of improv, even if an artifact is a goal. Something is improvised, in part, by being made up 'on the fly,' or not prepared beforehand. We can see it in dance, music, some painting (e.g., Pollock's flinging of paint), film, theater, 'automatic writing,' William Burrough's découpé,[22] and so forth.

Some works are completely improvised, some partially improvised, and the improvised elements can be structured and prepared to different degrees.

Structured
Ad-lib does not mean ad hoc. Improvisation is not purely random behavior or gobbledygook. In improv theater and jazz, the goal is a structured or coherent performance. There may, and perhaps must, be elements of randomness, but the whole should not seem completely random.

Collaborative Yes-And'ing
We are looking at *collaborative* improvisational forms. Improv theater and jazz bands work together to make a single work. One is a member of a team, and team goals trump personal ones. If someone in improv tries to stand out or works against their colleagues' contribution, the work usually suffers. Scenes only work if the players focus on doing what's right for the scene and characters, and build on, rather than deny, their colleagues' introduced content.

Playfulness
Arguably, improvisation is playful. It is participated in for joy and recreation, even if it has a serious purpose or application. One of the main draws for both artist and audience is that it is fun, even though (or partly *because*) it is difficult.

[21] See Zaunbrecher 2011 for more detail.
[22] Burroughs 'wrote' some pieces by cutting out words and randomly selecting them, while making some corrections for grammar and coherence.

Aesthetics of Ephemerality in Live Performance
Improvised art forms have aesthetic novelty. The most 'pure' improv and jazz are made to be performed live. In improv, this has to do with audience participation. Usually the direction an improv game or play takes will start with audience suggestions. Audience members are often asked to participate, sometimes on stage. Audiences usually cut a lot of slack to the performance that they wouldn't with a written play. Improv is self-consciously so, and that's part of what makes it the practice it is. In both improv and jazz the mutual interaction between performers and audience often makes a difference to the performance.

The ontology of an improv play is arguably different from a written one, and the same goes for an improvised jazz performance versus a recording, or a fully composed piece.[23] This has to do with entrenched Western ideas of what works of art are, as well as the distinction between composition and performance. With Western classical music, performer and composer are usually distinct, and the different performances are seen as different instances (or, 'tokens') of the same work (or 'type').

But the distinction between type and token breaks down with improv. In most cases, the performer and composer are one and the same, and the composition and the performance (to some extent) are one and the same. My friends Curtis Erhart and Tyler Denison, members of the improv troupe *Ephemerata*, begin every play by saying, melodramatically, "this play has never been performed before—and will never be performed again."

While there still are *kinds* of improv, both 'long-form' play structures (La Ronde, the Harold) and 'short-form' games (Word-at-a-time, Film Dub, etc.), performances in these structures are not different instances of the same work of art. The games are merely rules employed to shape spontaneous composition of plays.

With the most avante-y of *Avant-Garde* Jazz, every performance and composition are the same. With mainstream jazz, there are indeed different versions of the same piece, but some of the composition happens on the fly, so they are not instantiating a preexisting completed work.

Domenico Pietropaolo, while abstracting away from all the differences in the different schools of *commedia dell'arte* (the precursor of modern improv), analyzes *commedia dell'arte* as a "stochastic composition process" (Pietropaolo 1989).

[23] C.f. Solis, 316.

We can look at the various jazz soloing conventions and the formats of long- and short-form improv as stochastic composition processes. These are rules for making pieces and plays, which rely on randomness as a contributory agent. Randomness—it's not a *bug*, it's a *feature*!

15.3.3.1 Example 1: Jazz Band Leader

I am not the first to make a metaphorical connection between jazz and OT. Darryl Wooldridge on Sanders:

> Open Theism … proposes that God's give-and-receive relationship with humans requires that they have freewill and that God's actions are contingent upon human unknown actions. It is freewill that may change God's flexible strategies making macro predestination viable but micro predestination contingent, a bit like improvisational jazz solos within an overriding melody (Sanders 2007, 245). In other words, there is an unstructured or unknown polyphonic, improvisational element to human existence for which God accounts and responds, in real time, in harmonic kind.[24]

I am going to assume some familiarity with jazz[25] and will mostly refer to mainstream jazz of the 1940s and 1950s (especially 'Cool Jazz'). These works, like all jazz, have some amount of pre-arranged structure.[26] A familiar structure is a standard bop format, which is as follows: "there is an introduction, followed by the head, a series of solos and finally a closing recapitulation of the head" (Solis, 317). The 'head' is the main theme or melody of a song, and, very often, the work has a 32-bar AABA structure.[27]

The head remains recognizable in the piece's different versions, while improvisation provides for the difference. *Every* performance of an improvised jazz piece is different.

Improvisation is so central to jazz that 'covers,' or replication, is impossible. The band *Mostly Other People Do the Killing* (MOPDTK) did a painstaking, note-for-note reproduction of Miles Davis' album *Kind of Blue*. How can an intrinsic duplicate of a jazz *performance* not be the same

[24] Wooldridge 2014, 65.

[25] For those unfamiliar with the genre, here are some paradigmatic exemplars of the subgenres discussed in this paper: John Coltrane, "Alabama": https://tinyurl.com/y343ef6s, Miles Davis, "So What?": https://tinyurl.com/d3mack3, Thelonious Monk, "Don't Blame Me": https://tinyurl.com/ls2xlbh

[26] Some *Avant-Garde* works excluded.

[27] Solis, 317

jazz *composition*? Because, as (band leader) Elliott puts "it, 'the defining characteristic of jazz is improvisation,' and that's by definition precluded from this project."[28] Exact intentional replication is impossible since spontaneous creation is essential to the piece.

In jazz sheet music, there is often notation indicating when improvised solos should occur.[29] So, if one is not improvising, one is not playing the piece. MOPDTK weren't improvising "So What?," so they weren't playing it. Copying is not improvising. They weren't doing what Davis and crew were. Whether or not one is playing jazz is not intrinsic to the musical sounds, it depends on the intentions and preparations, or lack thereof, of the musicians.

Most small group jazz collaboration requires continuous simultaneous co-adjustment. They need to be playing *with* each other, not merely *beside* each other, and need to be creating something new as a group. Ingrid Monson colorfully describes how this fails in the following, even when the result sounds decent:

> I hate hearing them bands where like … one cat's playing some shit that he practiced. Another cat's playing some shit that he practiced. Everybody's playing some stuff that they practiced. … On a certain level there's like a feeling, "Well, I like playing with you," but … what does that mean? … You know, we didn't play shit together. We didn't do nothing together. I played my stuff, you played your stuff, we didn't screw up the time.[30]

It would, however, be a misconception to think that jazz solo work comes *ex nihilo* out of the head of the composer, in the moment. David Sterritt shows (as should be obvious) how jazz improvisation is based on hours of practicing and learning the various 'tricks' for improvising performances. "The allegedly inherent traits of improvisation—authenticity, spontaneity, individuality," which can give the art, and the artist, an air of mystique, or an aura of cool, "are often exaggerated or misrepresented by its advocates,"[31] Arguably, many improvised solos are pre-composed in part. As Thomas Owens states, all spontaneous performances "were

[28] See https://tinyurl.com/ybf875yh

[29] Or, at least, there is always an assumed convention that solos should occur during the piece.

[30] Monson 1995, 84. My source is Solis, 333.

[31] Sterritt, 166.

actually precomposed in part … no one can create fluent, coherent melodies in real time without having a well-rehearsed bag of melodic tricks ready."[32] And Sterritt states that "the typical improviser's mind … is 'stuffed with a congeries of motifs, instrumental sounds … scales, chords, modes, and the rest.'"[33]

This is not to denigrate jazz improvisation. While genuinely improvised, we must understand that the performance comes from disciplined preparation, shaping novel sounds from familiar material. It's the same with improv. Improvisers practice accents, character types, games, transitions, and so on.

If God interacts with us like a jazz band leader, perhaps we should look at an example.

John Zorn, while not a paradigm jazz band leader, provides a good example. A saxophonist, he plays and composes in many different genres. In the piece I will discuss (at https://tinyurl.com/pa6ue3h[34]), Zorn is solely directing. The piece's head is a simple guitar riff,[35] a few bars long, together with a keyboard chord progression. It begins by the guitarist, Marc Ribot, improvising with notes echoing the main riff, and Zorn points to his head when he wants Ribot to start playing the head, and, as you can see, he directs changes in tempo, volume, and points in certain ways when he wants an individual to solo or cease soloing. The keyboard chords act as an 'anchor' to give continuity and coherence to the piece, and when it's time for the keyboardist's solo, the head is taken up by Ribot to keep things anchored while the keyboardist wanders. You'll notice that at 3:29 Zorn pokes Ribot's leg to get his attention and points to his head to indicate the solo should end and he should get back to the head of the song. Ribot doesn't *immediately* go back to the head, but improvises a sensible way back, Zorn trusting Ribot to do this. You can see the constant micro-communications not just between the leader and band members, but directly between band members, and indirectly between members via the leader as a focal point.

This hopefully suffices to get the idea across how improvisational music is 'dialogical,' developing communicatively and communally among the

[32] Owens, 30. My source is Sterritt, 166.
[33] Both quotes from Sterritt, 166.
[34] The first piece, from the beginning of the video up until minute 9.
[35] A riff is a short series of notes which are catchy, repeating, and rhythmic.

musicians, usually coordinated through a leader. The emphasis is often on process over product, or perhaps, *process as product*. But, when a work is recorded, it can enter the popular culture as a work which is appreciated as an entity in and of itself, such as classics like *Monk at the Five Spot*, or *Bill Evans at the Village Vanguard*.

Gabriel Solis argues convincingly that jazz performances and recordings make it so that jazz has a kind of dual-life. Recently, he states, the emphasis on scholarship has focused on

> The dialogic qualities of jazz, on the ways that performances are multiply authored, undermining the priority of the single author, and focusing on the emergent, processual aspects of jazz performance, rather than viewing jazz as simply a collection of texts.[36]

Perhaps the recent scholarship has swung too far away from the preceding postmodern conception of jazz works, which regards them as 'texts'—the paradigm of completed, 'frozen' products.

Solis says

> I would like to suggest that the protocols of action and imagination that people involved with jazz—musicians and audiences—use to engage jazz recordings allow for a coexistence of a dialogic-processual interpretation of jazz recordings alongside an understanding of them as products.[37]

Compare this to the earlier distinction between two kinds of entities: an entire world, as it is unfolding, versus the completed recording of a world. Extreme Static Classical Theists regard the world as only the recorded and completed artifact, whereas extreme Dynamic Open or Process theorists see it as only the unfolding (or 'becoming') itself.[38]

Those who embrace the improvisatory metaphor that I'm using can also say that the world has a dual-life, the present unfolding processual life and its static past history. And, just like how MOPDTK's note-for-note intrinsic duplicate of *Kind of Blue* is not of the same kind as the original, so God, if He created a complete intrinsic duplicate of a 'finished' world

[36] Solis, *op cit.*, 333.

[37] Ibid.

