Redeeming Science

A God-Centered Approach

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Introduction: Science Mixing with People

When people hear of my love for science and mathematics, some react with enthusiasm, but others with dread. "Not me!" or "I hated math."

Though I classify myself with the enthusiasts, I sympathize with the rest. Somewhere along the way, many of these people started dreading their math or science class, and probably it only got worse with time. They did not understand well what was going on, and they could do the problems only with a hard struggle or not at all. Nothing kills enjoyment like failure.

Of course, it is partly that people differ in aptitude. Some prefer science, others prefer English or history or art. "Live and let live."

Importance of Thoughtful Response

But I believe that this is God's world, and that science and English and art alike reflect his wisdom. Even if we have little personal aptitude in a particular area, we can grow to appreciate and admire what skilled people do and what they experience.

And today our world experiences the continual impact of science, scientific ideas, and technological fruits of science. Whether we like science or not, we all have to deal with it on a practical level.

But then the question arises, "Is this indeed God's world? Or does it all reduce to matter and energy and motion?" And if it is God's world, how does God relate to science?

I myself am a believer in Jesus Christ. So I must ask myself how Christian belief relates to science. People often think that science is antagonistic to Christian belief. Science, it is said, shows that the universe is billions of years old, while the Bible says that it is only thousands of years old. And some people claim science shows that supernatural miracles are impossible.

This thinking in terms of antagonism crops up not only among non-Christians but among some Christians. I sometimes meet Christian people

who are afraid of science because they think it is antagonistic to Christianity. The idea of antagonism is widespread, but it rests on a cultural history that has distorted people's understanding of science.

I would like to kindle our appreciation for science as it ought to be, science that could serve as a path for praising God and serving fellow human beings. Have you seen a nature show on TV that followed the story of baby foxes or the life of otters? Often the verbal commentary on such a show invites us to admire "Nature" or "Mother Nature" as the source of wisdom, care, and beauty. But we ought to recognize here the wisdom, care, and beauty of God. A God-centered worldview restores a correct response, where we praise the God who created nature and cares for it.

MY STORY

Soon after beginning school I became fascinated with arithmetic. Practicing addition was like playing in a magical wonderland, because the operation proceeded with such precision, such stability, such consistency. It showed enormous power, because one could add large numbers and obtain still larger ones, on and on as long as one could go. (I did not know it, but I was experiencing the lure of infinity.) Numbers worked like magic, in that the operations carried out on paper matched perfectly what one could find by putting together 13 marbles with 15 more marbles.

My interest eventually expanded to include science and higher mathematics. I was fascinated by the regularity, dependability, and beauty that I saw. I found a sense of rest in the constancy of physical laws, their precision, their harmony.

I pursued my interest by majoring in mathematics at California Institute of Technology and by studying for a Ph.D. in mathematics at Harvard University. I then taught mathematics at Fresno State College (now California State University, Fresno) before turning to pursue a second interest, my interest in the Bible and theology.

Over the years, where did the fascination and the sense of the mystery of science go? To a certain extent they have remained with me. I still enjoy reading *Scientific American*. But learning began to squeeze out the fascination and mystery. To some degree I suppose this is inevitable. Learning brings familiarity, and familiarity can produce lack of attention or even boredom.

But other forces have been at work as well. Science as now taught is influenced by an ideology of "objectivity" that may prefer to sweep under the rug the experience of personal fascination, delight, beauty, and mystery.

Excitement is not communicated as it should be to each new generation, and so they do not see the point. Science gets reduced to a game in which we learn meaningless rules in order to solve artificial problems posed on teachers' tests. Or it is no more than a pragmatic tool by which we produce gadgets that bring comfort, entertainment, and status. Or, for those who excel in science, it is a platform for parading intellectual power and achievement. Where is a vision for the whole world that would draw us into an appreciation of the human significance of science?

My son has been studying conic sections in his high school math class. I think the subject is beautiful. But he does not; and he does not see the point. I asked him whether the teacher or the textbook provided any justification or meaning for it. No. If the teacher were asked, he would say, "We are doing it because it is part of the curriculum." That evasion sounds like saying, "There is no real point, but only an arbitrary decision from the authorities who drew up the curriculum." Such lack of purpose does not produce a good learning atmosphere, despite the fact that the teacher himself has a genuine love for his subject and a commitment to his teaching.

My wife and I observed the trouble with our son much earlier. In about the third grade, he was studying biology by memorizing scientific terminology for the parts of the leaf or for the divisions of the animal kingdom. He was not exploring how animals behave, but just memorizing. I was so appalled by the mauled vision of science that I felt like averting my eyes in shame. I found myself saying lamely, "This is not what real science is like. Real science means exploring and adventuring." And now with more maturity I might add, "And from time to time, after a long, exhausting climb, we catch a breathtaking glimpse of the beauty of God."

I wanted to see my son reading stories about how the bees build their hives and communicate the location of new sources of nectar, or how octopuses catch their prey, or how diamonds are formed. Let him enjoy the written analogue of a nature show, whenever the class cannot manage to get an effective multimedia presentation. Let him also sense some of the excitement in scientific discovery. Let him hear the story of the production of the first vaccine for smallpox and the discovery of penicillin. Have the class go outside and observe ants at work. Let them capture some sow bugs and find out what they like to eat. Let them cut up some large seeds to see what is inside, and let them water some and watch them grow. Let them take apart an old-fashioned wind-up clock and try to figure out how it works. And do not make it into a "lab" project where everyone must come up with the same predetermined results!

I am glad to say that later there were some high points in my son's science education. The sixth grade class set off toy rockets that went 500 feet into the air. The seventh grade took a field trip to a stream valley where they dug out shale and broke it open to find fossils.

