

Evolution, Neutrality, and Antecedent Probability: a Reply to Van Till and McMullen

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First, I'd like to thank Professors Van Till, Pun, and McMullen for their careful and thoughtful replies. There is a deep level of agreement among all four of us; as is customary with replies and replies to replies, however, I shall concentrate on our areas of disagreement. In the cases of Van Till and McMullen, this may give an impression of deeper disagreement than actually exists. In the case of Pun it leaves me with little to say except Yea and Amen; I find no serious disagreement between us.¹

I Ad Van Till

When my friend Howard Van Till first heard this lecture, he said he found himself in 98% agreement with it. Sadly enough, additional disagreement seems to have reared its ugly head.

A. Misunderstandings

First, some cases of "failure of communication,- as they say, due no doubt as much to expository inadequacy on my part as to hermeneutical inadequacy on his. Van Till thinks "it was most inappropriate for Plantinga to employ the conflict metaphor as frequently as he did in his paper." But here there is in part a

misunderstanding. I did speak of faith and reason as sometimes apparently conflicting, in the sense that what seems initially to be among the deliverances of the faith sometimes appears to conflict with what seems initially to be among the deliverances of reason; and of course this certainly happens. I employed the battle or conflict metaphor much more frequently, however, in connection with something quite different: the conflict between competing and fundamentally religious ways of thinking about ourselves, the world, and God. Here I was following Kuyper and Augustine (and many others) and here the conflict metaphor is perfectly appropriate. Indeed, as I see it, here it isn't really a metaphor at all; there really is a conflict between these competing world views, and it is of the first importance to be aware of it.

Second, Van Till seems puzzled by my use of the terms "faith" and "deliverances of the faith":

Perhaps my complaint is primarily with Plantinga's use of the term *faith*. In most instances in this paper the term does not refer to one's personal commitment to act in the warranted confidence that the object of one's faith is trustworthy... rather, Plantinga employs the term principally as an abbreviated version of "a deliverance of the faith". . . . I take this to be a reference to some specific belief concerning what the Scriptures require a Christian to affirm, a belief held mostly for the reason that it constitutes an element in the received Christian tradition (e.g., that the Bible teaches the concept of special creation).

But I wasn't using the term "faith" in *that way*; I meant to use it to denote or refer to the essential elements of Christian belief. I believe that this is perfectly standard use of the term. (Perhaps its origin is to be found in *Jude* v. 3 [King James translation]: "Beloved, when I gave all diligence to write unto you of the common salvation, it was needful for me to write unto you, and exhort you that ye should earnestly contend for the faith which was once delivered to the saints.") So taken, the deliverances of the faith would *of course* be beliefs or propositions (not personal commitments): such propositions, for example, as that God has created the heavens and the earth, that Jesus was in fact the divine son of God,

and that God was in Christ reconciling the world to himself. The deliverances of the faith would be what the Bible teaches; they would not be mere "received traditions about what the Bible teaches"; nor would an element of the deliverances of the faith be held "mostly for the reason that it constitutes an element in the received Christian tradition," It would be accepted, instead, because it is taken to be what the Lord teaches. There is misunderstanding when Van Till says, "In places where we might have expected Plantinga to pose penetrating questions that would challenge (in the constructive sense) the accuracy of the relevant 'deliverances of the faith'. . . ." But *you wouldn't* expect a Christian to challenge the deliverances of the faith (though she might challenge one or another understanding or construal of them).

Third, Van Till thinks he detects a certain *imbalance* in my paper: I seem "well aware," he says, of the need for paying careful attention to matters of epistemology and hermeneutics in the arena of the natural sciences, but "Where is the evidence for a comparable level of concern for dealing with the equally difficult and relevant issues of epistemology and hermeneutics in the arena of biblical exegesis?" Here the answer is twofold. First, academics, other intellectuals, the readers of this journal and the audience of my original lecture all get told about a dozen times a day that there are epistemological and hermeneutical difficulties in determining what the Bible teaches; this hardly needs further emphasis. But secondly, I explicitly set aside questions of the proper understanding of the early chapters of *Genesis*, just *because* this is a difficult area, an area where I am not sure where the truth lies. I do believe that the Lord intends to teach us here not only that the world depends upon him for its existence, but also (at least) that the world has not existed for an infinite stretch of time, and that there was an original pair of human beings whose sin brought calamity upon the human race (a calamity the remedy for which is the life and death and resurrection of Christ). I also think it likely that he intends to teach us that human beings were created in a special way and in an act of special creation; but I could be persuaded otherwise. Nothing in my paper hinges upon

these exegetical beliefs, however, or, as far as I can see, upon any other exegetical beliefs about which there is sensible controversy.

Still another misunderstanding: I spoke of what the Bible "initially seems" to tell us about the origin and development of life, and about what the Bible "taken at face value" seems to teach. Van Till asks: "But how well does this hermeneutic of 'initially seems' and 'taken at face value' actually hold up?" Here there is serious misunderstanding: of course I don't propose this as a hermeneutic. I don't mean for a moment to suggest that what the Bible initially seems to teach must be what it really does teach. Of course not. Indeed, I said that while the Bible initially seems to teach that the earth is very young, this is not what the Lord intends to teach us in early Genesis. Van Till goes on to say that "we need far more than a naive biblical hermeneutic or a simple folk exegesis." That is hard to dispute, but I can't see why Van Till felt obliged to say it.

