The Testimony of the Cosmos in a Scientific Age

Darek Barefoot

Paul famously wrote in Romans 1:20 that the invisible attributes of God are known from his creation. How does that claim fare at a time when scientists probe the universe with imposing technology, analyzing what they find in terms of esoteric theories? Can Paul's argument be taken seriously without dismissing, disputing, or simply ignoring the scientific understanding of nature?

Contemplating Creation

It helps in understanding Romans 1:20 to note that the Old Testament is close at hand. For example, Romans 1:23, concerning worship of created things, paraphrases Psalm 106:20. Behind verse 20 are passages of the Hebrew Bible that refer to the creation's testimony to Israel's God. While the earthly landscape with its plants and animals is given this role (Psalm 104), it is the starry sky that bears witness most dramatically:

> The heavens declare the glory of God;
> and the firmament displays his handiwork.
> Day to day utters speech,
> and night to night shows knowledge.
> There is no speech nor language
> where their voice is not heard.
> Their line is gone out through all the earth,
> and their words to the end of the world.
> In them he has set a tabernacle for the sun,
> which is as a bridegroom coming out of his chamber,
> And rejoices as a strong man to run a race.
>
> Psalm 19:1-5

> "To whom then will you liken me, or shall I be equal?" says the Holy One. Lift up your eyes on high, and behold who hath created these things, who brings out their host by number, who calls them all by name. By the greatness of his might, because he is strong in power, not one is missing. Isaiah 40:25-26

In keeping with this emphasis, we ought to picture nature on its grandest scale when we read Romans 1:20. But when considering natural wonders large or small we are confronted by scientific accounts of origins, whether of animals and plants in biology, the earth's features in geology, or the stars and galaxies in cosmology.

As can be seen from the contrasting opinions presented on the websites AnswersinGenesis.org and Biologos.org, it is a matter of interpretation whether scientific stories of origins clash irreconcilably with Genesis and certain other passages in the Bible. I will surprise some readers by

saying that this issue has no direct bearing on Paul's statement that the invisible attributes of God are known from creation. What Romans 1:20 says is true on at least two levels, and in neither one are scientific accounts of origins relevant.

The first level is that of intuition. Upon viewing the grandeur of the night sky, someone is moved to acknowledge a profound yet invisible reality for which no other description but *God* is appropriate. To illustrate, imagine two people gazing up for the first time at Michelangelo's work on the ceiling of the Sistine Chapel in Rome. One says, "What paintings!" while the other goes further by exclaiming, "What a painter!"

The impression that the cosmos is not only a work of art but the work of an artist is not a judgment about the value of astrophysics. In the moment of rapt appreciation, the visitor to the Sistine Chapel is unconcerned about whether Michelangelo took one year or twenty to complete it, or whether the paint was applied by a brush as opposed to a sponge.

The second level is that of analysis, which becomes important for those who are unmoved, or insufficiently moved, by intuition alone. Might the original testimony of nature be recovered by those who are infected by doubt but nevertheless willing to engage in thought and discussion? In what follows I will present one way that it can.

Laws of Nature and Scientific Laws

Anyone who has taken a course in physical science is introduced to formulas such as Newton's laws of motion and, even more famously, his law of universal gravitation. These formulas are called "laws" because they seem to prescribe rather than just describe; they tell us not merely the way objects behaved in the past but how they will behave under similar conditions in the future—how they in some sense *must* behave. It is as if objects from stars and galaxies to atoms and molecules obey invisible road signs.

As science has progressed, predictive formulas have more often been labeled theories than laws. Einstein's theories of relativity, which updated and corrected the laws of motion for large objects, still took the form of mathematical statements that predict observations. Quantum theory pertains to tiny particles such as protons and electrons, but although it contains an element of chance or probability, it too is defined by mathematical equations that predict the results of experiments.

Strictly speaking, modern theories of physics are called *scientific laws*. Scientific laws are our best approximations of the *laws of nature*, which in principle can never be known with certainty.

Whether we call them laws or theories, the formulas that predict the general behavior of objects and forces amount to a set of rules. Let's analyze further the idea that nature is rule-governed.