We need to reform our thinking about science. And we need to do it in a global way, by tackling on a large scale our conception of what kind of world we live in and what is our human role in it. Western civilization has lost sight of any unified goal, except perhaps the superficial goals of pleasure, prosperity, and tolerance. We have lost our way as a civilization, and the universities have become multi-versities with no center. The grade schools are little better. The atmosphere says, "Work on these apparently meaningless assignments now, so that you will be able to go to college, get a good job, and live the American dream of a large home with two cars and a plasma screen TV." The malaise about science and its meaning is only part of a larger malaise of meaninglessness engulfing us.

So we are taking a long route, to rethink the meaning of science. And I am doing that rethinking as a Christian believer. It would take another book to present the case that the Christian faith is true and that the Bible is the word of God. I am writing this book mostly for Christians who already believe these things. But I believe they are relevant to everyone, because basic truths about God and about science are relevant to all. Even if you are not yet a Christian, you may be interested to see how Christian faith interacts with the scientific enterprise. No, it does not result in the kind of antagonism that popular thinking suggests. And yes, it can liberate us from the tide of meaninglessness.

1

Why Scientists Must Believe in God: Divine Attributes of Scientific Law[1]

All scientists—including agnostics and atheists—believe in God. They have to in order to do their work.

It may seem outrageous to include agnostics and atheists in this broad statement. But by their actions people sometimes show that in a sense they believe in things that they profess not to believe in. Bakht, a Vedantic Hindu philosopher, may say that the world is an illusion. But he does not casually walk into the street in front of an oncoming bus. Sue, a radical relativist, may say that there is no truth. But she travels calmly at 30,000 feet on a plane whose safe flight depends on the unchangeable truths of aerodynamics and structural mechanics.[2]

But what about scientists? Do they believe in God? Must they? Popular modern culture often transmits the contrary idea, namely that science is antagonistic to orthodox Christian belief. Recitations of Galileo's conflict and of the Scopes Trial have gained mythic status and receive reinforcement through vocal promotions of materialistic evolution.

Historians of science point out that modern science arose in the context

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[1] This chapter originally appeared in different form in Vern S. Poythress, "Why Scientists Must Believe in God," *Journal of the Evangelical Theological Society* 46/1 (March 2003): 111-123.

[2] Gregory L. Bahnsen's work on self-deception ("A Conditional Resolution of the Apparent Paradox of Self-Deception," Ph.D. thesis, University of Southern California, 1979) has helped to show how people manage such paradoxical stances. They believe a certain proposition and also believe (as a second-order belief) that they do not believe it. They have hidden from their consciousness what their actions continue to reveal to others. In their actions they tacitly rely on truths about the world, while verbally and consciously they do not believe that they do. This model is helpful. But unbelief and rebellion, as manifestations of sin, produce deep effects on human nature, including its intellectual and practical affairs. Hence, any human account of the evasion of truth remains partial.

of a Christian worldview, and was nourished and sustained by that view.[3] But even if that was once so, twentieth-century and twenty-first-century science seems to sustain itself without the help of explicit theistic underpinnings. In fact, many consider God to be merely the "God of the gaps," the God whom people invoke only to account for gaps in modern scientific explanation. As science advances and more gaps become subject to explanation, the role of God diminishes. The natural drives out the need for the supernatural.[4]

FOCUSING ON SCIENTIFIC LAW

The situation looks different if we refuse to confine God to "the gaps." According to the Bible, he is involved in those areas where science does best, namely areas involving regular and predictable events, repeating patterns, and sometimes exact mathematical descriptions. In Genesis 8:22 God promises,

> While the earth remains, seedtime and harvest, cold and heat, summer and winter, day and night, shall not cease.[5]

This general promise concerning earthly regularities is supplemented by many particular examples:

> You make darkness, and it is night,
> when all the beasts of the forest creep about (Ps. 104:20).
>
> You cause the grass to grow for the livestock
> and plants for man to cultivate,
> that he may bring forth food from the earth (Ps. 104:14).
>
> He sends out his command to the earth;
> his word runs swiftly.

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[3] Reijer Hooykaas, *Religion and the Rise of Modern Science* (Grand Rapids, Mich.: Eerdmans, 1972); Stanley L. Jaki, *The Road of Science and the Ways of God* (Chicago: University of Chicago Press, 1980); Jaki, *The Origin of Science and the Science of Its Origin* (South Bend, Ind.: Regnery-Gateway, 1979); Nancy R. Pearcey and Charles B. Thaxton, *The Soul of Science: Christian Faith and Natural Philosophy* (Wheaton, Ill.: Crossway, 1994); Charles E. Hummel, *The Galileo Connection: Resolving Conflicts Between Science and the Bible* (Downers Grove, Ill.: InterVarsity Press, 1986).

[4] In about 1999 Edward J. Larson and Larry Witham conducted a survey of scientists' beliefs and compared the results with similar 1914 and 1933 surveys by James H. Leuba. They found little change, contrary to the impression that science is a secularizing force. 40 percent believed in God both in Leuba's surveys and today. But they also found that the "elite" of American scientists, represented by the National Academy of Science, contained a higher percentage of disbelief—more than 90 percent of those responding (Edward J. Larson and Larry Witham, "Scientists and Religion in America," *Scientific American* 281/3 [September 1999]: 88-93).

[5] Unless otherwise noted, Bible quotations are from the English Standard Version (ESV).

He gives snow like wool;
he scatters hoarfrost like ashes.
He hurls down his crystals of ice like crumbs;
who can stand before his cold?
He sends out his word, and melts them;
he makes his wind blow and the waters flow (Ps. 147:15-18).

The regularities that scientists describe are the regularities of God's own commitments and actions. By his word to Noah, he commits himself to govern the seasons. By his word he governs snow, frost, and hail. Scientists describe the regularities in God's word governing the world. So-called natural law is really the law of God or word of God, imperfectly and approximately described by human investigators.