[38] An Open Theist thankfully does not have to embrace a process metaphysics a la Hartshorne or Whitehead (but they may have to embrace some form of process).

with libertarian free will or randomness, would not be duplicating the same kind of world as the original.

15.3.3.2 Example 2: Improv Troupe Director-Participant—Christopher Guest's Model

With improv performance there is usually no ruler, just rules. While an improv instructor during class gives directions and instruction, this is considered practice, not rehearsal.

There are many forms of improv, and I'll resign a short discussion to a footnote.[39]

In the metaphor envisioned, where 'the play' is all of history, I prefer to model it with Christopher Guest's method, with some significant variations.

Guest, after starring in Rob Reiner's *This is Spinal Tap*, a 'mockumentary' about a heavy metal band, went on to make many improvised mockumentaries himself.[40] While Guest directed them, most were co-written with Eugene Levy. There wasn't exactly a script in the usual sense. The scripts were between 10 and 20 pages that merely outlined the scenes and story arc. They would also write up some brief background material for each major character. After casting was decided, filmmaking would consist in just throwing the actors together to start improvising the planned scenes. How each scene would develop was broadly settled, but how they would get there was up for grabs. No dialogue was written, being entirely improvised.[41]

[39] Improv plays are either short or long form. Short-form pieces are composed via the rules of improv games. Here's a simple one–'Questions.' The players get on stage, and ask for a setting suggestion from the audience (e.g., 'office,' 'beach'). Then they improvise, with the constraint that they can only ask questions. If someone fails, they are 'out,' until only one is left—the winner. Long form is much less constrained. Structures are provided to enable the players to create a play on the spot. One form, the La Ronde, works as follows. After an audience suggestion of a relationship, two of the players come out and start a scene. The other players form a line on the side of the stage. When it seems apt, the player next in line on the wall 'taps out' one of the players on stage, who exits to the back of the line, and a new scene begins. The next player will tap out the earlier of the two until everyone has had a turn, and it wraps up by a concluding scene with the first- and last-appeared characters. The goal is to develop the characters, their relationships, and to portray some alterations in the relationships.

[40] They include *Waiting for Guffman*, *Best in Show*, *A Mighty Wind*, and others.

[41] Usually they ended up with 30 hours of film, edited down to 1.5–2 hours for the final cut. Here's a trailer for *Waiting for Guffman*, just to give you a taste: https://tinyurl.com/

Guest frequently uses the same actors across films. Frequent co-star Parker Posey herself compares what they do to jazz:

> "It's like jazz," says Posey … "Everyone is a different instrument and adds a different element. Guest is very much a maestro, an *auteur*. … On *Waiting for Guffman* we'd do these long improvisations until the mag would run out. For like seven minutes, we're just lying on the floor, doing some acting exercise where everyone is talking and 'Yes-and-ing' each other." … The director, she continues, "definitely created his own formula with actors that only worked in a specific kind of way. It had to do with the creating of a certain character or persona. And you don't know what you're going to say—you're just going to be in the moment with someone else … and then something happens."[42]

The Divine Improv

The Divine Improv is a live, one-shot performance, with no editing, no revision, and relatively minimal preparation. The Director has envisioned an improvised play with a broad story arc, but with unsettled fine details. Each player receives a description of their character, background, and relationships. But one thing the Director *doesn't* do is tell the actors exactly what the story arc is. If the story strays too far from his vision, he has several tools at his disposal. For starters, he can enter the play whenever he wishes as a character.[43]

There are also some arranged prop and audio conventions. The Director is free to just throw a prop on stage whenever he wishes, and the actors must work it into the narrative in as plausible and seamless a way as possible. For example, he could throw an engagement ring in a box on stage when two characters who are lovers are out to dinner. Or, another time, he could play audio of a car crashing, and so forth.

The actors may discern where the action is going and can *try* to thwart matters. But this Director is so smart, with enough tools, that she will get from them roughly what she wants in any case. One thing she wants is what is best for each character, within limits set by logic, the demands of justice, and respecting each character's autonomy.

y8v8x5nl. Musical numbers are usually not improvised.

[42] From https://tinyurl.com/yb8kczah

[43] Analogous to, for example, a voice on Mount Sinai, or, for Christians, as Jesus. Also angels or internal suggestions work as presence by proxy.

These actors work on a "need-to-know basis." They do not know where they are going, for if they did, they would not arrive. Some of them may begin to discern the Director's benevolence for her characters, despite the play's vagaries indicating otherwise. The actors may begin to have faith in the end, glimpsing an ending which is surprising yet inevitable, but they cannot see how they will arrive. But a good improviser in this case will have trust in the Director's vision.

15.4 Salutary Upshots

And now for some explanations how these metaphors elucidate or support dynamic views of God and His interaction with the world.

1. Prayer can change things

While improvisation is extremely flexible, the players are constrained by genre-specific considerations. A competent leader-participant will be responsive to changing facts 'on the ground' in order to meet the player's needs. The Classical Theist cannot accommodate this—any contribution God would have as leader would be exhausted once the play or performance begins. While His effects may be located during the present, this would only work if he foreknows everything which will happen—which is incompatible with OT. Blending an open future with the God of Classical Theism directing would be like Him delivering a video-recording of a conductor conducting a future performance—it would be unable to respond to changes.

According to Classical Theism, God responds affirmatively to prayer by actualizing a world where one's prayer for x is followed by x. But on the Open view, if a prayer is free, it cannot be 100% predicted beforehand; therefore God *must* act in time in order to respond.

2. The future is open

Improvisation would be much more boring and low stakes if what will happen is fixed beforehand. Regardless of our epistemic shortcomings, if it is somehow metaphysically determined what will happen for any particular improv, then the practice would lose some of the features that make improv uniquely good—a product of random associationist thought tempered by improviser choice and skill. If we are engaged with God in a project of realizing a good, just, kind, and interesting world with high-stakes difference-making choices, a model which is collaborative and open-ended seems more apt than a sole-composed static work entirely realized before time, where each player's lines are all written.

3. Illustrating Providence: Freedom through constraint

The 'providence' of the band leader or collaborative improv director-participant can be divided into the help *before* the performance and *during* the performance.[44] First, the writing of the musical piece, or the development of the story arc, helps narrow the space of possibilities within which the artists can flourish in their given roles, and assigns them guiding structure. A good improv leader does not craft a piece for generic artists, but crafts and customizes the work in light of the particular artists involved. That there even is a song or play to perform depends on the improv leader, and if it is a good one, then it is thanks to her.

In jazz, in order for some individuals to perform their best, to exhibit their individuality in improvisation in the most excellent way, they may have to be not merely guided, but also goaded, by the band leader. A good leader often pushes their performers and, somewhat paradoxically, makes them freer by constraining them.

Solis notes that in some cases

> the need to come to a session prepared to 'bring something' to a dialogue with other musicians—the ability to make 'musical conversation'—is clearly mediated by the authority (if not the authorship, *per se*) of the leader.[45]

He then describes a case where Charles Mingus, with his domineering personality, dominated his band members to get them

> to bring every bit of themselves to the performance, so that the arrangements would be reflective of the individuals involved, rather than a mere collection of instruments. This goal is a composerly one. … The performance culminated in a performance of "Meditations on Integration."[46]

Buddy Collete describes a great moment during this performance:

[44] Henceforth, I will refer to both as 'improv leader,' and sometimes just 'leader.'
[45] Solis, 333.
[46] Ibid.

> Everyone was getting into it, playing solos. Mingus had two other trumpet players (besides Bobby Bryant) … and he let them play. Bobby knew he wasn't going to get a chance. It was getting louder, more intense, really screaming. Then Mingus looked at Bobby and said, "Now!" Bobby at this point was so angry he hadn't played that he took his horn and blew the bell off it to show Mingus what he could do. And that did it. Mingus got the climax he wanted and the people just went crazy. … He had psyched Bobby out. He knew Bobby was strong as a bull and he wanted a killer punch. … There it was. Mingus had captured all these moods. He knew how to get them. He was like a little teaser: 'Not yet' or 'Maybe you won't get any' and then 'Okay, now!' It does work. It's what coaches do for fighters. Sometimes you need that little kick.[47]

I think what is analogous to aesthetic performance in the metaphor must be our moral performance or our will's alignment with God's. God is the jazz band leader or improvisational director of our moral behavior, according to this model, but many folk don't know they are playing, much less playing in an ensemble, and much less that there is a leader. That's why their songs stink and their solos detract from, rather than enhance, the communally produced piece. The way we are directed does not make us unfree—it makes us more free to be able to realize the flourishing we are intended for.

4. God's risks, assurances, and sovereignty

Most believers I know accept, and should accept, both of the following:

a. God is looking after my welfare.
b. Terrible things will happen to me.

While we think that God may test us and allow us to suffer, we believe that (a.) still holds despite our calamities, since we think that ultimately He will not abandon us.[48]

Given that the improv leader employs fallible humans, there is no guarantee that the composition will be as good as it can be. Given the freedom artists in the medium enjoy, and a fickle world, there is no guarantee that, for example, one's solo will shine by being free from a distracting

[47] Collette 2000, 34–35. My source is Solis ibid., 334.
[48] C.f., for example, Habbakuk 3:16–19.

colleague, or that one's presuppositions laid out in the improv will be noticed, remembered, and so forth. But you can nevertheless trust the leader since, if there is a track record, one has seen how the leader has often pulled the play/song back from the brink, such as by helping a character's suffering make sense or tying together loose ends.

Many complain that views such as OT entail that God is not sovereign and is undermined by no longer being the sole author of the world. The correct response to this is nuanced.

How many authors are there for a jazz performance or improvised play? A case can be made for *one*, and a case for *many*.[49]

I think we can have it both ways. Solis mentions how, even though a jazz piece may be realized by a group collaborating and soloing, there can still be "reasonable individual authorial attributions" (Solis, 331). For example, the first recording of Monk's "Evidence" features Milt Jackson on vibraphone. While other, later versions did not, they were nevertheless versions of the same piece. But if, on the first recorded version, the vibraphonist improvises—why is he not an author of the piece as well? Especially if it is true, as mentioned, that the composer/performer distinction breaks down?

The answer for why he is not an author is that the differences he brings do not make a difference to it being the piece that it is, while they essentially bring to it something that makes it the version that it is. (The initial album was to showcase Jackson's work).[50]

With jazz, the non-authorial improvising performers are what we could call 'essential version-realizers.' While their solos do not make the song be the one that it is, they do make it be the version it is, distinct from any other performance of it. Improvising band members, while less than co-authors, are more than merely instruments to instantiate the composer's vision.

So, if we are the musicians in God's band, playing His piece, we also are less than co-authors but more than instantiating instruments. While the 'head' or coarse-grained structure of the piece is settled, we determine the fine-grained details and hence complete the work. We, like the band members, make a contribution to it being the piece it is.

Things are the same, *mutatis mutandis*, with improv. Maybe all the world is God's stage, but we are not merely players. The structure is

[49] When there's a single composer.