Rules and Patterns

It is often said that scientists look for patterns in nature. Observation of a pattern is followed by a guess at a rule that might generate it. The guess is called a hypothesis. Patterns, besides being generated by rules, may instead be generated by chance. Unlike patterns due to rules, those that owe to chance cannot be extended in order to generate reliable predictions.

Think of a die, that is, one of a pair of dice. Imagine that someone hands you a die and asks you to role it three times, and each time the die comes up "1." Three die rolls in a row of the same number comprise a simple pattern that could be created by a rule or by chance. The die might be weighted or otherwise have some built-in mechanism that biases it toward 1. The pat-

tern of rolls in that case would derive from the laws of motion and gravity in a controlled way, and we would be justified in predicting high odds of another 1 turning up on a fourth roll.

On the other hand, the pattern of three consecutive rolls of 1 might be due to chance. In that case, the odds of rolling 1 a fourth time would be no better than those of rolling any other number. The impression we might have that the previous rolls made a certain result more likely on the next roll would be an illusion.

Suppose we rolled the die a fourth time and again 1 came up. We would feel vindicated if we had assumed that a rule was creating the pattern. Even if we rolled a number other than 1, we could persevere in believing that a rule was at work. We might speculate that the pattern, and the mechanism causing it, was more complicated than it first appeared. The pattern could consist of three 1s, then another number, then three 1s again, or some other variation.

What we learn from die rolls can be extended to the whole of physical reality. If the patterns of nature are generated by rules, then science is realistic to assume that they are to some degree predictable. We can calculate the right speed and direction to send a satellite into orbit on a rocket. We can combine chemicals in a prescribed way knowing that the product will be yet another chemical with known properties.

If the patterns of nature owe to chance, then all of science is an illusion. We delude ourselves that lucky accidents are predictive successes. We rationalize failed predictions as the result of not establishing the proper conditions or of allowing mistakes to creep into our calculations.

It is unnecessary to justify the claim that the patterns of nature are generated by rules. The reason is not that the reality of rules is self-evident or than the proof of them is well known. It is that rational people find the alternative—nothing behind the patterns but pure chance—impossible to believe.

Scientific reasoning, then, is the process of inferring rules from the observed patterns of nature. Note that it is patterns that are observed while rules are inferred. A rule cannot be observed the way we observe the spots on a butterfly's wing, the gathering of clouds on the horizon, or the distribution of stars in the Milky Way galaxy. Objects and patterns can be seen or detected, but not so rules. Patterns and rules are related but distinct.

How does our tenacious belief in the rule-governed character of nature lead us toward God? That is what we will now consider.

Rules and Mental Space

Atheists often claim that the physical world (we might equally use the terms "nature" or "the universe") is a brute fact. A brute fact is one for which no further explanation is needed or possible. The trouble is that a brute fact is impossible to distinguish from a circumstance that owes to chance.

Modern physics tells us that space and time are intertwined into a single fabric. Properly speaking, nature consists of events contained in this "space-time"—all events whatsoever, past and future. One cannot say that space-time is a brute fact without implying that all events collectively are due to pure chance, as must be all the patterns we observe among those events. But, as we have seen, if patterns in nature owe only to chance then science is a mirage.

To put it differently, it is incoherent to claim that nature conforms to rules by chance. By chance nature might *appear to us* to conform to rules, but in this we would deceive ourselves.

Coming at the point from still a another direction, if reality consists of nothing but the physical world then how can rules, in the form of laws of nature, be real? Physical objects, states, and events can be observed or detected, but as we just saw, rules cannot. If the laws of nature are fic-

tions manufactured by our minds to explain the patterns among physical events, then once again we must conclude that scientists are building castles in the air.

The non-physical quality of rules is an important clue to moving forward from here. Humans invent rules. Consider the rules of chess. Where and how do these rules exist? Our first instinct might be to say that they exist in books and information storage systems. Reflecting further, we realize that printed marks or other artifacts merely *represent* the rules of chess, the way a printed numeral represents a number without being the number.

The rules of chess exist not as physical objects but as ideas in the minds of human beings. These ideas generate patterns of physical events, such as the movements of chess pieces as a chess game is played. We can say that the rules of chess exist not in *physical space* but in *mental space*. Mental space can to some degree be shared, which is why human beings can play chess with one another.