Now, the work of science depends constantly on the fact that there are regularities in the world. Without the regularities, there would ultimately be nothing to study. Scientists depend not only on regularities with which they are already familiar, such as the regular behavior of measuring apparatus, but also on the postulate that still more regularities are to be found in the areas that they will investigate. Scientists must maintain hope of finding further regularities, or they would give up their newest explorations.

(I should say here that I am concentrating on the natural or "hard" sciences such as physics, chemistry, geology, biology, and astronomy. To some extent similar observations hold for "human sciences" such as psychology, anthropology, linguistics, and sociology. But the study of human beings brings in additional challenges, because of the way in which one's overall understanding of the nature of humanity vitally influences the investigation. In concentrating on regularities, I am also putting into the background "historical" studies, such as the study of the past history of the large-scale universe [cosmology], the past history of life [paleobiology], the past history of the earth [historical geology], and so on. These studies rely on the assumption of regularities, but they also wrestle with understanding many unrepeatable events, such as the origin of the first cell, or the origin of the first humans. We will focus on the issue of uniqueness versus repeatability later [chapter 13]. And we will consider issues of origins in chapters 18 and 19.)

Belief in Scientific Laws

Now just what are these regularities? For five years in a row a robin appears and builds a nest in the same bush. But in the sixth year no robin appears. Does this show a "regularity" of the appropriate type? It might be a matter

of coincidence. Scientists are concerned to observe robins and their nest-building. But in the long run they do not rest with observations of mere coincidence. They want to know whether the recurrence is somehow constrained, whether it occurs according to a general explanatory principle.[6] The principles go by various names: "natural law," "scientific law," "theory." Some of these regularities can be exactly, quantitatively described for each case (within small limits of error), while others are statistical regularities that come to light only when a large number of cases are examined together. All scientists believe in the existence of such regularities. And in all cases, whatever their professed beliefs, scientists *in practice* know that the regularities are "out there." Scientists in the end are all "realists" with respect to scientific laws.[7] Scientists discover these laws and do not merely invent them. Otherwise, why go to the trouble, tedium, and frustration of experiment? Just make a guess, invent a new idea, and become famous!

These regularities are, well, regular. And to be regular means to be regulated. It involves a *regula,* a rule. *Webster's Dictionary* captures the point by defining "regular" as "formed, built, arranged, or ordered according to some established rule, law, principle, or type."[8] The idea of a law or rule is built into the concept of "regularity." Thus it is natural to use the word "law" in describing well-established scientific theories and principles. Scientists speak of Newton's laws, Boyle's law, Dalton's law, Mendel's laws, Kirchhoff's laws. All scientists believe in and rely on the existence of scientific laws.

UNIVERSAL APPLICABILITY OF SCIENTIFIC LAW

What characteristics must a scientific law have in order even to *be* a law? Again, we concentrate on the *practice* of scientists rather than their metaphysical musings. We ask, "Whatever their professed philosophy, what do scientists expect *in practice?"* Just as the relativist expects the plane to fly, the scientist expects the laws to hold.

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[6] Roy Bhaskar distinguishes carefully between "causal laws" and "patterns of events" (Bhaskar, *Reclaiming Reality: A Critical Introduction to Contemporary Philosophy* [London/New York: Verso, 1989], 16). "Causal laws" correspond to what I call "a general explanatory principle," whereas "patterns of events" may derive from coincidence. Even when a pattern is a direct result of the operation of laws, it is not identical with the laws but is one instance of an effect of the laws. Yet no rigid separation is possible, because no *pattern,* whether coincidental or not, can be recognized by a human being except against the background of the rationality of the word of God. We need to have two distinctions in place: the distinction between God's word and human knowledge of his word; and the distinction between God's word and the things and events it controls. We also need to acknowledge that science involves more than one level of description and explanation. Gathering data about a robin's nest-building involves a more elementary level than analysis of a neurological basis for nest-building instincts. See the later discussion in chapters 13–15.

[7] For a discussion of realism and alternatives to it, see chapter 15.

[8] *Webster's Ninth New Collegiate Dictionary* (Springfield, Mass.: Merriam-Webster, 1987).

Scientists think of laws as universal in time and space. Kirchhoff's laws concerning electrical circuits apply only to electrical circuits, not to other kinds of situations. But they apply in principle to electrical circuits at any time and in any place. Sometimes, of course, scientists uncover limitations in earlier formulations. Some laws, like Newton's laws, are not really universal, but apply accurately only to a restricted situation such as low velocity motion of large, massive objects.[9] In the light of later knowledge, we would say that Newton's laws were always only an approximation to the real pattern of regularity or lawfulness in the world. We modify Newton's laws, or we include the specific restriction to low velocity within our formulation of the laws. Then we say that they apply to all times and places where these restrictions hold.

Thus, within the very concept of law lies the expectation that we include all times and all places. That is to say, the law, if it really is a law and is correctly formulated and qualified, holds for all times and all places. The classic terms are *omnipresence* (all places) and *eternity* (all times). Law has these two attributes that are classically attributed to God. Technically, God's eternity is usually conceived of as being "above" or "beyond" time. But words like "above" and "beyond" are metaphorical and point to mysteries. There is, in fact, an analogous mystery with respect to law. If "law" is universal, is it not in some sense "beyond" the particularities of any one place or time? Moreover, within a biblical worldview, God is not only "above" time in the sense of not being subject to the limitations of finite creaturely experience of time, but he is "in" time in the sense of acting in time and interacting with his creatures.[10] Similarly, law is "above" time in its universality, but "in" time through its applicability to each particular situation.