[50] Milt Jackson and The Thelonious Monk Quintet (Blue Note BLP-1509, 12", 1956).

broadly determined, but we decide how some of the particulars go. We are more than mere actors given a script, yet less than co-authors. Below an author is a contributor. We contribute to the play, and if it weren't for us, the play would be different—but not a different play. We may 'author' our lines totally, but this is not enough to make us a co-author. Maybe we cannot choose our role, but can choose how we play it.

The point is that these analogies retain God's sovereignty, while allowing us to make a difference-making contribution to the world. And nothing about this view denies that God *could* take over to any degree He wished, if He so wished. I don't know how often He does, but we can see many things go on that are decidedly *not* what He wishes.

5. How randomness fits in the picture

Randomness, non-determinateness, or chance plays a crucial role in improv. If improv is, as Pietropaolo says, a "stochastic composition process," then how does the stochastic part come in?

I don't think the analogies provide much illumination into what randomness *is*, but I do think they can illustrate how randomness is *employed*, both by us and by God. In improv, unexpected things (e.g., notes, chords, puns, actions) just 'come to us,' and to our colleagues, and from the audience, and we need to work with that. Concentrate on attempting to make a great plan pan out, come what may, or on preparing for *any* possibility—and the whole thing falls apart. But, one can practice a lot beforehand so that more and better things come to one more easily, and actions undertaken more skillfully. We can ask the leader to help hone our skills. Analogously, we will be put into situations where our morality and character will be tested. At some point deliberation must end and action begin, and how we weigh and measure will be a somewhat intuitive and character-based matter. 'Growing' as a performer is analogous to forming one's moral character. (These metaphors lend themselves somewhat to a 'soul-making' theodicy like that proposed by John Hick.[51])

Another point about randomness—'stuff' happens, and it often seems to have no rhyme or reason. A bad split-second decision, or a slow reaction time, which could be caused by lack of sleep (which may depend on the vagaries of that damn alley-cat's estrous cycle), can make the difference between life and death. History is full of stories of battle where who lived

[51] Such as in Hick 1981.

and died had nothing to do with a soldier's skill, character, cleverness, or lovableness. There are many close calls, when we are happy that God is looking after us. Yet, sometimes other fine people aren't so lucky, and we'd be terrible if we used that as evidence that God doesn't care for *them*. We have to be careful with explanations of purpose and trying to explain away all randomness as actually pregnant with purpose. It could be that there is *no* reason some events occur,[52] and a good improviser will often be hampered by seeking explanations when things go badly.

In a striking passage from Stephen King's *The Stand* (not all of which I agree with, in characterization or tone) a narrator states:

> The beauty of religious mania is that it has the power to explain everything. Once God … is accepted as the first cause of everything which happens in the mortal world, *nothing is left to chance* … or change. Once such incantatory phrases as "we see now through a glass darkly" and "mysterious are the ways He chooses His wonders to perform" are mastered, logic can be happily tossed out the window. Religious mania is one of the few infallible ways of responding to the world's vagaries, because it totally eliminates *pure accident*. To the true religious maniac, it's all *on purpose*.[53]

Is the reason you didn't get the job over your less-qualified competitor because God is punishing you for not paying enough attention to your children? Or because of racism, sexism, or ableism? Or is it because in the interview you came off as arrogant? Or is it to save you from a commute where God was certain you would die? Or is it because a member of the committee forgot to set their alarm at that conference long ago, and in so doing and waking up late, happened to meet one of the future candidates in a cafe line and liked the cut of their jib? Likely you'll never know. In any case, however, the answer of what to do is somewhat like the improviser's—we've got to roll with it.

This does not mean that you should not be perturbed by anything, nor seek to rectify injustice. Rather, that you should foster a resilient and flexible disposition as much as you can—you're going to need it.

[52] Or that chance *is* the reason.
[53] Book II chapter 48.

15.5 Conclusion

If God constructs the world like how one directs an improvised play—then what is the *genre*? Genres not only shape the plot and themes, they shape expectations. If it's a comedy, expect some laughs. If it's a mystery, expect a crime and expect some false leads. While many good works are genre-bending, usually genre-crossing leads to disaster, like if aliens landed halfway through the film *Chinatown*, or if a wizard was the main explanation behind the aliens in *Alien*.

In improv, as in daily life, we may be terrified that we won't know what to do. But if we have a good Director, or Muse, we should not worry. Stephen Pressfield relates the following:

> Patricia Ryan Madson taught improv at Stanford for years. … Patricia has an exercise that she calls "What's in the Box?" She asks her students to imagine a small white box. Imagine a lid on this box. Now lift the lid. What do you find inside? Sometimes students say a diamond. … Sometimes a pomegranate. The trick is, there is always *something* inside the box. … Patricia was addressing her students' seminal terror: that they would get up on stage and draw a blank. The professional trusts the mystery. He knows that the Muse always delivers. She may surprise us. She may give us something we never expected. But she will always put something inside the box.[54]

Alasdair MacIntyre also has written about genre, and, in *After Virtue*, he compares us to authors, but of our own lives, and stresses the importance of narrative:

> thus the narratives which we live out have both an unpredictable and partially teleological character. If the narrative of our individual and social lives is to continue intelligibly … it is always both the case that there are constraints on how the story can continue *and* that within those constraints there are indefinitely many ways that it can continue. … I can only answer the question 'What am I to do?' If I can answer the prior question, 'Of what story or stories do I find myself a part?'[55]

It will help the players' performance to discover what genre of play they are in. If they are acting like they are in a comedy, when in fact they are in a tragedy, aesthetic disaster will ensue. But it may well be that having to

[54] Pressfield, *Turning Pro* 117.
[55] MacIntyre 1981, 216.

discover themselves what genre they are in is instrumental toward it being the instance of the genre that it is.

We do not get to fully determine what genre we are in. Part of the scoundrel's problem is that he believes he is in a heroic tale, where in fact he is in a tragedy, with himself as the anti-hero. A buffoonish blowhard may believe he is a stable genius and part of the greatest riches-to-greater-riches success story, whereas he is actually in a tragi-comedy about a spoiled rich boy and the soul-destroying effects of greed, power, and narcissism.

Maybe if we came to realize that we are all primarily in a *love story*, or collectively playing a *love song*, and are not composing, much less directing, on our own, we would come to change our expectations, attitudes, and show some real chops.

The world which is a love-themed improvised artwork is unique. This is the only love story wherein the very characters of the story can come to realize that they are both the story's subjects, and the story's collaborators, and that the story is also about a perfect loving author, who wants to play with them—not as playthings, but as playmates. Hence the story of the world reaches outside of itself.

The love which the work is *about* is not only represented by the work, the work is constituted and sustained by the very love which it is about.

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CHAPTER 16

Saadia on "what is in the hearts of people when they reach the limits of endurance in a trial"

Josef Stern

Saadia ben Joseph Al-Fayyumi Gaon (b. Egypt 882, d. Iraq 942) is one of the best examples of the impact of Islamic civilization (which absorbed Late Ancient culture and thought) on medieval Judaism in the East. The most distinguished rabbinic scholar of his generation, he was "Gaon" ("His Excellency"), or Head, of the famous Talmudic academy in Sura and later in Baghdad (under the Abbasids), the author of important legal responsa and treatises, especially on procedural law and on the calendar, and a powerful opponent of the sectarian Karaites. He also wrote pioneering work on Hebrew linguistics and grammar, poetry, and liturgy; translated the Hebrew Bible into Arabic; and composed commentaries on

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selected books, including the *Book of Job*. However, he is probably best known for his *Book of Doctrines and Beliefs*, a book of Jewish *kalam*, so-called dialectical theology, an attempt to systematize the beliefs of Judaism and, arguably, the first book of Jewish *philosophy* (in a broad sense of the term "philosophy," although it is not Aristotelian *falsafa*).[1] It was the first such text to initiate a *tradition* of Jewish thought.[2]

In the fourth and fifth treatises of *Doctrines and Beliefs* and, as we shall see, in the Introduction to his commentary on the *Book of Job*, *The Book of Theodicy*, Saadia discusses the constellation of metaphysical issues that revolve around providence, the problem of evil, free will and human responsibility, reward and punishment, suffering, and, in particular, unjust or undeserved suffering, which is known in rabbinic Judaism as the problem of *zaddiq ve-ra' lo'* (the suffering of the righteous) and *rasha' ve-tov lo'* (the prospering of the wicked). First, Saadia defends a libertarian conception of human freedom against strong Ash'arite arguments that deny it in order to secure divine omnipotence manifest in occasionalism, the doctrine that there are no intermediate natural causes and that all natural phenomena, including human action, are directly causally dependent on the will of God. On Saadia's view, God gave humans the freedom to act including the ability to commit moral wrongs. However, while He allows such evils—after all, the harm their free actions cause is not to Him but to themselves—at the same time He warns humans not to commit them out of His mercy for humanity. The fact that humans commit those evils is, in any case, neither incompatible with His power (to do only the good) nor does it show that He lacks power (over humanity). Second, in order to demonstrate the compatibility of natural evil, or suffering, with the

[1] *Doctrines and Beliefs* was not, however, the first book of Jewish *kalam*. That distinction goes to al-Muqammas 2016 (9th c.) which is also the first Arabic theological treatise we possess.

[2] For the major works of Saadia, see Saadiah 1946/2002; 1948; 1972; 1973; 1988. All citations in the text to *Doctrines and Beliefs* are to Saadiah 1946/2002 (Altmann translation) and all citations in the text to the Commentary on *Job* are to Saadiah 1988 (Goodman translation). For Saadiah's intellectual biography and especially the Islamic background to his life and thought, see Malter 1921; Brody 2016; and Stroumsa 2003. On the Commentary on *Job*, and its Islamic background, both in the *Qur'an* and *tafsir* literature, see Goodman's introductory essay to Saadiah 1988, 4–109; Goodman 1990; Stump 1997; 2000; Rosenthal 2001, 97–125; Eisen 2004, 17–41; and Cohen 2005, 243–253. On Saadiah's general theory of providence, see Stump 1997 and Nadler 2009, 624–628. On Saadiah's epistemology, see Heschel 1942–3 and 1944–5. On the significance of traditions in the characterization of Jewish philosophy and Saadiah's place in a tradition, see Josef Stern 2017.

existence of God and, more important for Saadia, with divine justice, he offers a number of traditional theodicies: that natural evil is an illusion if one were only to know the "big picture," that there are no goods without evils, and that evils are often corrective devices. However, the problem of evil that most concerns Saadia is that of the suffering of the righteous and the prosperity of the wicked. Not only is this unjust. According to Saadiah, it challenges the very idea of reward and punishment. His general reply is that while there is reward and punishment, we can never know who is truly deserving of either. Thus he attempts to disabuse us of one problem with evil—Why are we suffering and what did we do wrong?—by constructing an account that both affirms that there is a theodicy, or justification for all evil, and delimits human understanding of how to apply such a theodicy to actual cases.

More specifically, Saadia's theodicy to account for the suffering of the righteous distinguishes two kinds of suffering or evil: (i) punishment and (ii) trial or testing.

