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# POPULAR PORTRAITS OF SCIENCE: FOCUSED OR FUZZY?

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**I**N CHAPTER ONE WE POINTED OUT THAT THE domain of the natural sciences is restricted to questions regarding the physical properties, patterns of behavior and formative history of the physical universe. We argued that questions concerning the governance of the physical behavior or formative history of the universe, or questions about the relationship of the physical universe to transcendent or nonmaterial beings, such as God or angels, lie outside of the scientific domain. Such questions must be answered, not on scientific, but on religious or philosophical grounds. Because of such considerations, we would maintain that the domain of natural science is not being respected by those Christians, however well-meaning, who assert that the concepts of divine creation and providence are derivable from the discoveries

of science. On the other hand, and with equal insistence, we maintain that the proponents of philosophical naturalism also fail to respect the domain of natural science when they assert that it is from the results of natural science that they reach their conclusions that there is no God, or that the universe is self-existent, self-contained and self-governing.

In reality, much of today's popular scientific writing adopts neither an explicitly Christian nor an explicitly naturalistic stance. A Christian position is not commonly expressed in the popular scientific writings of professional, practicing scientists.<sup>1</sup> But neither is the blatant philosophical naturalism of such writers as Carl Sagan or P. W. Atkins commonplace in popular scientific writing.<sup>2</sup> Much of the scientific writing for the general public today is done in such a manner that the domain and limitations of natural science are reasonably well recognized. As a result, the writers do not appear to be trying to sharpen any religious or philosophical ax on a scientific grindstone, and the reader may often be hard-pressed to discover very much about the religious or philosophical leanings of the authors.

Contrary to a common impression among evangelical Christians that scientists are hostile to religious belief, we discover that much current writing does not attempt to make religious claims on scientific grounds. For example, many recent books written in defense of organic evolution and in opposition to scientific creationism are commendable for their careful avoidance of using natural science as a tool to attack religious belief.<sup>3</sup> The domain of science is generally understood and respected. Among the better books to appear are Norman D. Newell's *Creation and Evolution*, Niles Eldredge's *The Monkey Business*, Michael Ruse's *Darwinism Defended* and Philip Kitcher's *Abusing Science*.<sup>4</sup>

All of these works explicitly discuss, or incidentally touch on, the proper domain of science. They recognize that discussions about God, providence or ethics are, by their very nature, not scientific discussions, because their subject matter lies outside the province of natural

science. None of these writers makes any explicit claim to belief in God. Nor do they openly commit themselves to any religious position. But neither do any of them reject the legitimacy of belief in God or the compatibility of such belief with a scientific investigation of the universe. Even while vigorously defending biological evolution, these authors stress that biological evolution is not antithetical to the idea of God. And while not necessarily committed to it themselves, they all recognize the legitimacy of some form of theistic perspective on evolution.

These four writers seem to be open to the compatibility of science and religion. If there is fault to be found, it is perhaps that they appear to consider science and religion as so remotely different from one another that conflict would necessarily be out of the question because the fundamental concerns of religion and science are unrelated. They are often considered virtually separate compartments of life. Eldredge, for example, is critical of the fundamentalist perception that science and religion are in conflict. But this need not be, says Eldredge, for "science seeks to understand the universe in naturalistic terms. It depends upon observation, accepts nothing on faith and acknowledges that it can never claim to know the ultimate truth,"<sup>5</sup> and between religion and science, "most scientists and members of religious communities see no conflict, as the two systems are completely different, are pursued for different reasons and serve different functions."<sup>6</sup>

Seeing basic distinctions, many recent defenders of biological evolution also understand the limits of natural science well enough to recognize that standards of right and wrong are not to be derived from scientific theory. None of the four writers noted is guilty of adopting evolutionary ethics. They are as critical of social Darwinism as any scientific creationist.<sup>7</sup> These authors do not fall into the trap of attempting to derive ethical principles from scientific theories. Philip Kitcher, for example, claims that "what is evolutionarily useful, or even necessary, may not be morally correct."<sup>8</sup>