Divine Attributes of Law

The attributes of omnipresence and eternity are only the beginning. On close examination, other divine attributes seem to belong to scientific laws. Consider. If a law holds for all times, we presuppose that it is the *same* law through all times. The law does not change with time. It is immutable. A supposed "law" that did change with time would not really be "the law," but one temporal phase in a higher or broader regularity that would account for the lower-level change. The higher, universal regularity is the law. The very concept of scientific law presupposes immutability.

[9] But not too massive; we get into other limitations when the gravitational fields are strong.
[10] John M. Frame, *The Doctrine of God* (Phillipsburg, N.J.: Presbyterian & Reformed, 2002), 543-575.

Next, laws are at bottom ideational in character. We do not literally see a law, but only the effects of the law on the material world. The law is essentially immaterial and invisible, but is known through effects. Likewise, God is essentially immaterial and invisible, but is known through his acts in the world.

Real laws, as opposed to scientists' approximations of them, are also absolutely, infallibly true. Truthfulness is also an attribute of God.[11]

The Power of Law

Next, consider the attribute of power. Scientists formulate laws as *descriptions* of regularities that they observe. The regularities are there in the world first, before the scientists make their formulations. The human scientific formulation follows the facts, and is dependent on them. But the facts must conform to a regularity even before the scientist formulates a description. A law or regularity must hold for a whole series of cases. The scientist cannot force the issue by inventing a law and then forcing the universe to conform to the law. The universe rather conforms to laws already there, laws that are discovered rather than invented. The laws must already be there. They must actually hold. They must "have teeth." If they are truly universal, they are not violated. No event escapes their "hold" or dominion. The power of these real laws is absolute, in fact, infinite. In classical language, the law is omnipotent ("all powerful").

If law is omnipotent and universal, there are truly no exceptions. Do we, then, conclude that miracles are impossible because they are violations of law? In fact, miracles are in harmony with God's character. They take place in accordance with his predictive and decretive word. Through Moses, God verbally predicted the plagues that came to Egypt, and then brought them about. Through God's word spoken by the prophet Elisha, a spring of water was made healthy:

> "Thus *says* the LORD, I have healed this water; from now on neither death nor miscarriage shall come from it." So the water has been healed to this day, according to the *word* that Elisha spoke (2 Kings 2:21-22).

The real law, the word of God, brings forth miracles. Miracles may be

[11] I recently found parallel thinking in Paul Davies, who mentions the eternality, universality, and omnipotence of law (Davies, *The Mind of God: The Scientific Basis for a Rational World* [New York: Simon & Schuster, 1992], 82-83). But Davies then travels in other directions, without further expanding the list of divine attributes.

unusual and striking, but they do not violate God's law. They violate only some human expectations and guesses. But that is our problem, not God's. Just as Newton's laws are limited to low velocity approximations, so the principle that axe heads do not float is limited by the qualification, "except when God in response to a special need and a prophet's word does otherwise" (e.g., 2 Kings 6:5-6).

The law is both transcendent and immanent. It transcends the creatures of the world by exercising power over them, conforming them to its dictates. It is immanent in that it touches and holds in its dominion even the smallest bits of this world.[12] Law transcends the galactic clusters and is immanently present in the chromodynamic dance of quarks and gluons in the bosom of a single proton. Transcendence and immanence are characteristics of God.

The Personal Character of Law

Many agnostic and atheistic scientists by this time will be looking for a way of escape. It seems that the key concept of scientific law is beginning to look suspiciously like the biblical idea of God. The most obvious escape, and the one that has rescued many from spiritual discomfort, is to deny that scientific law is personal. It is just there as an impersonal something.

Throughout the ages people have tried such routes. They have constructed idols, substitutes for God. In ancient times, the idols often had the form of statues representing a god—Poseidon, the god of the sea, or Mars, the god of war. Nowadays in the Western world we are more sophisticated. Idols now take the form of mental constructions of a god or a God-substitute. Money and pleasure can become idols. So can "humanity" or "nature" when it receives a person's ultimate allegiance. "Scientific law," when it is viewed as impersonal, becomes another God-substitute. But in both ancient times and today, idols conform to the imagination of the one who makes them. Idols have enough similarities to the true God to be plausible, but differ so as to allow us comfort and the satisfaction of manipulating the substitutes that we construct.

In fact, a close look at scientific law shows that this escape route is not really plausible. Law implies a law-giver. Someone must think the law and enforce it, if it is to be effective. But if some people resist this direct move to personality, we may move more indirectly.

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[12] On the biblical view of transcendence and immanence, see John M. Frame, *The Doctrine of the Knowledge of God* (Phillipsburg, N.J.: Presbyterian & Reformed, 1987), especially 13-15; and Frame, *Doctrine of God*, especially 107-115.

Scientists in practice believe passionately in the rationality of scientific law. We are not dealing with an irrational, totally unaccountable and unanalyzable surd, but with lawfulness that in some sense is accessible to human understanding. Rationality is a *sine qua non* for scientific law. But, as we know, rationality belongs to persons, not to rocks, trees, and subpersonal creatures. If the law is rational, which scientists assume it is, then it is also personal.

Scientists also assume that laws can be articulated, expressed, communicated, and understood through human language. Scientific work includes not only rational thought, but symbolic communication. Now, the original, the law "out there," is not known to be written or uttered in a human language. But it must be expressible in language in our secondary description. It must be translatable into not only one but many human languages. We may represent restrictions, qualifications, definitions, and contexts for a law through clauses, phrases, explanatory paragraphs, and contextual explanations in human language.

Scientific law is clearly like a human utterance in its ability to be grammatically articulated, paraphrased, translated, and illustrated. Law is utterance-like, language-like. And the complexity of utterances that we find among scientists, as well as among human beings in general, is not duplicated in the animal world.[13] Language is one of the defining characteristics that separates man from animals. Language, like rationality, belongs to persons. It follows that scientific law is in essence personal.[14]

The Incomprehensibility of Law

In addition, law is both knowable and incomprehensible in the theological sense. That is, we know scientific truths, but in the midst of this knowledge there remain unfathomed depths and unanswered questions about the very areas where we know the most.