> I find that suffering befalls the pious in this world in one of two ways: either as punishment for the relatively small number of their transgressions … or, alternatively, as a visitation from God in order to test them, provided He knows that they will be able to endure it. Later he compensates them for their suffering. (Saadiah 1946/2002, 137–8)

> When sufferings and calamities befall us, they must be of one of two classes: either they occur on account of prior sins of ours, in which case they are to be called punishments, and we must search out the relevant shortcomings and remove them and improve our actions. … Or they are a trial from the Allwise, which we must bear steadfastly, after which He will reward us. (Saadiah 1988, 130)

The first justification for suffering is that it is punishment for past sins and wrongs. However, the function of the suffering is not only retribution but also purification of the sinner's soul of lasting bad effects on his dispositions and character as a result of his individual sinful actions. People's actions, good and bad, leave their traces on their souls, rendering them either pure or sullied. One function of suffering is to correct, purify, or cleanse the soul of any defect or unclean stain on the sinner's character or personality, and to restore it to its pristine condition. But only God can discern the flaws in the soul and recognize whether there are long-term effects on our dispositions and characters. Hence, humans can never know—especially about others—why in particular they suffer, although the fact *that* they suffer should be attributed to just desert.

Understanding suffering as punishment is complicated by the fact, Saadia argues, that no one is either purely righteous or purely wicked. If someone fell in a single category, the purely righteous or the purely wicked, there would be no difficulty in explaining why he prospers or suffers, respectively. But generally humans are a mix of the righteous and the wicked. Thus divine justice demands that even the very wicked receive their due for good actions or virtues, and analogously for the very righteous, for their sins. Therefore, reward and punishment cannot be measured as simple one-to-one effects of or reactions to individual actions; they require calculation and computation, balancing good with evil and the evaluation of punishment and reward in a more holistic fashion, looking at the whole person, not just his isolated acts, one by one. Only God can know how to do this.

Saadia distinguishes two worlds: a "world of action," this world in which we humans live and act, and a "world of reward," a world in which human actions receive their compensation, reward or punishment. This second world according to Saadia is not necessarily "the world to come" in rabbinic terminology, the afterlife, paradise or hell. It is closer to a post-historical age like the messianic era in which it is humans (perhaps resurrected), not disembodied souls, who are compensated. However, the fact that there exists a dedicated world for compensation does not mean that there is no evidence of reward or compensation in *this* world, the world of action. The true rewards may all come in the world of compensation but there is also some reward or compensation in the world of action, both to signal to humans that there exists a future world of compensation and, more important, because individuals are typically a mix of righteousness and wickedness and therefore demand *both* reward and punishment. In other words, the innocent are never totally innocent, nor are the wicked totally wicked. If "entrance" to the (sub-?) world (only) of reward is only for those who are due reward exclusively (and analogously for the (sub-?) world of punishment), what of the mixed cases? They cannot enter either world. Therefore, the Divine Bookkeeper calculates each individual's good and bad deeds and then rewards/punishes that class of deeds that are in the minority *in this world of action* in order to enable her soul to enter the (sub-)world of reward (or punishment, as the case may be) in a "pure" position. Because even the righteous have slight failings, given divine bookkeeping, they are punished in this world and likewise for the wicked who are rewarded in this world. However, this explanation solves the problem only insofar as the punishments (and rewards) in this world of action are *commensurate* to the supposed minor acts of wickedness for the righteous (and minor acts of righteousness for the wicked). But most cases of the suffering of the righteous appear to be exactly the opposite: the more righteous the sufferer, the more incommensurate seem to be the evil acts that are called upon to justify her suffering. Thus, the overall moral of this quantified, economic model of suffering serves to underscore our human ignorance of how to calculate virtues and vices to determine reward and punishment. One should never draw inferences about desert and justice for any particular individual from either her prosperity or her suffering.

The second kind of justification for suffering and evil is what Saadia calls "trials and testing." These are not correctives for prior sins, but show-trials enacted by God to reveal to the world at large the piety of those tested. Enduring such show-trials demonstrates the piety of the sufferer to the whole world. However, if that is the purpose of the trial, one might nonetheless object that the suffering is not deserved. No past wrongs that the sufferer committed justify why he should be subject to evil. In order to address this objection and thereby render the suffering just, or at least seem fair, Saadiah argues that the trial leads to compensation or a greater reward (*gemul*) in the future for the sufferer, either in the temporal future or in the afterlife. In return for suffering now, the victim, or sufferer, is compensated in the future.

This second justification, the so-called doctrine of compensation, which is also identified with the rabbinic notion of "sufferings of love," is severely criticized by Maimonides in the *Guide of the Perplexed,* and Saadia is clearly his target although he is not mentioned by name (1965, 498, 471). "God sends down calamities upon an individual, without their having been preceded by a sin, in order that his reward be increased" (Maimonides 1965, 497). But even if the victim is ultimately "paid back" for his losses and suffering with a greater reward at some time in the future, Maimonides objects that the suffering was undeserved at the time of the suffering and therefore it was unjust *then*. Nor is it obvious that any individual would willingly undergo suffering only for the promise of future compensation. So insofar as the suffering is not what the individual wants, even if the compensation is fair, it is not something the individual desires, hence, not good for him. In sum, although this explanation is, Maimonides grants, "generally accepted among people" (498), no one "endowed with intellect" (497) would believe such an impious opinion about God.

To recap, Saadiah offers two solutions, or theodicies, for the metaphysical problem of the suffering of the righteous human: punishment and trial. In addition, he gives a third account in the *Commentary* that suffering is simply part of, or constitutive of, being a created substance.

> God created human beings in the first place to test them. (Saadiah 1988, 129)

The very reason for creating finite humans was to enable them to manifest their ability to survive or endure suffering—and to endure it autonomously, that is, through their reason. To be sure, they will be compensated, but on this explanation suffering is the rule, not the exception, for created life.

Saadia's clearest example of such suffering built into createdness is what I will call epistemic evil: doubt and uncertainty. Saadiah tells us that he wrote *Doctrines and Beliefs* because of the pervasive doubt among his co-religionists at his time, his contemporaries' lack of certainty and security in their beliefs, their many false or at least unjustified beliefs, and a kind of pervasive relativism due to their cosmopolitan culture.

> When I considered these *evils* …, my heart grieved for my race, the race of mankind … as I saw in my time many of the believers clinging to unsound doctrines and mistaken beliefs. … I saw men sunk, as it were, in a sea of doubt covered by the waters of confusion. (Saadiah 1946/2002, 28–29, my emphasis)

This leads him to ask:

> How can it be reconciled with the wisdom of the Creator … that he allowed errors and doubts to arise in the minds of His creatures? We may answer this question at once by saying that the very fact that they are created beings causes them to be subject to error and delusion. (Saadiah 1946/2002, 31)

That is, error and doubt are a natural evil that comes with being a human and one must learn to live with it. Indeed

> To wish to have "knowledge that is free from doubt" is "to ask to be nothing less than like God." (Saadiah 1946/2002, 33)

Being human is being subject to doubt and uncertainty. But doubt and uncertainty are themselves evils and forms of suffering, both epistemic and psychological.

With this background, I now want to turn to Saadia's *Commentary on the Book of Job*, his *Book of Theodicy*. As I have already indicated, Saadia discusses the metaphysical problem of evil in his Introduction to his Arabic translation and commentary, more or less repeating the justifications he presents at greater length in *Doctrines and Beliefs*.[3] However, I will argue that the main issue with which he is concerned in the commentary itself is not the metaphysical problem and its solutions, or theodicies. Rather the issue is what I shall call the *existential* problem of evil:

> Knowing that throughout the ages the thoughts which pass before men's minds when sufferings befall them are of four sorts, corresponding to those which arose in Job's day, God required all this to be set forth for us. … Thus God caused the record of Job's trials and afflictions to be set forth—his words, the words of his companions, the arguments of each, as well as Elihu's rebuttal—*with the purpose of revealing by this means what is in the hearts of people when they reach the limits of endurance in a trial.* (Saadiah 1988, 127)

What we learn from the *Book of Job* is not metaphysics—the compatibility of evil and suffering with the existence of God or with divine justice—but what people enduring and witnessing suffering are *thinking when they suffer*, their *experience* of suffering, how they react to suffering—and, perhaps, in turn, how *we ought* to react to our own suffering. Thus Saadiah wants to give us primarily a phenomenology of suffering although sometimes he seems to slip from the descriptive to the normative, from what people *are* thinking to what they *ought* to be thinking.

Saadia's pursuit of this problem is itself highly original. I know of no other medieval Jewish thinker who poses such a question. As important, it is a problem that can be explored best, perhaps only, through a commentary on a narrative like *Job*, not through discursive philosophical analysis and traditional forms of argument or proof. Saadia was not, of course, the only medieval Jewish, Muslim, or Christian philosopher to write *both* philosophical treatises (or commentaries on earlier philosophical works) and philosophical commentaries on Scripture. However, when an author

[3] Weiss 2000 and Eisen take the Commentary primarily to recapitulate *Doctrines and Opinions*.

engages in different genres of philosophical writing (like these), one naturally wonders whether the one form enables her to address and explore issues that the other does not, or not as well or in different way. And how does the genre of writing affect how the author deals with the same problem in the different works? In particular, does a narrative or dialogue allow the author to address subtle questions from more perspectives than philosophical exposition?[4] For example, in the passage just quoted, Saadia writes that it is from the words of *all* the figures in the book, not from any one speaker, that we learn "the thoughts which pass before men's minds when sufferings befall them." The "record" of *Job* consists not only in Job's words but equally in "the words of his companions, the arguments of each, as well as Elihu's rebuttal." No single character expresses what is revealed about "what is in the hearts of people," only the totality of different perspectives, each partial and even potentially in conflict with one another. The opportunities made possible by the dialogue form in *Job* are reminiscent of Hume's explanation in the opening to his *Dialogues Concerning Natural Religion* in Hume 1779 (1993) of why he employs the genre of the dialogue: to explore a topic "where human reason can reach no fixed determination," where "reasonable men may be allowed to differ," and "where the variety of lights, presented by various personages and characters, may appear neither tedious nor redundant" (29–30). Is there something about the problem of evil, or God's relation to the world, that makes it especially appropriate for treatment in the dialogue form?

The task Saadia sets for himself in the Commentary on *Job* is not only novel and original. The commentary is a seminal work of scriptural exegesis and interpretation for at least two additional reasons. First, Saadiah gives radically naturalistic interpretations, downplaying, if not eliminating, the fantastic, mythical, supernatural elements in the biblical text, features that were emphasized and expanded upon in earlier rabbinic midrashic exegesis. For example, the *Leviathan* becomes a crocodile in Saadia's hands, and *Behemoth*, a hippopotamus or cattle. These are exotic animals but not mythical or fantastic creatures. And we will turn next to Saadiah's most naturalistic de-mythicizing interpretation of the narrative frame of the book.