While recognizing that much popular scientific literature does an acceptable job of respecting the limits of science by not making unwarranted assertions about religion or ethics in the name of science, two books will now be considered briefly that *do* overstep the proper bounds of science. On the one hand is Isaac Asimov's book *In the Beginning*;<sup>9</sup> on the other is Douglas Futuyma's *Science on Trial*.<sup>10</sup>

Asimov's book is an example of naive scientism at its worst.<sup>11</sup> Although not obviously operating from a position of overt philosophical naturalism, Asimov does try to draw deistic or agnostic religious conclusions from scientific discovery. Futuyma's book, in many respects an excellent work and far more worthwhile than Asimov's, contains much more subtle examples of the failure to respect the boundary of the proper domain of natural science.

Asimov's *In the Beginning* is a verse-by-verse scientific and religious commentary on the first eleven chapters of Genesis.<sup>12</sup> In some ways this book is a counterpart of Henry Morris's *The Genesis Record*,<sup>13</sup> although Morris's commentary deals with the entire book of Genesis. While Morris writes as one unashamedly devoted to Scripture as the Word of God, Asimov nowhere makes any commitment to Scripture as being anything more than a fascinating religious book.<sup>14</sup> And while Morris takes pains to show how Scripture, interpreted in his literalistic manner, completely agrees with the "true facts of science" as understood by scientific creationism, Asimov constantly seeks to show that Scripture, as interpreted according to the documentary hypothesis, presents points of view that are radically different from those that he considers to be deducible from the scientific world-picture.

In this book, Asimov does not explicitly discuss the domain and limitations of science. His comments, however, do strongly suggest that he believes that science is able to establish certain metaphysical parameters about the ultimate character of reality. For example, he notes that the Bible presents a sophisticated picture of a monotheistic god who "constantly engages himself in the minutiae of his creation."<sup>15</sup> But in contrast to the biblical view, Asimov believes that over

the past four centuries,

scientists have built up an alternate picture of the Universe. . . . The natural phenomena of Earth and of the Universe have seemed to fall into place bit by bit as behavior that is random, spontaneous, unwilled, and that takes place within the constraints of the "laws of nature." Scientists grew increasingly reluctant to suppose that the workings of the laws of nature were ever interfered with. . . . Certainly, no such interference was ever observed, and the tales of such interferences in the past came to seem increasingly dubious.

In short, the scientific view sees the Universe as following its own rules blindly, without either interference or direction.<sup>16</sup>

Here Asimov has given a misleading impression of the scientific approach to the study of the world. Some individual scientists may have reached the conclusion that natural behavior is blind and unwilled by anything outside nature. However, science as a professional, communal enterprise has never made any judgment that natural behavior is either blind and unwilled or directed and willed by something outside of nature. Furthermore, science has made no judgment as to whether or not "interferences" with the supposed "laws of nature" are possible or have happened.<sup>17</sup> Because science functions without making judgments about such matters as external direction, interference or will, it may appear to the casual observer that science describes the universe *as if* the forces of the universe and the "laws of nature" were unwilled, blind and undirected. Such an observation, however, is very different from the claim that science has made the judgment that the behavior of the universe *is* in actuality unwilled, undirected and blind.

Furthermore, Asimov steps completely beyond the bounds of science without being candid about what he is doing. On the basis of scientific method he claims to draw a variety of metaphysical conclusions. He continues,

That still leaves it possible that God created the Universe to begin with and designed the laws of nature that govern its behavior. From this standpoint, the Universe might be viewed as a wind-up toy,

which God has wound up once and for all and which is now winding down and working itself out in all its intricacy without having to be touched at all.

If so, that reduces God's involvement to a minimum and makes one wonder if he is needed at all. . . .

So far, scientists have not uncovered any evidence that would hint that the workings of the Universe require the action of a divine being. On the other hand, scientists have uncovered no evidence that indicates that a divine being does *not* exist.<sup>18</sup>

This quotation is replete with what we consider to be intolerable assertions. In the first place Asimov is guilty of the common error of thinking that the "laws of nature" govern the behavior of the universe. They do no such thing. As pointed out in chapter one, the "laws of nature" are only our finite and fallible attempts at describing the regular patterns of behavior that we observe in the world around us. The identity of the ultimate power that governs those patterns must be determined on extra-scientific grounds.