Shared mental space may be compared with our visual field. Several people can stand looking at a single object that is in their shared field of vision and agree on what the object is even though each of them sees it from a slightly different angle.

Physical objects, besides existing in physical space, can exist in mental space to the extent that they can be thought about. Abstract objects, including rules and mathematical formulas, exist in mental space only. Mental space is therefore larger than physical space, in the sense that it is more inclusive.

Abstractions can be inferred from physical patterns. Someone with no knowledge of chess might infer the rules of the game by watching the movements of chess pieces during play. Abstractions can also be represented by objects in physical space, such as printed words and numbers.

Laws of Nature and the Mind of God

If the physical world really does conform to rules in the form of laws of nature, then the rules must be real. To be real, the rules must exist in someone's mental space. How mental space could exist apart from one or more thinking beings is unclear if not inconceivable.

Could the laws of nature exist only in the mental space of humans? The philosopher Immanuel Kant argued that the concepts of space, time, and cause-and-effect are imposed on nature by the human mind. However, earlier we noted that scientific laws are only approximations of the actual laws of nature, which can never be known with certainty. How can humans be projecting upon nature rules which humans are, at the same time, trying to determine from nature?

To suggest that the orderly course of nature is a creation of human thought is another way of turning the laws of nature into fictions, undercutting science as a means to truth. Scientific laws are fictions only insofar as they are approximations, just as the rounded number 3.14159 is not, strictly, the ratio of a circle's diameter to its circumference. Approximations are not fictions in the sense of being untethered to objective reality, however.

One explanation would be a great primary mind, God, whose mental space contains the physical world, the laws of nature, and the secondary mental spaces of thinking creatures. Unless there were a reason to do so we need not speculate about more than one primary mind.

It is easy to relate this line of reasoning to specific passages in the Bible:

> For in him we live, and move, and have our being; as certain also of your own poets have said, "For we are also his offspring." Acts 17:28

> And he is before all things, and in him all things consist. Colossians 1:17

> Who, being the brightness of [the Father's] glory, and the express image of his person, and upholding all things by the word of his power, when he had by himself purged our sins, sat down on the right hand of the Majesty on high. Hebrews 1:3

To understand the last passage above, from Hebrews, note that in biblical language words in the mind, or thoughts, are not sharply distinguished from audible words. The sense must be that the orderly unfolding of nature is conditioned by divine thought—the "word" that upholds all things.

The divine mind is therefore implied by the rule-governed character of physical reality. Ultimately, predictable order flows from thought and not the other way around. Physical space is secondary to, and dependent upon, mental space in its primary form.

The Thinking Creator

If the laws of nature are thoughts in God's mind, according to which he sustains the universe from moment to moment, then it scarcely needs saying that the universe is his creative product. Scientific ideas about the expansion of the universe from a seed-like singularity or from an energy fluctuation in a quantum vacuum are grounded in mathematically-based theories of physics. Therefore, those ideas are not in themselves God-denying. To the extent that the scientists are correct, they have done no more than trace God's application of rules through cosmic time.

We would not expect to see, hear, or otherwise detect God's thoughts marshaling energy and matter, any more than we would expect to detect a Euclidean circle or the number 5 exerting an effect on a rock or a tree.

Return for a moment to the example of chess. Given the right technology we could scan the brains of chess players and map their neural activity in fine detail, all the way down to reactions at the level of molecules. In none of this mapping would we observe an abstraction, such as the rule that bishops may only move diagonally on the chessboard.

The effect of the rules of chess on physical movements is something we experience from the inside out, so to speak. It is one aspect of the mysteriousness of mind, what has been called by modern thinkers the "hard problem" of how conscious experience is related to physical events in the brain.

The effect of God's thoughts on nature, like the effect of the rules of chess on physical movements of chess players, must be inferred rather than observed. Because we as humans experience the effect of abstractions on our own physical behavior, we know such effects occur even though they cannot be observed.

Mind Without Matter?

The only minds of which we have everyday experience are those of human beings. The human mind, moreover, is dependent in complex and specific ways upon physical processes in the brain. Even a minor change in the brain can interfere with a person's ability to think clearly, or otherwise affect their mind.