The knowability of laws is closely related to their rationality and their immanence, displayed in the accessibility of effects. We experience incomprehensibility in the fact that the increase of scientific understanding only

[13] Animal calls and signals do mimic certain limited aspects of human language. And chimpanzees can be taught to respond to symbols with meaning. But this is still a long way from the complex grammar and meaning of human language. See, e.g., Stephen R. Anderson, *Doctor Dolittle's Delusion: Animals and the Uniqueness of Human Language* (New Haven, Conn.: Yale University Press, 2004).

[14] In their ability to undergo transformation and reformulation, scientific laws also show an analogy with the ability of human language to represent multiple perspectives. For more on the language-character of scientific law, see Vern S. Poythress, "Science as Allegory," *Journal of the American Scientific Affiliation* 35/2 (1983): 65-71; Poythress, "Newton's Laws as Allegory," *Journal of the American Scientific Affiliation* 35/3 (1983): 156-161; Poythress, "Mathematics as Rhyme," *Journal of the American Scientific Affiliation* 35/4 (1983): 196-203.

leads to ever deeper questions: "How can this be?" and "Why *this* law rather than many other ways that the human mind can imagine?" The profundity and mystery in scientific discoveries can only produce awe—yes, worship—if we have not blunted our perception with hubris (Isa. 6:9-10).

Are We Divinizing Nature?

But now we must consider an objection. By claiming that scientific laws have divine attributes, are we divinizing nature? That is, are we taking something out of the created world, and falsely claiming that it is divine? Are not scientific laws a part of the created world? Should we not classify them as creature rather than Creator?[15]

I suspect that the specificity of scientific laws, their obvious reference to the created world, has become the occasion for many of us to infer that these laws are a *part* of the created world. But such an inference is clearly invalid. The speech describing a butterfly is not itself a butterfly or a part of a butterfly. Speech *referring* to the created world is not necessarily an ontological *part* of the world to which it refers.

In addition, let us remember that we are speaking of real laws, not merely our human guesses and approximations. The real laws are in fact the word of God, specifying how the world of creatures is to function. So-called "law" is simply God speaking, God acting, God manifesting himself in time and space. The real mistake here is not a matter of divinizing nature, but of refusing to recognize that the law is the law of God, nothing less than God speaking. We are confronting God.

The key idea that the law is divine is not only older than the rise of modern science; it is older than the rise of Christianity. Even before the coming of Christ people noticed profound regularity in the government of the world and wrestled with the meaning of this regularity. Both the Greeks (especially the Stoics) and the Jews (especially Philo) developed speculations about the *logos,* the divine "word" or "reason" behind what is observed.[16] In addition the Jews had the Old Testament, which reveals the role of the word of God in creation and providence. Against this background John 1:1 proclaims, "In the beginning was the Word, and the Word was with God, and the Word was God." John responds to the speculations of his time with a striking revela-

[15] In conformity with the Bible (especially Genesis 1), we maintain that God and the created world are distinct. God is not to be identified with the creation or any part of it, nor is the creation a "part" of God. The Bible repudiates all forms of pantheism and panentheism.

[16] See R. B. Edwards, "Word," in Geoffrey W. Bromiley et al., eds., *The International Standard Bible Encyclopedia,* 4 vols. (Grand Rapids, Mich.: Eerdmans, 1988), 4:1103-1107, and the associated literature.

tion: that the Word (*logos*) that created and sustains the universe is not only a divine person "with God," but the very One who became incarnate: "the Word became flesh" (1:14).

God said, "Let there be light" (Gen. 1:3). He referred to light as a part of the created world. But precisely in this reference, his word has divine power to bring creation into being. The effect in creation took place at a particular time. But the plan for creation, as exhibited in God's word, is eternal. Likewise, God's speech to us in the Bible refers to various parts of the created world, but the speech (in distinction to the things to which it refers) is divine in power, authority, majesty, righteousness, eternity, and truth.[17] The analogy with the incarnation should give us our clue. The second person of the Trinity, the eternal Word of God, became man in the incarnation, but did not therefore cease to be God. Likewise, when God speaks and says what is to be the case in this world, his words do not cease to have the divine power and unchangeability that belongs to him. Rather, they remain divine, and in addition have the power to specify the situation with respect to creaturely affairs. God's word remains divine when it becomes law, a specific directive with respect to this created world.

The Goodness of Law

Is the law good? Ah, here we run into struggles. Many people say that the evils in the world are the greatest obstacle to believing in God.[18] Larson and Witham's survey of scientists and religion quotes Albert Einstein as saying, "in their struggle for the ethical good, teachers of religion must have the stature to give up the doctrine of a personal God."[19]

But it is not quite so simple. We may appeal to a standard of good in order to judge that an existing situation is evil. In doing so, we appeal to a standard beyond the confines of the empirical world. We appeal to a standard, a law. To give up the idea of moral law is to give up the very basis on which criticism of evil depends. Moral law is thus indispensable to atheist argument, but at the same time it presupposes an absolute. This absolute, in order to obligate us and hold us accountable, must be personal. The Bible's answer alone gives clarity here. God's character is the ultimate source of moral law. Man made in the image of God is aware of this law but has

[17] On the divine character of God's word, see Vern S. Poythress, *God-Centered Biblical Interpretation* (Phillipsburg, N.J.: Presbyterian & Reformed, 1999), 32-36.
[18] Larson and Witham, "Scientists and Religion," 90-91.
[19] Ibid.

rebelled against it (Rom. 1:32). The existing evils are a consequence of that rebellion. Do not cast moral blame on God but on man.