Additionally, it appears that Asimov thinks of natural science as such a comprehensive method of discovering knowledge that it is within the capability of science to uncover, recognize, evaluate and interpret evidence for or against the existence of God. Not only so, but Asimov speaks as if science can potentially decide the relationship of whatever god there may be to the universe. Science, in his view, ultimately has the power to determine whether or not a theistic, deistic or atheistic world view is legitimate. He continues to make the totally unwarranted assumption that, since science is able to describe the intrinsic intelligibility of the universe without reference to the agency of external spiritual beings, therefore the universe in fact operates solely in terms of purely blind, impersonal law. It seems not to have occurred to Asimov that God may act immanently within the universe in such a manner that we perceive that matter and energy behave in regular and usefully predictable patterns.

Contrary to Asimov's assertions, however, professional natural

science can make no judgments as to whether or not we live in a theistic, deistic or atheistic universe. Such conclusions are entirely beyond the capabilities of science with its methods of empirical observation and testing. We regret that such a widely read popularizer as Asimov has not been more careful in giving proper guidance to the general public on such an important matter as the limitations of natural science with respect to religion and philosophy. Sadly he has not honored the proper domain and boundaries of science. He has incorrectly transposed the *methodological* naturalism of professional natural science into a universal *ontological* or *metaphysical* naturalism. By his failure to honor the boundaries of the scientific domain, Asimov gives religiously sensitive persons a bad impression of natural science, making it appear as the opponent of any theistic perspective. Irresponsible rhetoric of this sort provides much of the fuel for the creation-evolution debate.

Next we consider Douglas Futuyma's book *Science on Trial*. The general reader would do far better to read Futuyma than Asimov. Futuyma is a totally convinced evolutionist, and he defends the neo-Darwinian theory of evolution with enthusiasm and ability.<sup>19</sup> Contrary to what many Christians might expect about those who accept evolution, Futuyma, although certainly not claiming to be a theistic evolutionist, does not promote naturalistic evolutionism.

To Futuyma, biological evolution is a scientific theory only and is not a comprehensive explanation for the totality of existence. As a careful scholar who respects the boundaries of science, he further recognizes, unlike Asimov, that many questions that people ask are of a philosophical, religious, ethical or aesthetic nature and cannot fruitfully be addressed or answered by natural science. Thus, for example, Futuyma, like Ruse, does not draw his ethics from the biological theory of natural selection. He takes great pains to reject social Darwinism and so-called evolutionary ethics. Indeed, he speaks of social Darwinism as a "perversion of biology"<sup>20</sup> and also states "Nor is there any moral imperative in evolution telling us that we ought to progress,

nor any deity called Natural Selection telling us that we ought to compete. Natural selection may be a 'law of nature;' but a scientific law, like the 'law of gravity,' is merely a description of a regularity in natural processes, not a rule of conduct."<sup>21</sup>

The following extended selections from Futuyma's work contrast very favorably with the quotation from Asimov and show that Futuyma understands what science can and cannot do. For example,

it is important to recognize that not all "facts" are susceptible to scientific investigation, simply because some observations and experiences are entirely personal. I cannot prove that someone loves his or her child. The emotions that any individual claims to have are not susceptible to scientific documentation, because they cannot be independently verified by other observers. In other words, science seeks to explain only objective knowledge, knowledge that can be acquired independently by different investigators if they follow a prescribed course of observation or experiment.