Our experience of predictable patterns as being generated uniquely by mental processes, pointing toward a primary mind, seems at odds with our observation that mental processes depend on physical events in the brain. If thoughts depend on matter, how can matter depend on thought? Here we need to remember that even within the physical realm the same phenomenon is sometimes accompanied by different conditions.

As an example, consider the magnetic fields generated, respectively, by an electromagnet and a permanent magnet. An electromagnet is a composite device with a core wrapped in wire, and has a field only while electrical current is supplied from an outside source; a permanent magnet can consist of a single, continuous piece of material whose field requires no outside electrical current and persists over a long period of time.

Another example may be drawn from a comparison of mechanical waves with electromagnetic waves. The waves first identified as such were mechanical waves, including surface waves on water and pressure waves such as sound waves. Since all these waves consist of vibrations in material, it was once assumed that waves by their very nature require a material medium.

At the end of the nineteenth century, it became clear that electromagnetic radiation—including visible light, infrared rays, radio waves, etc.—consists of waves somehow capable of moving through a vacuum, absent any material medium whatsoever. There are fundamental differences between mechanical waves and electromagnetic waves, but both share distinctively wave-like properties.

Waves and magnetic fields illustrate, usefully if roughly, that we cannot rule out a form of consciousness that is independent of matter. And insofar as nature conforms to rules, we have reason to believe that such a consciousness exists.

Further, to acknowledge that our own thoughts depend on brain processes is not to say that they depend *solely* on those processes. It is unclear why deep mysteries should attach to the human mind if the brain were simply another organ contributing to survival, different from the heart, kidneys, and immune system only in terms of complexity.

If, besides depending on brain processes, human minds are additionally supported on another level by a primary mind, it is no wonder that thinkers have grappled for so long with the "other minds problem," mind-body problem, problem of intentionality, problem of qualia, and similar puzzles.

Further Implications

As far as we can tell, any intelligible universe, that is, any universe governed by rules, must be the product of thought. That includes universes whose laws exclude the formation of stars and planets, or anything larger than atomic nuclei forever caroming back and forth through a void.

The rules governing our own universe do provide not only for large scale structures but for the richness of biological life. Presumably, the transcendent mind responsible for our cosmos orchestrated it according to laws of nature that are life-nurturing.

The natural cycles that sustain life are cited by Jesus and Paul as evidence, not merely for a Creator, but for one with a loving character:

> Behold the birds of the air. For they do not sow, neither do they reap, nor gather into barns. Yet your heavenly Father feeds them. Are you not much better than they? Matthew 6:26

> [God] in times past permitted the nations to go their own way. Nevertheless, he did not leave himself without a witness in that he did good, and gave us rain from heaven, and fruitful seasons, filling our hearts with food and gladness. Acts 14:16-17

These are not denials that birds and people occasionally starve or suffer cruel deaths in other ways. It is an observation that the greater part of the earth overflows with life—though humans

clumsily tend to extinguish it—and that human populations particularly have flourished until their expansion itself has posed challenges.

Undeniably, nature as it currently exists apportions plenty of suffering to higher life forms. Predation, parasites, disease, and deformity make up a catalog of horrors. Yet the value of life is such that not even a grotesque array of afflictions can obscure it.

Here is a question for those who disparage life due to the ubiquity of suffering: Would an asteroid impact that ends life on earth be (a) a good event, (b) a bad event, or (c) a neutral one. People who are both sane and honest will acknowledge that the obliteration of earth's life and natural beauty would be, unquestionably, bad in every sense of the word. Why would the question be easy to answer if the defining features of life were senselessness and misery?

The dizzying variety of forms of earthly life is not the only measure of its richness. The more complex creatures enjoy some measure of a mysterious phenomenon we have already touched upon, conscious experience of sensations and emotions. We humans enjoy an especially deep conscious life that features imagination, reason, and conscience.

The most exalted sensations, such as love and joy, have a biological aspect. As with the workings of the mind, these responses are tied to chemical processes in the brain. Also, they seem related to behaviors that have adaptive purposes. Those associations do not justify equating love, compassion, and inner peace with mere chemistry, or reducing them to behavioral patterns.

To illustrate, social insects exhibit a range of dutiful behaviors, including tireless work and willingness to sacrifice themselves in defense of their colony. Still, we don't picture ants as taking emotional satisfaction in their labors or bees pondering their responsibilities to their queen. We assume that insects need be motivated by nothing more than blind instinct, and carry on as automatons with little or no conscious awareness.