Second, Saadia was the first, to my knowledge, to reconstruct the rambling, repetitious speeches of the three friends and of Elihu, Job, and God as philosophical arguments, identifying theses for which they argue that

[4] For an intensive exploration of this question, see Stump 2010, ch. 9.

serve as objections and responses to each other, thereby shaping each figure's speech into a "coherent" philosophical position, turning the book into a philosophical dialogue between different philosophical schools. Each character represents a different school—an idea that, in turn, will be borrowed by Maimonides in his interpretation of *Job* in the *Guide*, although the schools Saadia and Maimonides find in the book are not the same. So, for Saadia, Job is initially an Ash'arite: his God does whatever He wants without constraint, and justice is whatever God so decides. The three friends are all Mut'azalites: they insist that everything God does is just (in our sense of the term); hence, Job must have sinned for which he suffers as punishment. Elihu is a revised Mut'azalite (probably speaking for Saadiah himself) who introduces the doctrine of compensation and trials in addition to suffering and punishment. However, as Saadia emphasizes a number of times, none of the figures in the *Book of Job*, or their respective schools, claim that God acted unjustly, none deny divine justice. It is because they all assume divine justice that the characters disagree among themselves as to how to resolve that with Job's suffering and evil.

In order to work out Saadia's phenomenology of what is in the hearts of people when they suffer, let's begin with his interpretation of the narrative frame of the book, chs. 1–2.

According to its traditional literal meaning, Satan is *God's* quasi-divine mythical adversary, and the description "*bnei ha-elohim*" (1, 6), which is usually translated as "children/sons of God," traditionally refers to angel-like, supernatural, quasi-divine figures, demi-gods, or other fabular beings in the divine court. After arguing against these supernatural interpretations, Saadiah instead offers his own naturalistic reading:

> I rendered "*bnei ha-elohim*" as "God's beloved" (*awliya' Allah*; Kafih: *nikhbadey hashem*) in accordance with the widespread usage of the nation, as in *Children are ye to the Lord your God* (Deut. 14:1), *My first-born child Israel* (Exod 4: 22), *Is corruption His? No, His children's is the fault* (Deut. 32: 5), *and the like*. These beloved would gather in a special place on appointed days to worship God and do His bidding. … The gathering was for worship of Him. … As for the adversary (*satan*), he was in fact an ordinary human being, like the one mentioned when Scripture says, *The Lord raised an adversary (satan) to Solomon, Hadad the Edomite* (1 Kings 11:14) It also says, *And God raised up against him an adversary (satan), Rezon, son of Eliada* (I Kings 11:23). Both of these were mortal men. … So commonly is this word (*satan*) applied to people who oppose one another that it occurs in many passages of Scripture which I shall not enumerate. … On the basis

> of this and other parallels, the adversary here would be a human being. It is farfetched in the extreme to infer that he should be an angel. (Saadiah 1988, 153–4)

In other words, the *bnei ha-elohim* are *humans* who assemble to worship God and obey His laws; hence, they are intimates of and beloved by God. Likewise, Satan is *Job's* (not God's) adversary (Saadiah 1988, 154), and (based on v 6) also one of God's Beloved or nobles, hence, also a God-fearing and God-worshiping human but a special rival of Job, the leader of the Job-opposition party.

But Saadiah's naturalism does not stop here. His full explanation of Job's suffering is also naturalistic: in terms of human psychology and attitudes. As we said, the human *bnei ha-elohim* are sincere servants of God who shun sin and pursue virtue and, if they are not quite as virtuous as Job, nonetheless they are worthy to be loved by God, good people deserving happiness and a good life. But

> with all Job's probity and plenty, there were folk in that land who envied him on both accounts, who said of him that he served God only out of solicitude for His blessings, and that if some disaster befell him or if he were deprived of some of those blessings, he would falter in his faithfulness and turn apostate. (Saadiah 1988, 159)

Notwithstanding the fact that they were also beloved by God, these same folks *envied* Job for his piety and prosperity. They charged that, as blameless as he was, he was pious, if not *in order to* receive the plenty, then *only so long as* he was blessed with plenty. That is, they raise the suspicion: does Job prosper because he is pious or is he pious only because he is prosperous?

According to Saadiah, it is "envy" that gives rise to this suspicion about Job. Who or what creates the envy? According to the literal meaning of v. 8, the source is God Himself who singles out Job's exceptional blamelessness and God-fearingness—"for there is none like him in the land." In other words, among God's Beloved, all of whom worship God, all of whom are good people, God plays favorites—and rewards Job more than the others. What Saadiah is getting at, in more contemporary terms, is the basic inequity of distribution of goods in social life. Not everyone, even when they are all good and deserving, is treated or rewarded equally. Or at the very least not everyone *perceives* him/herself to be equally well treated as everyone else is. Someone will always take someone else to be better treated, more beloved, than she is. We cannot help but compare ourselves to others and ask the following: What did I do not to deserve the same great fortune he is receiving? If I am as good as that other person, why is she better off than me? This sort of envy is a source of suffering, hence, an evil.

But even worse than this suffering is the suspicion of others that envy breeds. In these circumstances, it is all too easy to suspect the credentials of others whom we perceive to be doing better than us, to accuse others of *being* good only because they *receive* goods, that they would not act as well if they were subject to more difficult circumstances—if they were subject to the difficult circumstances that *each* person believes is *his* lot in life despite his good behavior. Hence, others are always less, or at least no more, deserving than us. This delegitimation of others Saadiah calls "slander" or "defamation" (Saadiah 1988, 159), a kind of humanly inflicted violence, again, an evil.

This, I propose, is how Saadiah interprets the opening frame of the *Book of Job*. Job's world, for all of its pious obedience and worship, was a very unhappy place in which good people were nonetheless so jealous and envious of Job's pious success that they could not but suspect his motives and sincerity. The challenge the author of the *Book of Job* presents to us—or that God faces—is: How, in such a world, can one prove the righteous person's, Job's, true and genuine piety and love and fear of God? The scenario Saadiah proposes is to make Job suffer. In Satan's words, he will then "falter in his faithfulness and turn apostate." Therefore, God inflicts Job to vindicate him of this charge. In more naturalistic terms, the *Book of Job* adopts what I call the "Thucydidean test."

> In the various cities these revolutions were the cause of many calamities—as happens and always will happen while human nature is what it is, though there may be different degrees of savagery, and, as different circumstances arise, the general rules will admit of some variety. In times of peace and prosperity cities and individuals alike follow higher standards, because they are not forced into a situation where they have to do what they do not want to do. But war is a stern teacher; in depriving them of the power of easily satisfying their daily wants, it brings most people's minds down to the level of their actual circumstances. (Thucydides 1972, 242)[5]

[5] See also Reeve 1999.

If we follow Thucydides' wisdom, in order to discover who humans really are, to expose true human nature and the authentic characters of humans, we should pinch them, put them under pressure: subject them to a plague, civil war, disease, loss of children, illness—in a word, suffering. Prosperity deceives or at least fails to expose the true self. Only when someone is desperate and suffering does she manifest who she really is. Only then, depending on how she endures or expresses herself in her suffering, can we tell whether she is as pious and deserving as she *should* be to receive goods and rewards. Happy circumstances leave open the question whether one is pious because she is prosperous or prosperous because she is pious. The function of suffering is to disambiguate or resolve this doubt.

However, as Saadiah goes on to interpret the story of Job, suffering alone does not disambiguate his situation. Thus I take part of the point of the *Book of Job* according to Saadiah to be a critique of the Thucydidean idea that suffering will unambiguously reveal the true self. Instead, suffering itself admits multiple interpretations and breeds its own ambiguities. Let me give you just one of a number of examples.

One would prima facie think that Elihu's theodicy of future compensation or reward is a good alternative to either incriminating Job (thereby making his suffering, punishment) or (allowing Job to be innocent) to rendering God arbitrary at best and unjust at worst. But in fact Elihu's theodicy creates a further ambiguity in suffering. On the table now are three disjuncts. Suffering can either be *unjust persecution* of Job despite his absolute innocence or *punishment* for prior sins or a *trial* to be compensated in the future. According to Saadia, no character or school in the *Book of Job* entertains the first disjunct: that God is unjust. With Elihu's intervention, however, that leaves two other disjuncts. Ambiguity persists. Whenever one suffers, one knows that it is either for one or for the other, but not which one. Hence, the Thucydidean test, suffering, fails to disambiguate Job's true piety. Beginning with ch. 37, Saadiah again and again emphasizes the ambiguity that accompanies Job's suffering, the fact that the victim must continually ask himself and ask God: Why am I suffering? The impossibility of clarification or disambiguation leads to isolation and alienation. Following Elihu's speech,

> Job heard this discourse but held his peace, offering no rebuttal to Elihu. His silence at this point might indicate one of two things: either acquiescence or reservations. And it was for this reason that God addressed Him, to exhort to acknowledge Elihu's arguments and leave behind his fancies and

suppositions, which in effect constitute his failing—although He does not say so directly, lest the people think little of Job's forbearance. (Saadiah 1988, 379)

Is Job silent because he accepts Elihu's explanation for his suffering—silence is assent—or is he silent because he is *silenced* by Elihu—that is, overpowered by his rhetoric and too exhausted to fight it, though he resents and rejects it in his heart—or perhaps he is simply unsure? According to Saadiah, the question before God, as it were, is as follows: How will Job be perceived and judged by his fellow humans? God knows what Job feels, but it is necessary that Job publically articulate his *reasoned acceptance* of suffering *for* and *to* other humans if he is to disambiguate and thereby vindicate his piety. This in turn forces God to address Job in order to make him publically acknowledge Elihu's theodicy. And we would prima facie think that God's own speech to Job is unambiguous. But it isn't. Recall that Job has repeatedly pleaded with God to respond to his suffering by either killing him or by revealing his sin to him. God's lack of response, His silence, has only increased Job's lonely suffering. And when God finally speaks to Job from the whirlwind, Saadiah argues that what literally appears to be God extolling His all-powerfulness and control of Creation, is in fact, a new kind of silence.

> Job had tried to understand why God tormented him and had entreated God to make the reason known to him [See 23: 3–5]. … But God did not make this known to him. Sifting through many of the accounts of the ancients, we find that whenever one of them was afflicted by God in some way, and then asked his Lord to make known to him why that misfortune had been loosed upon him, we find a division: if the victim had suffered deservedly, God made it clear to him and told him, "This is for your wrong doing." … But if the sufferer was being tested and had committed no offense to begin with, God did not explain his sufferings, so as not to undermine his forbearance in people's eyes. … This is the pattern with those who are undergoing a trial. God does not directly inform them that they will be recompensed. Rather *they must persevere on the basis of their reason alone*. … So when Job asked his Lord to make known to him why He tormented him, God did not answer him about that but spoke to him instead about something else, describing Himself to him in terms of His power and greatness, and His choosing what is best for all creation. And this answer on God's part was one mark of His wisdom. (Saadiah 1988, 383–384)

God's "silence"—his blank refusal to answer Job's question: Why am I suffering?—is His four-chapter-long and very loud *speech* extolling His power and beneficence. In reality, Saadia writes, this very speech is a demonstration of God's *powerlessness*. God *cannot* tell Job why he is suffering—as a trial to prove his piety that in turn will be compensated in the future—because were He to reveal that reason, people would say that Job accepts his suffering only to receive that reward—thereby undermining the test and injuring Job yet again. Thus God is constrained to be silent about the one thing Job wants to know—constrained by His own creation, other humans' perceptions, and the implications of His own speech. All of God's talk about His all-power*fulness* is a mask to conceal His power*lessnes*s. To be sure, this also makes Job suffer, but perhaps it is the lesser of the evils God would have committed had He explicitly answered him.