Many human experiences and concerns are not objective, and so do not fall within the realm of science. As a result, science has nothing to say about aesthetics or morality. It cannot provide an objective basis on which to judge whether or not Beethoven wrote great music, or whether or not an act is ethical. The functioning of human society, then, clearly requires principles that stem from some source other than science. While science can provide objective knowledge, we must look elsewhere for guidance on how to use that knowledge.<sup>22</sup>

Futuyma also recognizes that science as such cannot develop explanations about God and his relationship to the world:

Any "theory" that explains phenomena by recourse to the actions of an omnipotent, omniscient supreme being, or any other supernatural omnipotent entity, is a nonscientific theory. I could postulate that all human actions are slavish responses to the suggestions of guardian angels and diabolical incubi, and no one could possibly prove me wrong; for whether a person's actions look rational

or irrational, good or evil, I can involve the power of supernatural suggestion. I could similarly postulate that God personally has governed the development and life of every creature that has ever been born, and if you protest that the laws of physics, chemistry, and biology explain biological phenomena, I could answer that God in his wisdom sees fit to act in an orderly way that gives the appearance of material laws of causation.

Because such a theory cannot be challenged by any observation, it is not scientific. It isn't necessarily wrong. It is just not amenable to scientific investigation. Science cannot deny the existence of supernatural beings. It cannot prove that God didn't create the universe. . . . Science can neither affirm nor deny supernatural powers. Science is the exercise of reason, and so is limited to questions that can be approached by the use of reason, questions that can be answered by the discovery of objective knowledge and the elucidation of natural laws of causation. In dealing with questions about the natural world, scientists must act as if they can be answered without recourse to supernatural powers. There can be no scientific study of God.<sup>23</sup>

So far, so good. Futuyma has done a commendable job in paying careful attention to the bounds of scientific investigation and in recognizing that science cannot be used to draw conclusions about the relationship of God to the world. Futuyma is not guilty of espousing naturalism or materialism in the name of science. But now we issue a caution. Despite Futuyma's recognition of and respect for the limits of science, he does make a number of assertions that are phrased in such a way that an undiscerning reader may be strongly inclined to draw metaphysical conclusions from science. Below we discuss four examples of such unfortunate language.

1. The mind that cannot abide uncertainty is troubled by the idea that the human species developed by "chance." But whether we evolved by chance or not depends on what the word means. We did not arise by a fortuitous aggregation of molecules, but rather

by a nonrandom process—natural selection favoring some genes over others. But we are indeed a product of chance in that we were not predestined, from the beginning of the world, to come into existence. Like the extinction of the dodo, the death of Rosenzweig and Gouldenstern, or the outbreak of World War I, we are a product of a history that might have been different.<sup>24</sup>

It is not clear whether or not Futuyma is making a metaphysical assertion here. He might simply be claiming that, just as humans cannot predict the outcome of history, so, too, we could not have predicted the certain appearance of the human race. In other words, *from a purely biological perspective*, human beings were not predestined to appear. If that is all that Futuyma means, then there is little cause for disagreement. On the other hand, if Futuyma is making a metaphysical assertion, then he ought to have identified it as such and also indicated that such an assertion could not be made on the basis of science.

Christians, of course, confess that God is sovereign over history from beginning to end, and that the human race is not just an afterthought in the mind of God but was specifically brought into the world as the crown of creation. In the Christian world view, human beings most certainly were predestined, *from a theological perspective*, from the beginning of the world, to come into existence. Futuyma's claims are sufficiently unguarded that the unwary reader might be led to make a theological inference from what may simply be a biological statement.

2. Perhaps most importantly, if the world and its creatures developed purely by material, physical forces, it could not have been designed and has no purpose or goal. The fundamentalist, in contrast, believes that everything in the world, every species and every characteristic of every species, was designed by an intelligent, purposeful artificer, and that it was made for a purpose. Nowhere does this contrast apply with more force than to the human species. Some shrink from the conclusion that the human species was not

designed, has no purpose, and is the product of mere material mechanisms—but this seems to be the message of evolution.<sup>25</sup>

Here it is not clear whether Futuyma is simply alluding to incorrect inferences that might be drawn from evolution or if he in fact makes these incorrect inferences himself. Christians agree that in some meaningful sense God did design and make human beings for a purpose. Even though we may readily grant that material mechanisms may have been involved in forming the human species, human beings, on the Christian view, are not *solely* the product of these mechanisms. If Futuyma is claiming that human beings are not on earth for a purpose and were not designed by God but came into being *only* through physical-biological mechanisms, then he has drawn improper conclusions from a scientific theory. If Futuyma does not mean that, then he has once more expressed himself in such a way that the unwary reader could get the impression that biological evolution does, after all, imply that human beings are without purpose. This erroneous conclusion is one that Christians vigorously opposed to evolution have long been making. Futuyma does nothing at this point to correct that error or to reassure the reader otherwise.