The goodness of God is displayed most clearly in the *moral* law of God. But for many modern people, influenced by Kant and the subsequent history of ideas, moral law is radically subjectified, and radically separated from physical law or scientific law. In order to engage scientists most directly, we need to return to consider scientific law.

Subtle indications of the goodness of God can be seen in the concept of scientific law. One might put it this way: scientists expect "the laws of nature" to be sometimes subtle, but never perverse. Law does not play tricks, deliberately hiding itself and giving anomalous results simply to confound the researcher. "Nature" plays fair. Or, to put it more deeply, God "plays fair." All scientists, to continue with sanity in their research, must believe that the laws of the universe "play fair" with them. There is a fundamental goodness, as opposed to perversity, in the way in which results arise from scientific investigation.

The Beauty of Law

Scientific laws, especially "deep" laws, are beautiful. Scientists have long sifted through possible hypotheses and models partly on the basis of the criteria of beauty and simplicity. For example, Newton's law of gravitation and Maxwell's laws of electromagnetism are mathematically simple and beautiful. And scientists clearly *expect* new laws, as well as the old ones, to show beauty and simplicity. Why? The beauty of scientific laws shows the beauty of God himself. Though beauty has not been a favorite topic in classical expositions of the doctrine of God, the Bible shows us a God who is profoundly beautiful. He manifests himself in beauty in the design of the tabernacle, the poetry of the Psalms, and the elegance of Christ's parables, as well as the moral beauty of the life of Christ.

The beauty of God himself is reflected in what he has made. We are more accustomed to seeing beauty in particular objects within creation, such as a butterfly, or a lofty mountain, or a flower-covered meadow. But beauty is also displayed in the simple, elegant form of some of the most basic physical laws, like Newton's law for force, $F = ma$, or Einstein's formula relating mass and energy, $E = mc^2$. Why should such elegant laws even exist? Beauty is also displayed in the harmony among different areas of science, and the harmony between mathematics and science that scientists rely on whenever they use a mathematical formula to describe a physical process.

The Rectitude of Law

Another attribute of God is righteousness. God's righteousness is displayed preeminently in the moral law and in the moral rectitude of his judgments, that is, his rewards and punishments based on moral law. But moral law, as we have observed, lies outside the area of scientists' special focus. Does God's rectitude appear in physical law, in scientific law?

The traces are somewhat less obvious, but still present. People can try to disobey physical laws, and when they do they often suffer for it. If one attempts to defy the law of gravity by jumping off a tall building, he will suffer consequences. There is a kind of built-in righteousness in the way in which laws lead to consequences.

In addition, the rectitude of God is closely related to the fitness of his acts. It fits the character of who God is that we should worship him alone (Ex. 20:3). It fits the character of human beings made in the image of God that they should imitate God by keeping the Sabbath (Ex. 20:8-11). Human actions fitly correspond to the actions of God.

In addition, punishments must be fitting. Death is the fitting or matching penalty for murder (Gen. 9:6). "As you have done, it shall be done to you; your deeds shall return on your own head" (Obad. 15). The punishment fits the crime. There is a symmetrical match between the nature of the crime and the punishment that fits it.[20] In the arena of physical law we do not deal with crimes and punishments. But rectitude expresses itself in symmetries, in orderliness, in a "fittingness" to the character of law. Symmetries occur in fascinating ways throughout the natural world. Fundamental laws of physics have a deep connection with fundamental symmetries of space, time, charge, and parity. This "fitness" that scientists expect of law is perhaps closely related to beauty. God's attributes are involved in one another and imply one another, so beauty and righteousness are closely related. It is the same with the area of physical law. Laws are both beautiful and "fitting," demonstrating rectitude.

Law as Trinitarian

Does scientific law specifically reflect the *Trinitarian* character of God? Philosophers have sometimes maintained that one can infer the existence of God, but not the Trinitarian character of God, on the basis of the world around us. Romans 1:18-21 indicates that unbelievers know God, but how

[20] See the extended discussion of just punishment in Vern S. Poythress, *The Shadow of Christ in the Law of Moses* (Phillipsburg, N.J.: Presbyterian & Reformed, 1995), 119-249.

much do they know? I am not addressing this difficult question,[21] but rather reflecting on what we can discern about the world once we have absorbed biblical teaching about God.

Scientific law is a form of the word of God. So it reflects the Trinitarian statement in John 1:1, which identifies the second person of the Trinity as the eternal Word. In John, God the Father is the speaker of the Word, and God the Son is the Word who is spoken. John 1 does not explicitly mention the Holy Spirit. But earlier Scriptures associate the Spirit with the "breath" of God that carries the word out. "By the *word* of the LORD the heavens were made, and by the *breath* of his mouth all their host" (Ps. 33:6). The Hebrew word here for *breath* is *ruach,* the same word that is regularly used for the Holy Spirit. Indeed, the designation of the third person of the Trinity as "Spirit" (Hebrew *ruach*) already suggests the association that becomes more explicit in Psalm 33:6. Similarly, Ezekiel 37 plays with three different meanings of the Hebrew word *ruach,* namely "breath" (37:5, 10), "winds" (37:9), and "Spirit" (37:14). The vision in Ezekiel 37 clearly represents the Holy Spirit as like the breath of God coming into human beings to give them life. Thus all three persons of the Trinity are present in distinct ways when God speaks his Word. The three persons are therefore all present in scientific law, which is a form of the word of God.