What exactly is it for Saadiah for humans "to persevere on the basis of their reason alone"? I don't have a full answer to this question but one thing emerges in God's speech. According to Saadia,

> When God says, *I shall ask thee* (38, 30), it does not mean that God is giving him the power to answer as he pleases. Rather He is requiring Job to answer truthfully, that is, to submit (*altaslim*) to Him. (Saadiah 1988, 396)

First, when challenged, as in a debate—and Saadiah uses here terminology like *altaslim* and *mas'ala* drawn from the logical language of dialectic—*one perseveres by reason* by committing or submitting oneself to the challenger's question, responding explicitly and openly according to the demands and standards of truth as revealed by reason and science. One does not evade or ignore the challenge. One takes it up and responds.

Second, by "perseverance on the basis of reason alone" Saadiah also seems to mean that one should follow her reason even when it leads to uncertainty, doubt, and more suffering. When God has completed His speech, describing His wisdom manifest in nature, Saadiah tells us

> Since the word had descended upon Job from God, it seemed best to him to hold his peace and say nothing. He supposed that such would be the proper behavior for one who submitted to Him. This called for a second address by God, making known to Job that discourse (*al-kalam*) was preferable. (Saadiah 1988, 396–7)

I take Saadiah to mean that Job's silence *after* God's speech, like his silence after *Elihu's* speech, is still ambiguous, so, God forces Job in ch. 40 to speak to disambiguate "the thoughts in his heart." But even so, Job does not speak unambiguously:

> What he says can bear two different senses. This statement of Job's was ambiguous. It does not convey to the hearer a clear idea of his meaning. One who says to someone who confronts him, "Truly, I cannot answer you," could be understood in two ways: either he is admitting the justice of the other's position and saying that he is not prepared to refute the truth, or he could be implying that the other is in the wrong, and saying, "How can I refute you when you have the upper hand?" (Saadiah 1988, 402)

Now, Job's *speech*, rather than his silence, is ambiguous. And "by suggestion he is impugning divine justice." And for yet a third time, this ambiguity repeats itself in ch. 41 when Job again does not speak. According to Saadiah,

> [God says to Job:] 'As long as you leave your answer in suspense, you are in fact impugning My justice while holding yourself blameless.' The fruit of this utterance should be for Job to make a clear statement before his Lord, explaining to all who hear him that he acknowledges that God is the Alljust, who does no injustice, and that it is imperative to admit that He treats His servants only as is best. And that is what Job does. (Saadiah 1988, 408–9)

Ambiguity persists in both silence and speech. True submission (*taslim*) requires explicit acknowledgment through a confession of impotence, ignorance, or limitations on one's knowledge, and regret—all aspects of repentance. This is what Job finally delivers in ch. 42.

> In this passage Job combines all that was required of him: he confesses his impotence and his paltry ability to comprehend the grace in the governance and decree of the Allwise; he repents of what has passed … and he resigns himself submissively (*yaslam*) to God, taking solace for himself. (Saadiah 1988, 410)

The ending of the book is reconciliation of Job with God—reconciliation depicted as a complex act of repentance. But this is not repentance for a sin he committed but a confession of his finite condition, his being a creature of creation, and his inability to comprehend the benevolence in the governance of God, which is accompanied by regret (*haratah*) and rejecting, or spurning, of his previous state, and submission, yielding solace.

However, Job's repeated ambiguous remarks underscore the problematics of ambiguity as an expression of his own mental suffering and of the evil he experiences. As long as he is not explicit, whether in speech or in silence, he is perceived as "controverting" God's justice. Although Job *is* innocent, he cannot state "I am innocent" because that would implicate that God is guilty, hence, unjust. So, to avoid that implicature, Job must do one of two things, neither of which is true to himself. Either he can say that he is guilty—but that would violate his own integrity. Or he must explicitly acknowledge that God is just and only acts for his creatures' good (408), which effectively belies his own suffering, re-describing the evil he experiences as a divine good.

What, then, *"is in the hearts of people when they reach the limits of endurance in a trial"*? First and foremost: repeated instances of ambiguity, both of silence and of speech, both about why one is suffering and about how to react. As we said, ambiguity is a species of doubt, and doubt is an epistemic evil. I am tempted to say that for Saadiah, Job's suffering state of mind and doubt replaces the earlier bodily, material, familial, and physical evils he suffered. The inner state of epistemic evil—how Job thinks about his external suffering—replaces the external evil of physical and material suffering. But the evil is twofold. First, the ambiguity allows others to continue to impugn Job's piety, which is yet another moral evil inflicted on Job. Second, the ambiguity reflects Job's own state of mind, his uncertainty, anxiety, isolation, and powerlessness due to his ignorance of why he is suffering and how he should react. But this kind of inability to understand God's justice and governance is not because God's will is incomprehensible, as it is for the Ash'arite. Job's lack of understanding is an achievement of his own reason, not a surrender. Job's reason leads him to its limits, but at the same time he is empowered by it to fulfill the obligation of submission or commitment to God—to explicitly, propositionally, discursively articulate in the third person what he is thinking. This kind of submission, and consequent reconciliation, not a theodicy, is what the *Book of Job* teaches us and that is the reason why it was written:

> [God] caused their [Job's and the other friends'] history to be written as a lesson to all creation, so that we may bear sufferings with fortitude when they befall us and not hasten to impugn God's judgment but submit to God and accept His wisdom and direction. (Saadiah 1988, 410)

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CHAPTER 17

Randomness, Causation, and Divine Responsibility

Scott A. Davison

What does it mean to say that someone is responsible for something? It turns out that the concept of responsibility is both vague and ambiguous. Let us say that someone is *casually responsible* for something E in virtue of actively contributing causally to E's production.[1] Being causally responsible for something E is not enough, all by itself, for being *morally responsible* for E, where moral responsibility includes also the possibility of the appropriate application of the retrospective, reactive attitudes of praise or blame.[2] But being causally responsible does seem to be necessary for being morally responsible.[3]

[1] Could one also be causally responsible for the occurrence of something E simply because one failed to prevent it? This is an interesting and complicated question; I do not want to enter the dispute about it here, so I will simply set it aside. (For a powerful and detailed discussion of the power of causal absences, see Goldschmidt 2016.)

[2] Being morally responsible for something does not imply that one deserves praise or blame for it, though—one might be morally responsible for something that is neutral, in such a way that neither praise nor blame is appropriate.

[3] See Fischer and Ravizza 1998, chapter 1.

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What else is necessary for being morally responsible? Although there is sharp disagreement about this,[4] it seems to me that moral responsibility requires the capacity for foresight, the capacity for causal contribution, and the capacity for intentional action directed at a particular outcome. But I will not argue for these claims here, and as far as I can tell, nothing I say in this chapter assumes that they are correct. It is important to note that one could satisfy all of the criteria for being morally responsible for something that is neutral, so that one does not deserve praise or blame for it—rather than create a new category of responsibility to cover this kind of case, we should just keep in mind its possibility.[5]

Consider the following thesis:

Divine Moral Responsibility: God is morally responsible to some substantial degree for the occurrence of every contingent event.

There seems to be strong support for Divine Moral Responsibility from the Jewish, Christian, and Islamic traditions (e.g., see Freddoso 1988). In virtue of creating and sustaining the contingent universe, God contributes causally to every contingent event. Furthermore, God has the maximum capacity for foresight possible, and the greatest possible capacity for intentional action directed at particular outcomes.[6]

But suppose that there are *ontologically random* events in the universe, events which have no sufficient cause and could have turned out differently in some respect, given the same initial conditions and laws of nature. Would the existence of such random events count against Divine Moral Responsibility? To explore this question, I will begin with a much-discussed approach to the problem of evil and God's responsibility for free creaturely actions before turning to questions about shared moral responsibility.

[4] A great deal has been written about the claim that libertarian freedom is necessary for moral responsibility; see Frankfurt 1969, Nagel 1976, Adams 1985, Fischer and Ravizza 1998, and Morriston 2000 for the tip of the proverbial iceberg. Libertarian accounts of free action have their defenders (see, for instance, Van Inwagen 1983, Kane 1985, O'Connor 2000, and Clarke 2003), but they are not as popular today as their compatibilist rivals. I will not try to resolve this dispute here.

[5] For an interesting argument for the conclusion that God's unsurpassable goodness implies that God does not deserve praise or thanks, see Howard-Snyder 2008.

[6] This might lead us to think that for God, unlike for human beings, there is no such thing as casual contribution without moral responsibility.

17.1 Augustinian Approaches to Evil

How could a perfectly good creator make a less than perfectly good world? Historically, the most popular approach to answering this question involves trying to blame the imperfections of the created world on created agents, rather than the creator, where such created agents are viewed as introducing randomness into the world in a way that provides some casual distance between God and evil. This strategy typically assumes that if one person is fully morally responsible for something, then nobody else is morally responsible to any degree for that same thing. In this section, I will explore the role that this assumption plays in typical Augustinian approaches to the problem of evil, and then explain in the next section why it is false.

Contemporary interest in the problem of evil can be traced to rigorous formulations of the problem generated by J. L. Mackie (1955) and H. J. McCloskey (1960). Their articles led to influential responses from John Hick (1966) and Alvin Plantinga (1974a, b), among others. In his survey of historical approaches to the problem, Hick distinguished between two groups of theodicies, the Augustinian and Irenaean, where the former explains evil as an accidental by-product of the free choices of creatures, and the latter explains it as necessary for moral development ("soul-making").[7] Hick himself defended an Irenaean approach, whereas Plantinga developed a highly technical formulation of the Augustinian approach called the Free Will Defense. Plantinga's Augustinian approach has received the lion's share of attention in the literature, and I will return to it later. But it will be helpful to begin with St. Augustine himself in order to explain in more general terms how assumptions about causality and moral responsibility function in an Augustinian approach.[8]

[7] St. Augustine's theodicy is not the first one to be based explicitly on human freedom, though—that honor might belong to the author of the Biblical account in Genesis 3. Or it might belong to the great Stoic Cleanthes of Assos (c.331–232 BCE; see the discussion of Stoic responses to the problem of evil in Jordan 1987, 200–5); a version of this strategy can also be found in Plato's *Timeaus* (42d–e). There is more to St. Augustine's position than the argument concerning freedom and moral responsibility that I explore here, but I will continue to use Hick's label ("Augustinian") because it has become commonplace in the literature on this question; for perhaps the most detailed classification and survey of possible responses to the problem of evil, see Tooley's essay in Plantinga and Tooley 2008.

[8] I am not an expert in St. Augustine's thought and do not claim that my brief summary here sheds any new light on his views; instead, I will draw only upon one of his early work (*On Free Choice of the Will*), which seems to capture adequately the general outlines of what I am calling here an Augustinian approach.