3. Evolution wouldn't be such a controversial subject if it didn't touch on our perceptions of ourselves. In the Western tradition, humans are set apart from the natural world. The gap in mental and emotional powers between humans and animals is thought to be a profound, unbridgeable difference in kind. According to this anthropocentric, even egocentric tradition, the earth and its inhabitants were created to serve us. We are the special object of God's creative beneficence, so much so that he will even bend the natural world to our desires, and alter natural laws in response to our special pleading. Nothing could be more antithetical to such a world view than a science that tells us the earth is not the center of the universe; that life came and went for billions of years before man appeared on the scene; that living things and the human species itself originated by natural, impersonal causes rather than

the direct intervention of a Creator; that we are as much a part of nature as each of the millions of other species with which we share a common bond of inheritance.<sup>26</sup>

In this passage Futuyma pits scientific methodology and theory against a religious world view. Christians confess that humanity is the special object of God's creative beneficence. We do claim that God has given the created world to us for our good. We confess that God has given the heavenly bodies to us for signs and seasons and that he has given us other life forms for food. Such a confession in no way implies that the heavenly bodies and other life forms exist *only* for us.<sup>27</sup> We are puzzled as to how the scientific perspective can be antithetical to a world view in which human beings are the special objects of God's creative beneficence and the other organisms exist, at least in part, to serve us, if, as Futuyma has explained so well elsewhere, the scientific perspective is limited to addressing questions about the physical mechanisms of material patterns of behavior. Science, operating within its appropriately restricted domain, cannot decide whether or not human beings are special to God.

4. In the world of nature, there is neither good nor evil. The extinction of a comet astronomers recently sighted plunging into the sun is not a cosmic tragedy, it is just an event produced by mindless physical forces. Neither is the extinction of the pterodactyl tragic, nor is the struggle for existence that causes evolution either good or bad. It just is. Species arise throughout the ages, "but time and chance happeneth to them all."<sup>28</sup>

Perhaps Futuyma merely means here that from the scientific perspective, which by its very nature cannot make ethical judgments but only describes the world, natural events are neither good nor evil but just are. If that is all he intends to say, then we agree. But he appears to be saying more. To say that in the world of nature there is neither good nor evil is to make a metaphysical assertion. Such a claim should certainly not be made as a conclusion based on the findings of natural science. Moreover, there is a vast difference between the distinctly

metaphysical statement that forces are "mindless" and a scientific statement which makes no claims about the mindless or personal nature of forces.

Many individual scientists are convinced that the "forces of nature" are personal in the sense that they are governed by a divine mind. Other scientists believe that there is nothing but matter and energy. For them forces are mindless and impersonal. But these philosophical biases of individual scientists are not the product of communal science. How could natural science ever test the notion of the mindlessness of force? How could science ever test the notion that a divine mind is directing the action of forces over a long term?

Thus even as careful a writer as Futuyma occasionally lapses into the error of transferring the methodological naturalism of natural science into an ontological naturalism which makes unwarranted metaphysical assertions about the ultimate character of reality.