We can come at the issue another way. Dorothy Sayers acutely observes that the experience of a human author writing a book contains profound analogies to the Trinitarian character of God.[22] An author's act of creation in writing imitates the action of God in creating the world. God creates according to his Trinitarian nature. A human author creates with an Idea, Energy, and Power, corresponding mysteriously to the involvement of the three persons in creation. Without tracing Sayers's reflections in detail, we may observe that the act of God in creation does involve all three persons. God the Father is the originator. God the Son, as the eternal Word (John 1:1-3), is involved in the words of command that issue from God ("Let there be light," Gen. 1:3). God the Spirit hovers over the waters (Gen. 1:2). Psalm 104:30 says that "when you send forth your Spirit, they [animals] are created." Moreover, the creation of Adam involves an inbreathing by God that alludes to the presence of the Spirit (Gen. 2:7). Though the relation among the persons of the Trinity is deeply mysterious, and though all persons are involved in all the actions of

[21] But see the following chapter, where we at least deal with some of the related issues on the relation of different sources for human knowledge.
[22] Dorothy Sayers, *The Mind of the Maker* (New York: Harcourt, Brace, 1941), especially 33-46.

God toward the world, one can distinguish different aspects of action belonging preeminently to the different persons.

Scientific law stems from the creative activity of God, the "Author" of creation. The activity of all three persons is therefore implicit in the very concept of scientific law. First, law involves a rationality that implies the coherence of a plan. This corresponds to Sayers's term "Idea," representing the plan of the Father. Second, law involves an articulation, a specification, an expression of the plan, with respect to all the particulars of a world. This corresponds to Sayers's term "Energy" or "Activity," representing the Word, who is the expression of the Father. Third, law involves holding things responsible to law, a concrete application to creatures, bringing them to respond to the law as willed. This corresponds to Sayers's term "Power," representing the Spirit.[23]

We may see a reflection of the Trinity in still another way by using the categories that have already been developed in Trinitarian theological meditations on the character of God and his word. According to Trinitarian thinking, the unity and diversity in the world reflect the original unity and diversity in God. First, God is one God. He has a unified plan for the world. The universality of scientific law reflects this unity. God is also three persons, the Father, the Son, and the Holy Spirit. This diversity in the being of God is then reflected in the diversity in the created world.[24] The many instances to which a law applies express this diversity. Moreover, unity and diversity are expressed in another way. The unity of God's plan has a close relation to the Father, the first person of the Trinity, who is the origin of this plan. The Son, in becoming incarnate, expresses the particularity of manifestation in time and space. He is, as it were, an instantiation of God. Thus he is analogous in his incarnation to the fact that the universal law expresses itself in particular instances.

GOD SHOWING HIMSELF

These relations are suggestive, but we need not develop the thinking further at this point. It suffices to observe that, in reality, what people call "scientific law" is divine. We are speaking of God himself and his revelation of himself through his governance of the world. Scientists must believe in scientific law in order to carry out their work. When we analyze what this scientific law

[23] See also John Milbank, *The Word Made Strange: Theology, Language, Culture* (Oxford: Blackwell, 1997), on the Trinitarian roots of communication.

[24] See Cornelius Van Til, *The Defense of the Faith*, 2nd ed., revised and abridged (Philadelphia: Presbyterian & Reformed, 1963), 25-26.

really is, we find that scientists are constantly confronted with God himself, the Trinitarian God, and are constantly depending on who he is and what he does in conformity with his divine nature. In thinking about law, scientists are thinking God's thoughts after him.[25]

But Do Scientists Believe?

But do scientists really believe all this? They do and they do not. The situation has already been described in the Bible:

> For what can be known about God is plain to them, because God has shown it to them. For his invisible attributes, namely, his eternal power and divine nature, have been clearly perceived, ever since the creation of the world, in the things that have been made. So they are without excuse (Rom. 1:19-20).

> The heavens declare the glory of God,
> and the sky above proclaims his handiwork.
> Day to day pours out speech,
> and night to night reveals knowledge (Ps. 19:1-2).

They know God. They rely on him. But because this knowledge is morally and spiritually painful, they also suppress and distort it:

> . . . for although they knew God, they did not honor him as God or give thanks to him, but they became futile in their thinking, and their foolish hearts were darkened. Claiming to be wise, they became fools, and exchanged the glory of the immortal God for images resembling mortal man and birds and animals and creeping things (Rom. 1:21-23).

Modern people may no longer make idols in the form of physical images, but their very idea of "scientific law" is an idolatrous twisting of their knowledge of God. They conceal from themselves the fact that this "law" is personal and that they are responsible to *him*. Or they substitute the word "Nature," personifying her as they talk glowingly of the works of "Mother Nature." But they evade what they know of the transcendence of God over nature.

Even in their rebellion, people continue to depend on God being there. They show *in action* that they continue to believe in God. Cornelius Van Til

[25] See ibid., 31-50.

compares it to an incident he saw on a train, where a small girl sitting on her grandfather's lap slapped him in the face.[26] The rebel must depend on God, and must be "sitting on his lap," even to be able to engage in rebellion.

DO WE CHRISTIANS BELIEVE?

The fault, I suspect, is not entirely on the side of unbelievers. The fault also occurs among Christians. Christians have sometimes adopted an unbiblical concept of God that moves him one step out of the way of our ordinary affairs. We ourselves may think of "scientific law" or "natural law" as a kind of cosmic mechanism or impersonal clockwork that runs the world most of the time, while God is on vacation. God comes and acts only rarely through miracle. But this is not biblical. "You cause the grass to grow for the livestock" (Ps. 104:14). "He gives snow like wool" (Ps. 147:16).[27] Let us not forget it. If we ourselves recovered a robust doctrine of God's involvement in daily caring for his world *in detail,* we would find ourselves in a much better position to dialogue with atheist scientists who rely on that same care.

PRINCIPLES FOR WITNESS

In order to use this situation as a starting point for witness, we need to bear in mind several principles.