Why behavior in higher creatures is accompanied by an inner life, including emotions, reflections, and a sense of self, is an enigma. More than an enigma, it is a gift surpassing the rest of life's many wonders.

The transcendent intelligence behind the law-like regularities of nature must also be the source of love, joy, and virtue. We may wish these graces were more abundant, but it is hard to envision their originator not intending them eventually to predominate in creation. Can we imagine beauty's inventor being indifferent toward beauty's defilement?

God of the Gaps?

We have seen that the ordered complexity of nature implies an organizing intelligence, God. While the vastness of the universe testifies to God's power, its life-nuturing properties bear witness to God's love and goodness. Far from being undermined by science, Paul's claim in Romans that the Creator's attributes can be seen from the creation is confirmed anew by each scientific advance.

What I have presented here is formally called the argument from intelligibility. It is perhaps the deepest yet least familiar of the classical arguments for God's existence. For those interested in slightly different, more detailed presentations I recommend John Foster's book *The Divine Lawmaker: Lectures on Induction, Laws of Nature, and the Existence of God* (OUP, 2004) as well as *The Intelligible Universe: A Cosmological Argument* by Hugo Meynell (Palgrave MacMillan, 1982).

A caution is in order, too. No argument amounts to a "proof" of God, if by proof we mean a statement with the logical force of a mathematical equation. In front of us lie clues pointing in a Godward direction, but any attempt to reach beyond our everyday reality can be resisted.

To be fair, often enough circumstances have been attributed to God's miraculous action that were eventually explained by science. This is the so-called god-of-the-gaps fallacy. It is unwise to make a case for God from some open scientific question that future research, plausibly, may answer. Is the argument from intelligibility an example of this fallacy?

Science explains observations by placing them within a common, rule-governed framework. Even when science explains rules, it does so in terms of other rules, such as how the laws of optics are derived from more basic laws of physics. Therefore, we can never hope to find within science an explanation of the most basic rules, the laws of nature.

Science could only explain the laws of nature in terms of, well, themselves. Therefore, proposing a universal intelligence to explain the laws of nature is not a case of using God as a placeholder for a scientific discovery yet to be made.

An objection related to the god-of-the-gaps fallacy is to point out, correctly, that God is not a scientific explanation of anything. In the search for truth, we can indeed avoid God by insisting that all explanations be scientific ones. Understand, however, that the strategy of limiting rational explanations to those found within science comes at a steep price. If all rational judgments were scientific, then no rational case could be made for science as such.

Consider that the proposition, "science is a source of knowledge about nature." It should be impossible to frame a sound argument for this hypothesis if science contains all that is rational. What about the argument that because science has resulted in useful technologies it must provide knowledge about nature? If that is a reasonable way to think, then all rational explanations do not lie within the boundaries of science. God, therefore, can be a rational explanation even if not a scientific one.

Belief and Decision

Romans 1 says us that people suppress spiritual truth by adopting false deities, which might take the form of an ideals or causes that do little more than sanction human cravings. Without humility, moreover, no one will give God the least attention. According to the Scriptures, it is God himself who warns us that we are skilled at evasion even as he invites us to return to him.

The enlightenment philosopher and skeptic David Hume (1711-1776), whose devastating critique of religious gullibility has been echoed by secularists for two-and-a-half centuries, took up the question of the testimony of nature in his *Dialogues Concerning Natural Religion*. Near the end of the treatise, in dialogue 12, Hume concedes in the voice of the character Philo that the order of the universe points toward something like intelligence. Hume adds that the indication is too vague to give us a picture of God.

Hume's primary objection to a personal Creator had been offered previously, in dialogue 11. There Hume reflects on the fragility of living things in an uncaring cosmos. Hume insists that if the universe were a house built by a sovereign architect, he would have made it a more comfortable, less dangerous abode for his creatures.

The message of the Bible that at the cross God paid the ultimate price to advance the renovation of nature was left unmentioned in the *Dialogues*.

Any argument can be discounted, rationalized away, or simply ignored. How clearly nature's testimony to God is heard will always be determined in part by individual human choice.