In spite of the best intentions of writers to recognize the limits of natural science, the temptation to make metaphysical assertions as if they were the logical deductions from scientific discoveries is a strong temptation that is not easily avoided. Because they are not always aware that they are doing so, such writers rarely identify these metaphysical assertions as philosophical rather than scientific in nature. Rarely do they indicate, when they yield to temptation, that they are now about to express a personal religious conviction or conclusion that cannot be demonstrated on the basis of any scientific reasoning. Consequently, the reader of popular scientific writing must always be on guard whenever a writer begins to discuss the ultimate nature of reality, the nature of God, God's relationship to the world and man, or ethical standards. One can be sure that as soon as such happens we have left the realm of scientific theorizing and have entered the domain of philosophy or religion.

feet of predominantly limestone in the Virgin Mountains of easternmost Nevada and tentatively assigned the rocks to the Pogonip Limestone of probably Ordovician age. McNair also measured in the Virgin Mountains 651 feet of Cambrian Limestone that overlies the Peasley Limestone, the western lateral equivalent of the Muav. As indicated from sections measured east of the Virgin Mountains, these post-Muav Cambrian Limestones thinned eastward.

<sup>33</sup>Burdick, *Canyon of Canyons*, p. 77.

<sup>34</sup>Charles B. Hunt, "Geologic History of the Colorado River," U.S. Geological Survey Professional Paper 669-C, 1969, p. 65.

<sup>35</sup>"Grand Canyon Presents Problems for Long Ages," p. 4.

<sup>36</sup>Edwin D. McKee, "The Supai Group of Grand Canyon," U.S. Geological Survey Professional Paper 1173, 1982, p. 4.

<sup>37</sup>McKee and Gutschick, *History of the Redwall Limestone*, p. 74. Talus refers to the pile of rocks at the base of a cliff. The rocks were dislodged from the cliff and fell to the base.

<sup>38</sup>See G. H. Billingsley and E. D. McKee, "Pre-Supai Buried Valleys" in McKee, "Supai Group," pp. 137-47.

<sup>39</sup>*Ibid.*, p. 139.

<sup>40</sup>*Ibid.*

<sup>41</sup>*Ibid.*, p. 190.

<sup>42</sup>*Ibid.*, pp. 155-76.

<sup>43</sup>"Grand Canyon 'Creation' Story," *Bible-Science Newsletter*, v. 14, 1976, p. 1.

<sup>44</sup>*Ibid.*

<sup>45</sup>The principle of uniformity is one of the most widely discussed and misunderstood principles in geology. Those who wish to understand the term would do well to read Martin J. S. Rudwick, "Uniformity and Progression: Reflections on the Structure of Geological Theory in the Age of Lyell," in D. H. D. Roller, *Perspectives in the History of Science and Technology* (Norman, Okla.: University of Oklahoma, 1971), and also Stephen Jay Gould, "Toward the Vindication of Punctuational Change," in *Catastrophes and Earth History* (Princeton: Princeton University Press, 1984).

<sup>46</sup>The principle of superposition is a fundamental principle of geology in which it is stated simply that in any succession of layered rocks that has not been overturned or injected by parallel sheets of igneous rock, the layer at the bottom of the succession was deposited first and succeeding layers were deposited sequentially.

<sup>47</sup>For example, radiometric dating of a variety of rocks and minerals using several well-established techniques repeatedly discloses that earth materials typically have ages measurable in terms of a few million to a few billion years in age. Indeed, one lava flow in the western end of the Grand Canyon that clearly erupted after all the layered sedimentary rocks were deposited has been dated by Potassium-argon dating as about 1.2 million years old. Clearly the theory of a global flood that occurred only a few thousand years ago is incompatible with such an age for the lava flow. Moreover, all the layered rocks, since they underlie the lava flow, must be older than 1.2 million years.

Biogeography concerns the distribution of plants and animals over the face of the earth. That distribution is totally at odds with the theory of a global flood and the preservation of animals on Noah's ark. As one example, consider the fact that all

fossil sloths occur in the rocks of the Americas. During a global flood all sloths would inevitably be drowned and therefore would become extinct. Sloths are extremely slow movers and could never be expected to flee to high ground during a flood. If they were to be preserved by having them board Noah's ark, then several sloths would have to migrate to the Middle East.