In trying to explain how "the goods pursued by sinners are in no way evil things, and neither is free will itself," St. Augustine says that

> When the will clings to the common and unchangeable good, it attains the great and foremost goods for human beings. … But when the will turns away from the unchangeable and common good toward its own private good, or toward external or inferior things, it sins. (St. Augustine 1993, 68)

This movement of the will, the turning away from a higher good to embrace a lower one, is the essence of evil, according to Augustine.[9] Since this movement is "not coerced, but voluntary, it is justly and deservedly punished with misery" (Augustine 1993, 68). What is the cause of this movement of the will, one might ask? Augustine answers:

> But perhaps you are going to ask what is the source of this movement by which the will turns away from the unchangeable good toward a changeable good. This movement is certainly evil, even though free will itself is to be counted among good things, since no one can live rightly without it. For if that movement, that turning away from the Lord God, is undoubtedly sin, surely we cannot say that God himself is the cause of sin. So that movement is not from God. (St. Augustine 1993, 69)

St. Augustine seems to argue here as follows:

1. If God were the cause of evil, then God would be morally responsible for evil.
2. God is not morally responsible for evil.

Therefore,

3. God is not the cause of evil.

Although there are questions (to which I shall return later) about what exactly it is saying, to defend premise 2, the Augustinian might offer the following argument:

[9] Here I am concerned only with what is often called moral evil, as opposed to natural evil (see Plantinga 1974a, 30). Plantinga claims that St. Augustine himself thought that all evil was moral evil, because he thought that all cases of apparently natural evil were caused by "Satan and his cohorts": see Plantinga 1974a, 58.

4. If a created person S performs an evil action A freely, then God does not cause S's performance of A.
5. If God does not cause created person S's performance of an evil action A, then God is not morally responsible to any degree for S's performance of A.

Therefore,

6. If a created person S performs an evil action A freely, then God is not morally responsible to any degree for S's performance of A.

There is something to be said in defense of each of these premises. First, premise 4 reflects the Augustinian's libertarian view of the nature of free action, according to which an action is free only if it is not determined. This view of freedom, which implies what I have called ontological randomness, seems essential to the Augustinian approach to the problem of evil.[10] As Plantinga says, "Now God can create free creatures, but He can't cause or determine them to do only what is right. For if He does so, then they aren't significantly free after all; they do not do what is right freely" (Plantinga 1974a, 30). One of Plantinga's most vocal critics, J. L. Mackie, seems to agree:

> [The Free Will Defense] alone allows the theist to admit that there are some real and unabsorbed evils, some items which the world would, from however broad and ultimate a perspective, be better without (so that this is not the best of all possible worlds), and yet at the same time to detach their occurrence from God, to show them as not having been chosen by God.. (Mackie 1982, 156)

Second, premise 5 is a clear consequence of the following general principle:

[10] For more on St. Augustine's libertarianism, see the preface to Augustine 1993, xi–xiv. Libertarian accounts of free action have their defenders (see, for instance, Van Inwagen 1983, Kane 1985, O'Connor 2000, and Clarke 2003), but they are not as popular today as their compatibilist rivals. A great deal has been written about the Augustinian claim that libertarian freedom is necessary for morality in general, or praise and blame in particular; see Frankfurt 1969, Nagel 1976, Adams 1985, Fischer and Ravizza 1998, and Morriston 2000 for the tip of the proverbial iceberg. I will not discuss here the plausibility of libertarian accounts of free action or the alleged connection between libertarian freedom and responsibility.

7. A person S is morally responsible for something E to some degree only if S causes E.

However, the inference from 4 and 5 to 6 is problematic. In order for 4 to be true, the word "cause" must be understood as "provide a causally sufficient condition," because God clearly provides many causally necessary conditions for creaturely free action (more on this later). To avoid equivocation, then, "cause" must be understood in the same way in 5 (and hence in 7). But in general, providing a causally sufficient condition for an event E is not necessary for being morally responsible for E.[11] For example, "If two people pick up a heavy rock [together] and chuck it on a third person's head, both will be responsible for the consequent injury" (Zimmerman 1985b, 355). So 5 and 7 are not plausible if "cause" is understood in the way that is required for 4 to be true. Could the Augustinian argument be revised in order to accommodate this fact about causation and moral responsibility?

Here is the most natural and straightforward way to revise 7 in order to meet this objection:

8. A person S is morally responsible to some degree for something E only if S contributes causally to the production of E to some degree.

From 8, one might infer 9:

9. If God does not contribute causally to any degree to a created person S's performance of an evil action A, then God is not morally responsible to any degree for S's performance of A.

These revisions yield the following version of the Augustinian argument:

10. If a created person S performs an evil action A freely, then God does not contribute causally to any degree to S's performance of evil action A (replacing 4).

[11] Some will say that 5 is false for another reason: because it is possible to be responsible for something that one fails to prevent, even though one does not contribute causally to its occurrence. (Still others would say, to the contrary, that the failure to prevent something is itself a kind of causal contribution.) I do not want to enter this dispute here, so I will simply set it aside; for a powerful and detailed discussion of the power of causal omissions, see Goldschmidt 2016.

9. If God does not contribute causally to any degree to a created person S's performance of an evil action A, then God is not morally responsible to any degree for S's performance of A (replacing 5).

Therefore

6. If a created person S performs an evil action A freely, then God is not morally responsible to any degree for S's performance of A.

Before commenting on the strength of this argument, I should point out that throughout the chapter, I am talking about causation in the sense of efficient causation (not formal, final, or material causation, to use Aristotelian terminology). Even if God does not exist on the same ontological plane as creatures, as some people say, traditional theists hold that God is an efficient cause of the obtaining of various states of affairs in the world, whether or not God's causation involves other created agents as intermediaries.

Returning now to the argument: it is clearly valid, but according to traditional theism, the first premise (i.e., proposition 10) is false. This is because according to traditional theism, God creates, sustains, and cooperates with the action of every created cause in the world, including free human beings (see the discussion of this point in Freddoso 1988); so God must contribute causally to the performance of every creaturely action, even those evil human actions that are free in a libertarian sense. But since God's causal contribution is not sufficient, all by itself, for the performance of those evil actions, and God does not intend them per se, the Augustinian approach outlined earlier would insist that God is not to be blamed for them.[12] As the sixteenth-century Spanish Jesuit theologian Luis de Molina says,

> From what has been said we have it only that our morally evil actions are not attributed to God as to a positive cause who has an influence on them. This is in accord with the example of the workman who produces swords. For just as the deeds which are done by those who do not use the swords rightly are not imputed to the workman (for the swords are indifferent with respect

[12] I will return below to the question of the relationship between moral responsibility and blame.

> to good or bad use), but are instead imputed to the free choice of those who use the swords badly, so too, since God's general concurrence is indifferent with respect to good and evil actions, the evil actions should not be attributed to God, but should rather be attributed to those who abuse God's general concurrence in order to do evil. (Molina 1989)

In other words, since created persons freely determine for themselves whether their actions are good or evil, they are completely morally responsible for this, and therefore God is not. St. Augustine seems to agree:

> There is nothing I feel so firmly and so intimately as that I have a will by which I am moved to enjoy something. If the will by which I choose or refuse things is not mine, then I don't know what I can call mine. So if I use my will to do something evil, whom can I hold responsible but myself? (St. Augustine 1993, 72)

Perhaps, then, the following argument captures better than the previous ones the Augustinian approach to the problem of evil:

11. If a created person S performs an evil action A freely, then S is fully morally responsible for performing A.
12. If one person is fully morally responsible for something E, then no other person is morally responsible to any degree for E.

Therefore,

6. If a created person S performs an evil action A freely, then God is not morally responsible to any degree for S's performance of A.

This argument seems to capture the essence of the Augustinian approach. But is this argument sound, assuming that free creaturely action involves the kind of randomness described earlier? If so, then it seems that Divine Moral Responsibility is false, because God is not morally responsible to any degree for creaturely evil actions. And a parallel argument would seem to show that God is not morally responsible to any degree for any free creaturely actions at all, whether good or evil—but this would seem to be quite problematic, at least from the point of view of traditional theism.

17.2 Zimmerman on Shared Responsibility

It seems to me that Michael J. Zimmerman has shown that premise 12 is false.[13] In this section, I will present and extend his arguments for this conclusion. Along the way, I will also criticize his arguments for the view that degree of causal contribution is not a factor in determining degree of moral responsibility.

Zimmerman discusses possible cases of group action which are either oversupplied (i.e., "there is a greater supply of agents involved in the action than is in fact causally necessary for the outcome at issue") or standard (i.e., not oversupplied: see Zimmerman 1985a, 116). According to Zimmerman, group action involves more than one individual acting together in such a way that each one contributes causally to a single outcome.[14] Consider the following case of standard group action, to which Zimmerman refers as case X:

> Imagine a group of teenagers pushing a large boulder off a plateau, so that it rolls down a slope and wrecks a car at the bottom. Each of the teenagers intends to contribute to the damage to the car and freely participates in the enterprise, in the full knowledge that his contribution to the enterprise is required if the boulder is to be shifted and the car wrecked at all. (Zimmerman 1985a, 116)

Zimmerman argues that in this case, each of the teenagers involved is fully morally responsible for the damage to the car. His argument for this interesting conclusion involves an appeal to a slightly different case, Y, which differs from case X in only one respect: in Y, just one of the teenagers involved in case X is present (let's call him "S"), and this teenager wrecks the car all by himself. In this case, Zimmerman claims, "there would be no hesitation in ascribing to S full (that is undiminished; not merely sole) responsibility for the damage" (116). In both cases, S's action is causally necessary but not causally sufficient by itself for the damage (since S's action requires the co-operation of other factors or agents in both cases, such as the boulder being able to be moved, the boulder and the car being

[13] Although other work on shared responsibility has been done since then, as far as I can tell, Zimmerman was the first to articulate this clearly, and his formulation of the question remains the standard formulation.

[14] Although this description does not imply that the members of the group share a common purpose or make a concerted effort: see Zimmerman 1985a, 115–6.

properly positioned relative to one another, the force of gravity, etc.). More formally, here is Zimmerman's argument in detail:

(A) The only respect in which case X differs from case Y concerns the type of co-operation which S receives in his endeavor.
(B) This respect provides no reason to ascribe a lesser degree of moral responsibility to S in case X than in case Y.
(C) If (A) and (B), then S is just as morally responsible for the outcome in case X as in case Y.
(D) In case Y, S is fully morally responsible for the outcome.

So,

(E) In case X, S is fully morally responsible for the outcome.

Therefore,

(F) In case X, all participants in the action are fully morally responsible for the outcome (Zimmerman 1985a, 117).

I think that Zimmerman's main argument here is essentially right, although it seems to presuppose that degrees of moral responsibility do not depend upon degrees of causal contribution. This is especially evident in connection with premise (D). It is one thing to claim that someone acts without excuse, so that his or her moral responsibility is undiminished because of co-operating factors; it is another thing to claim that someone is fully morally responsible for something. Full moral responsibility would be responsibility to the highest degree possible, and degree of causal contribution does indeed seem to be relevant to determining this.[15] Let me explain.