First, the observation that God underlies the concept of scientific law does not have the same shape as the traditional theistic proofs—at least as they are often understood. We are not trying to lead people to come to know a God who is completely new to them. Rather, we show that scientists *already know* God as an aspect of their human experience in the scientific enterprise. This places the focus not on intellectual debate but on being a full human being within the context of scientific research.[28]

Second, scientists deny God within the very same context in which they depend on him. The denial of God springs ultimately not from intellectual flaws or from failure to see all the way to the conclusion of a chain of syllogistic reasoning, but from spiritual failure. We are rebels against God, and we will not serve him. Consequently, we suffer under his wrath (Rom. 1:18),

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[26] I do not know the location of this story in print. For rebels' dependence on God, see Cornelius Van Til, *The Defense of the Faith,* 2nd ed. (Philadelphia: Presbyterian & Reformed, 1963); and the exposition by John M. Frame, *Apologetics to the Glory of God: An Introduction* (Phillipsburg, N.J.: Presbyterian & Reformed, 1994).

[27] See also the discussion in Poythress, "Science as Allegory."

[28] Much valuable insight into the foundations of apologetics is to be found in the tradition of transcendental apologetics founded by Cornelius Van Til. See Van Til, *Defense of the Faith;* and Frame, *Apologetics to the Glory of God.*

which has intellectual as well as spiritual and moral effects. Those who rebel against God are "fools," according to Romans 1:22.

Third, it is humiliating to intellectuals to be exposed as fools, and it is further humiliating, even psychologically unbearable, to be exposed as guilty of rebellion against the goodness of God. We can expect our hearers to fight with a tremendous outpouring of intellectual and spiritual energy against so unbearable an outcome.

Fourth, the gospel itself, with its message of forgiveness and reconciliation through Christ, offers the only remedy that can truly end this fight against God. But it brings with it the ultimate humiliation: that my restoration comes entirely from God, from outside me—in spite of, rather than because of, my vaunted abilities. To climax it all, so wicked was I that it took the price of the death of the Son of God to accomplish my rescue.

Fifth, approaching scientists in this way constitutes spiritual warfare. Unbelievers and idolaters are captives to Satanic deceit (1 Cor. 10:20; 2 Thess. 2:9-12; 2 Tim. 2:25-26; Eph. 4:17-24; Rev. 12:9). They do not get free from Satan's captivity unless God gives them release (2 Tim. 2:25-26). We must pray to God and rely on God's power rather than the ingenuity of human argument and eloquence of persuasion (1 Cor. 2:1-5; 2 Cor. 10:3-5).

Sixth, we come into this encounter as fellow sinners. Christians too have become massively guilty by being captive to the idolatry in which scientific law is regarded as impersonal. Within this captivity we take for granted the benefits and beauties of science for which we should be filled with gratitude and praise to God.

Does an approach to witnessing based on these principles work itself out differently from many of the approaches that attempt to address intellectuals? To me it appears so.

Broadening Our Audience

So far we have focused on scientists as potential recipients of Christian witness. But what implications might we draw for dealing with the broader public?

In a technologized world, every inhabitant depends on the products of science and technology. And people trust some of the tools of technology enough to rely on them. They trust them not only for their information about the world at large but also for the very preservation of their lives. Not everyone travels on airplanes, but most people do travel from time to time in high-speed automobiles, and most buy food from supermarkets that rep-

resent the endpoint of a long chain of technological steps in food production and distribution.

What then protects us from disaster? The biblical witness is clear: it is God. We behold day by day God's providential rule. God does "good by giving you rains from heaven and fruitful seasons, satisfying your hearts with food and gladness" (Acts 14:17). The marvels of growing plants manifest the faithfulness of God as he speaks his word to plants. These long-standing marvels are now supplemented by the marvels of chemistry in making fertilizer and pesticides; the marvels of soil science informing and advising the farmers; the marvels of biology in breeding and genetically modifying plants; the marvels of technological complexity in harvesters, processing plants, shippers, and packagers.

Scientists necessarily work daily with the eternality and omnipotence of scientific law right before their eyes. But the rest of us see the faithfulness of God manifested more prosaically in the dependability of the technological apparatus that spins off from science. We assume the reliability of our food sources; we believe the food will grow every year; and we believe that our food will nourish rather than poison us.

Returning to the Attributes of God

To some extent, then, the attributes of scientific law are visible even to ordinary people who enjoy the benefits of technology. Ordinary people believe that technological products will work in the same way at any time and in any place. Thus, in principle they believe in the constancy of technology. And they believe by implication that the laws in back of technology are constant. Of course, an average person may or may not be informed about the details of the scientific laws in back of a particular technological product. But even if he does not know the laws in detail, he believes that even in detail they remain constant. This constancy guarantees the constancy of the functioning of the technological product governed by the laws. The toaster continues to toast bread because the electricity continues to produce heat according to constant laws. The constancy of law in both time and space points to the eternality and omnipresence of the laws.

Of course, the common person may be less aware of the implication of eternality and omnipresence. He is not a theoretician testing the outer limits, theorizing about gamma ray bursts in distant galaxies or about nuclear reactions in the sun. He is much more down to earth. He cares for and believes in the constancy of laws within the practical scope of his personal world.

But in fact a similar observation can be made about the traditional idea of the eternality and omnipresence of God. The teachings of the Bible focus primarily on the common person's world within his limited vision of time and space. The Bible asks people not primarily to believe in eternality and omnipresence as theoretical abstractions, but to trust God in practice in the conduct of their daily lives. The attributes of eternality and omnipresence are theoretical generalizations from this practical experience. Hence, the common person in the biblical world corresponds to the common person today who believes that his toaster will toast bread; the theoretical theologian who speaks of eternality and omnipresence corresponds to the theoretical scientist who speaks of laws in their perfect generality.

God's providence affects us in both spheres. Thus the divine attributes of scientific law offer a platform for witness to both ordinary people and scientists.