That, of course, is rather unlikely since sloths, as arboreal animals, don't like to move more than a few feet to find water or get from one tree to another. Also, three-toed sloths eat nothing but Cecropia tree leaves, a treat they would be unlikely to find all the way to Noah's ark. Then the problem is compounded by the need to have the sloths migrate all the way back to South America at the conclusion of the flood since that is the only place they live today. The problem could be multiplied a thousandfold by considering the improbabilities of the migration of Australian marsupials to the ark, or the difficulties of preserving river dolphins, freshwater fish, snakes and turtles and so on.

#### Chapter 7: Popular Portraits of Science: Focused or Fuzzy?

<sup>1</sup>In spite of the fact that many within the scientific-creationist movement who are actively involved in writing in defense of scientific creationism have Ph.D. degrees in science, it is very difficult to regard these people as professional, practicing scientists. They do not demonstrate the marks of integrity that are so important in professional science (see, for example, the case studies of part two), and most of them are not actively practicing in a field of science by conducting legitimate research following the accepted canons of scientific practice.

<sup>2</sup>For P. W. Atkins, see our chapter eight. Carl Sagan's *Cosmos* begins with the overtly naturalistic statement, "The cosmos is all that is or ever was or ever will be." One wonders how Sagan can know that.

<sup>3</sup>These works do, however, criticize specific religious tenets when they masquerade as science. For example, the scientific-creationist claim that scientific evidence supports the notion of special creation of organisms is attacked by these evolutionists because it is a scientific claim as well as a religious one.

<sup>4</sup>Niles Eldredge, *The Monkey Business* (New York: Washington Square, 1982); Norman D. Newell, *Creation and Evolution* (New York: Columbia University Press, 1982); Philip Kitcher, *Abusing Science* (Cambridge, Mass.: MIT Press, 1982); and Michael Ruse, *Darwinism Defended* (Reading, Mass.: Addison-Wesley, 1982).

<sup>5</sup>Eldredge, *The Monkey Business*, p. 18.

<sup>6</sup>*Ibid.*

<sup>7</sup>Michael Ruse, for example, has an entire chapter devoted to evolution and ethics in his *Darwinism Defended*. In that chapter he takes great pains to dismiss evolutionary ethics and social Darwinism.

<sup>8</sup>Kitcher, *Abusing Science*, p. 200.

<sup>9</sup>Isaac Asimov, *In the Beginning* (New York: Crown, 1981).

<sup>10</sup>Douglas J. Futuyma, *Science on Trial* (New York: Pantheon, 1983).

<sup>11</sup>See our chapter one for a brief discussion of the term *scientism*.

<sup>12</sup>According to Asimov, his book "merely considers the verse of the Bible, line by line and, indeed, word by word, discusses the content and meaning and compares them with the scientific view that pertains to the passage" (p. 2).

- <sup>13</sup>Henry M. Morris, *The Genesis Record* (San Diego: Creation-Life, 1976).
- <sup>14</sup>Asimov's view of the Bible falls far short of an adequate view of Scripture as the Word of God. "The Biblical writers and editors were thoughtful men who borrowed selectively, choosing what they considered good and rejecting what seemed nonsensical or unedifying. They labored to produce something that was as reasonable and as useful as possible" (p. 3).
- <sup>15</sup>Asimov, *In the Beginning*, p. 11.
- <sup>16</sup>*Ibid.*
- <sup>17</sup>For a satisfying, readable overview of the genuine reactions of scientists in response to the developments of science see, for example, C. A. Russell, *Cross-Currents* (Grand Rapids: Eerdmans, 1985). Many other excellent works on the history of science also make it plain that many outstanding scientists, such as Faraday, Newton, Maxwell, Kelvin and others did not draw the conclusions that Asimov thinks were drawn. Consult, for example, the work of Hooymaas, Klaaren, Raven, Dillenberger and Peacocke. A very readable new work is that of C. E. Hummel, *The Galileo Connection* (Downers Grove, Ill.: InterVarsity Press, 1986).
- <sup>18</sup>Asimov, *In the Beginning*, pp. 11-12.
- <sup>19</sup>We are not here making any judgment about the validity of Futuyma's case for evolution. Futuyma presents the case for evolution cogently and eloquently, but whether or not evolution is "true" is beside the point of the argument that is being made in this case study.
- <sup>20</sup>Futuyma, *Science on Trial*, p. 209.
- <sup>21</sup>*Ibid.*, p. 213.
- <sup>22</sup>*Ibid.*, p. 167.
- <sup>23</sup>*Ibid.*, pp. 169-70.
- <sup>24</sup>*Ibid.*, p. 147.
- <sup>25</sup>*Ibid.*, pp. 12-13.
- <sup>26</sup>*Ibid.*, pp. 98-99.
- <sup>27</sup>Christians, of course, also confess that God placed us on earth to be conscientious stewards of his good creation. Though we may use the earth, we must use it responsibly as those who are image-bearers of the living God and as those who have been entrusted with something that ultimately belongs to the Creator.
- <sup>28</sup>Futuyma, *Science on Trial*, p. 131.