Consider Zimmerman's agent S, the teenager in case Y who pushed the boulder down the slope and wrecked the car all by himself. Case Y must

[15] In personal correspondence, Zimmerman has explained that by "full" moral responsibility, he meant only undiminished-by-any-excuse moral responsibility and not moral responsibility to the highest possible degree, because he does not know how to make sense of the idea of such a maximal degree. As will become clear, it seems to me that S would have the highest degree of moral responsibility for E just in case S contributed to the maximal degree to the obtaining of E, intended that E result for its own sake, and had maximally certain foresight that S's causal contribution would lead to the obtaining of E. (Such a condition might be satisfied by God's creation of the material world in its initial state *ex nihilo*, for instance.)

differ from case X in some respect with regard to the initial conditions, since in case X, the contribution of each teenager is causally necessary for moving the boulder, whereas in case Y, S acts alone to accomplish (roughly) the same thing. Now compare case Y to a third case, Z, which involves just two persons, S and P. Suppose that S casually suggests to P the possibility that P could push the boulder down the slope all by herself, without any (other) help from S; imagine that S then walks away, but thanks to S's suggestion, P freely decides to do this and does so, where this possibility would not have occurred to P without S's prompting.

Shouldn't we say that S's moral responsibility for the damage to the car in case Z is less than S's moral responsibility for the damage to the car in case Y? After all, if we hold all of the other factors constant, S's causal contribution to the wrecking of the car in case Z is not causally sufficient (in the circumstances) for the wrecking of the car, since it must operate "through" P's free decision to push the boulder down the slope all by herself. (If P's decision is free, then it is not determined by the prior events, including S's attempts to persuade.[16]) By contrast, if we hold all of the other factors constant, S's causal contribution to the wrecking of the car in case Y is causally sufficient (in the circumstances) for the wrecking of the car. Doesn't this difference clearly indicate different degrees of causal contribution in the two cases, and doesn't this difference indicate a difference in degrees of moral responsibility in the two cases?

I think so. But Zimmerman offers an argument against this approach. He mentions a variant on his original case X which involves S twisting P's arm so that P will help S to push the boulder against P's will, and says this about such a case:

> In a case such as that just given it is common and tempting to talk of the differing "extents" to which S and P contributed to the outcome; but I think that such talk should be avoided. Presumably more blame is to be ascribed to S than to P—he is more to blame for the outcome than P is, he is also to blame for twisting P's arm, and so on—but, given that the action of each is causally necessary and of neither is causally sufficient for the out-

[16] Here I am assuming, of course, that P's decision is free in some libertarian sense. (Those who find this example incoherent because they find the concept of libertarian freedom incoherent will find a different example of degrees of causal contribution leading to different degrees of responsibility in the discussion of Zimmerman in the next few paragraphs.) For persuasive arguments for the conclusion that intervening agents do not necessarily diminish moral responsibility, in general, see Zimmerman 1985b.

> come, it seems misleading to talk of S contributing to a greater extent than P to this outcome. In general, it seems to me best to say the following. There is a sense to be attached to the claim that different individuals have more or less "important" roles in the production of an outcome, but such a claim is, first, a normative one and, second, not to be confused with the non-normative issue of contribution to an outcome (a factor which admits of no degrees). (Zimmerman 1985a, 117)

I think that Zimmerman is mistaken here: just because various factors are in themselves neither causally necessary nor causally sufficient for a given outcome, it does not follow that there can be no differences between them in terms of their respective causal contributions. Case Z, involving causal contribution that is non-necessitating, seems to illustrate this clearly; causal contribution is a matter of degree.

Here is another way to illustrate this same point, this time by reference to another hypothetical case from Zimmerman. This case involves group action which is sequential instead of simultaneous:

> Imagine a dozen people, with murder on their minds, each delivering one stab to the body of some victim. Let us suppose that each of the stabs is causally necessary for the death to ensue. I submit that, given certain other conditions (full freedom, intent, and so forth), each of the assailants is fully morally responsible for the death. (Zimmerman 1985a, 117)

Zimmerman's argument for this last claim is essentially similar to the one mentioned earlier in connection with case X: each of the stabs is causally necessary but not causally sufficient, so each of the assailants is morally responsible to the same degree for the outcome. Furthermore, we could imagine a case in which only one of the assailants administered just one stab and killed the victim, and there is no reason to regard that one person's moral responsibility in the modified case as different from his moral responsibility in the original case involving the twelve people.

But Zimmerman's case of the dozen stabbers can be modified easily to illustrate different degrees of causal contribution. Suppose that instead of people stabbing, we have a million people, each laying a single straw on the proverbial camel's back, except for the last person, who lays a hundred straws on the camel's back (all at once, let's say).[17] As before, let's follow Zimmerman in assuming that each of the million straws is causally necessary for the outcome. Isn't it obvious that the person who lays a hundred straws at once contributes causally to the breaking of the camel's back to a greater extent than any of the other people do? This gives us good reason to think that Zimmerman is mistaken here, that causal contribution does come in degrees, and that degrees of causal contribution help to determine degrees of moral responsibility.

However, Zimmerman offers one final argument in this connection that is worth considering. This argument occurs in the context of the evaluation of group action which is oversupplied:

> If the argument concerning the possibility of the proper ascription of full moral responsibility to each of the participants in a standard simultaneous group action is successful, then it is easy to argue for this possibility when it is oversupplied rather than standard action that is at issue. Suppose that fifteen teenagers had pushed the boulder instead of ten. This surely would not have diminished the responsibility of any of the original ten. (What an easy "out" that would be! Just invite a few more friends to participate.) (Zimmerman 1985a, 119)

My claim about the relevance of causal contribution to moral responsibility might seem to imply that Zimmerman's case of oversupplied group action should be diagnosed as involving diminished moral responsibility for the participants. But this apparent implication is only apparent; I agree with Zimmerman's claim that adding more agents is insufficient, all by itself, to diminish moral responsibility. As Zimmerman says, in another context,

> To say that someone is fully responsible is not to say that he is solely responsible; responsibility is not to be cut up, like a pie, so that the more people that join in a wrongdoing, the less responsibility to be allocated to each. (Zimmerman 1985b, 355)

But it is easy to imagine a case which is similar to Zimmerman's case involving the ten teenagers pushing the boulder in which it does make a

[17] For further discussion of this example with respect to the responsibility for created persons in connection with answered petitionary prayers, see Davison 2017, chapter 7.

difference if more agents are added. For example, suppose that fifteen teenagers are involved instead of ten, and imagine that the causal contribution of each teenager is reduced accordingly (so that the case is not oversupplied, but rather standard, like the original case X). Then it seems reasonable to say that the moral responsibility of a given participant S would be less in this case than it would be in the original case X, all other things being equal. The difference might be slight, of course, and perhaps not important enough to make a difference practically in terms of our response to each individual, but there would be a difference.

Hence I conclude that Zimmerman is mistaken about degrees of causal contribution and that different degrees of causal contribution explain different degrees of moral responsibility, at least in some cases. But notice that along the way, Zimmerman has shown that just because one agent is fully morally responsible for a given event, it does not follow that no other person can be morally responsible for that same event—in other words, the Augustinian premise 12 is false.[18] How should traditional theists who wish to pursue something like an Augustinian approach to answering the problem of evil respond to this?

It seems to me that they should accept the claim that God is partly morally responsible for evil in the world, but then argue that God's responsibility does not imply that God is worthy of blame for such evil. This could be done by explaining the reasons that actually justify God's permission of evil (in the case of theodicy), or explaining the reasons that could justify God's permission of evil (in the case of defense), or simply explaining why we should not expect to know such reasons if they existed (in the case of the so-called skeptical theism). If these strategies are successful, then either God would be worthy of praise for God's contributions to such things, or at least God would be neither worthy of praise nor worthy of blame (although satisfying the other requirements for moral responsibility, in the sense mentioned at the beginning of this chapter). Whether or not such

[18] By way of reminder, I am understanding premise 12 of the Augustinian argument in terms of efficient causes. The argument I have cited here as showing that premise 12 of the Augustinian argument involves only creaturely efficient causes, rather than a combination of divine and efficient causes, but I don't see how that makes any difference. (If there are other kinds of causation, then perhaps some analogue of premise 12 is true for them; I am agnostic about this possibility.)

strategies can be successful, in terms of explaining how God could be responsible but not blameworthy for evil, falls beyond the scope of this chapter.[19]

17.3 Conclusion

We should conclude that the ontological randomness involved in creaturely libertarian freedom (should actual creatures possess it, of course) does not by itself imply that God is not morally responsible to any degree for the free actions of creatures, whether good or evil, assuming (as traditional theists do) that God makes some causal contribution to the free actions of creatures. But what about random events that do not involve the free actions of any creatures, such as the random decay of radioactive isotopes?

In cases such as these, it seems important to note that the randomness in question is randomness over a limited range of possible outcomes. In the famous example of Schrödinger's cat, for instance, there are only two possible states of the radioactive substance in the box with the cat: either it has decayed, or it has not. If it has decayed, then the Geiger counter detects the decay and triggers the hammer to release the poison, which kills the cat. If it has not decayed, then the Geiger counter does not detect the decay and does not trigger the hammer to release the poison, so the cat remains alive. Whether or not the cat is dead, then, involves what I have called ontological randomness. But this arrangement does not involve the possibility of the cat becoming a full-grown horse, a nuclear weapon, or an atom of hydrogen; these last three outcomes are inconsistent with the initial arrangement.

So if God is morally responsible for the fact that a random process is in place that will result in either X or Y, and God knows this, then it seems clear that God is morally responsible to some degree for X if it occurs and morally responsible to some degree for Y if it occurs. Assuming (as I have) that God's degree of causal contribution to the outcome of a random process is not sufficient to guarantee any particular outcome, we might think that God's causal contribution in such cases is less than it is in cases

[19] For an approach to theodicy that does not appeal to libertarian freedom among creatures at all, or to any kind of compensation in an afterlife, see my forthcoming paper, "A Naturalistic Intrinsic Value Theodicy."

in which God's causal contribution is sufficient to guarantee a particular outcome. But as the discussion of degrees of causal contribution shows, causal contribution and hence moral responsibility come in degrees, so we cannot conclude that those cases that involve God's causal contribution to random processes are cases in which God's causal contribution is not necessary or important. Hence traditional theists need not reject Divine Moral Responsibility because of the existence of what I have called ontologically random events in the world.[20]

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[20] For a very different approach to a closely related question, see van Inwagen 1995 and the reply in Freddoso 1987. Many thanks to Jeff Koperski, Kelly James Clark, Thomas P. Flint, Samuel Lebens, Emil Salim, Marilee Coetsee, and other participants in the third annual Abrahamic Reflections on Science and Religion program in Casablanca, Morocco, for helpful comments and suggestions concerning earlier versions of this chapter.

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Index[1]

[1] Note: Page numbers followed by 'n' refer to notes.

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