#### Chapter 8: A Masquerade of Science

- <sup>1</sup>P. W. Atkins, *The Creation* (San Francisco: W. H. Freeman & Company, 1981), p. vii.
- <sup>2</sup>*Ibid.*
- <sup>3</sup>*Ibid.*
- <sup>4</sup>Edward R. Harrison, *Cosmology: The Science of the Universe* (Cambridge: Cambridge University Press, 1981), pp. 10-11.
- <sup>5</sup>*Ibid.*, p. 100.
- <sup>6</sup>*Ibid.*
- <sup>7</sup>Atkins, *Creation*, p. vii.
- <sup>8</sup>*Ibid.*, p. 6, emphasis added.
- <sup>9</sup>Harrison, *Cosmology*, pp. 107-11.
- <sup>10</sup>*Ibid.*, p. viii, emphasis added.

- <sup>11</sup>*Ibid.*, p. 127.
- <sup>12</sup>Carl Sagan, *Cosmos* (New York: Random House, 1980), p. 4.
- <sup>13</sup>Atkins, *Creation*, p. 17.
- <sup>14</sup>*Ibid.*, p. 17.
- <sup>15</sup>*Ibid.*, p. 115.
- <sup>16</sup>*Ibid.*, p. 17.
- <sup>17</sup>*Ibid.*, p. 107.
- <sup>18</sup>*Ibid.*, p. 111.
- <sup>19</sup>*Ibid.*, p. 45.
- <sup>20</sup>*Ibid.*, p. 21.
- <sup>21</sup>*Ibid.*, p. 23.
- <sup>22</sup>*Ibid.*, p. 37.

#### Chapter 9: Sagan's Cosmos

- <sup>1</sup>Carl Sagan, *Cosmos* (New York: Random House, 1980), p. 39; though I refer to the television series, quotations will normally be cited from the published version.
- <sup>2</sup>*Ibid.*, p. 131.
- <sup>3</sup>*Ibid.*, p. 4.
- <sup>4</sup>*Ibid.*
- <sup>5</sup>*Ibid.*, p. 180.
- <sup>6</sup>*Ibid.*, p. 127.
- <sup>7</sup>*Ibid.*, p. 258.
- <sup>8</sup>*Ibid.*, p. 242.
- <sup>9</sup>Sagan, "Cosmos," Episode 12, emphasis added.
- <sup>10</sup>Sagan, "Cosmos," Episode 10, closing lines.
- <sup>11</sup>Sagan, *Cosmos*, p. 176.
- <sup>12</sup>*Ibid.*, p. 173-74.
- <sup>13</sup>*Ibid.*, p. 174.
- <sup>14</sup>*Ibid.*, p. 177.
- <sup>15</sup>*Ibid.*, p. 258.
- <sup>16</sup>*Ibid.*, p. 257.
- <sup>17</sup>Sagan, "Cosmos," Episode 4.
- <sup>18</sup>Sagan, *Cosmos*, p. 333.
- <sup>19</sup>*Ibid.*, p. 345.
- <sup>20</sup>*Ibid.*, p. 250, emphasis added.
- <sup>21</sup>*Ibid.*, p. 4.