B. Disagreements

1. *Is Science Religiously Neutral?* I come now to two matters, not of misunderstanding, but of disagreement. First, there is the question whether science is religiously neutral. I said I thought there was a three-way conflict between the Civitas Dei, Perennial Naturalism, and Creative anti-Realism. And I added that "it would be excessively naive to think that contemporary science is religiously and theologically neutral, standing serenely above this battle and wholly irrelevant to it." Now Van Till suggests that it is "profoundly misguided" "to expect the Scriptures to provide us with the kind of statements that would be directly relevant to the evaluation of contemporary scientific theory on the world's formative history." This seems to me mistaken. It seems entirely possible that Scripture should teach us something running wholly contrary to a given scientific theory, and even to a scientific theory on the world's formative history; and the fact that Scripture does not directly involve that list of concepts given by Van Till (galactic red shift, thermonuclear fission, etc.) seems irrelevant to this question. For if a scientific theory entails, for example, that the universe has existed for an infinite stretch of time (i.e., if it entails that for any number n , the universe has

existed for more than n years), then that theory would be in conflict, so I believe, with the clear teaching of Scripture. The Bible clearly teaches (so I believe), that every concrete object distinct from God was created by God, and was created by God in such a way that it has not existed for an infinite stretch of time. That a scientific theory should say something inconsistent with this is not merely a possibility; until fairly recently, that is precisely what the accepted scientific theories did.

Secondly: Van Till speaks here only of "contemporary scientific theory on the world's formative history"; but of course the question whether science is religiously neutral extends much further than that. Consider the human sciences: economics, sociology, psychology, sociobiology, and the like. Here too it seems wholly obvious that a scientific theory belonging to one of those areas *could* assert something inconsistent with biblical teaching; and here too some scientific theories *to* precisely that. Consider, for example, Herbert Simon's recent article, "A Mechanism for Social Selection and Successful Altruism."² According to Simon, there is a problem with altruistic behavior, such as that displayed by Mother Teresa, or The Little Sisters of the Poor. Why do they do the sorts of things they do? The rational thing to do, says Simon, is to act or try to act in such a way as to increase one's personal fitness, i.e., to act so as to increase the probability that one's genes will be widely propagated, thus doing well in the evolutionary derby.³ Altruistic behavior, such as that of Mother Teresa and The Little Sisters, does no such thing; so what is the explanation of their behaving as they do? Simon proposes two mechanisms: "bounded rationality," and "docility":

Docile persons tend to learn and believe what they perceive others in the society want them to learn and believe. Thus the content of what is learned will not be fully screened for its contribution to personal fitness (p. 1666).

Because of bounded rationality, the docile individual will often be unable to distinguish socially prescribed behavior that contributes to fitness from altruistic behavior. In fact, docility will reduce the inclination to evaluate independently the contributions of behavior to fitness.... By virtue of bounded rationality, the docile

person cannot acquire the personally advantageous learning that provides the increment, d , of fitness without acquiring also the altruistic behaviors that cost the decrement, c (p. 1667).

So the idea is that a Mother Teresa displays "bounded rationality"; she adopts those culturally transmitted altruistic behaviors without making an independent evaluation of their contribution to her personal fitness. If she *did* make such an independent evaluation (and was rational enough to do it properly) she would see that this sort of behavior did not contribute to her personal fitness, would stop engaging in it, and would instead get to work on her expected number of progeny.

But isn't this in clear conflict with scriptural teachings about what it is rational for human beings to do? Behaving like Mother Teresa is not at all a manifestation of "bounded rationality"-as though if she thought about the matter with greater clarity and penetration, she would instead act so as to increase her personal fitness. Behaving as she does is instead a manifestation of a Christlike spirit; she is reflecting in her limited human way the splendid glory of Christ's sacrificial action in the Atonement. (No doubt she is also laying up treasure in heaven.) From a Christian perspective, there is no sense of "rational" in which there is anything at all a human being can do, that is more rational than what she does. Of course we might be tempted to claim that Simon's article really isn't science; but can we sensibly make that claim in these post-Kuhnian days? If the scientists call it science and get grants from the National Science Foundation for doing it, can we sensibly claim that it really isn't science?

And obviously the connection between the explicit tenets of Christianity or the explicit teachings of Scripture, on the one hand, and a given scientific theory, on the other, can be vastly more subtle. Perhaps, for example, a scientific theory doesn't explicitly *contradict* the deliverances of the faith, but offers evidence of some sort against it, or is unlikely to be true if the faith is, or is such that its conjunction with some other epistemically probable proposition meets one or both of those conditions.

2. *Is the Grand Evolutionary Story (GES) Religiously Neutral?* Coming to the second area of disagreement (a special case of the first), I said I thought the Grand

Evolutionary Story wasn't religiously neutral:

Now it would be excessively naive to think that contemporary science is religiously and theologically neutral, standing serenely above this battle and wholly irrelevant to it. Perhaps parts of science are like that: mathematics, for example, and perhaps physics, or parts of physics-although even in these areas there are connections. Other parts are obviously and deeply involved in this battle: and the closer the science in question is to what is distinctively human, the deeper the involvement.

Now I think Van Till and I disagree here, but I'm not sure; and this is again because of misunderstanding. Van Till apparently believes what I meant to say when I said GES was not neutral, was only that scientific theories (for example, GES) could be incorporated into various different world views (for example, naturalism). To put it in his words, what I meant was that science did not have mythological immunity": science is not "immune from employment in the mythology of all religious cultures, including atheistic ones." But of course this isn't at all what I meant. To say that science was not neutral in *that* sense would be to make a statement weak *in excelsis*: a scientific theory would be neutral in that sense (if I understand Van Till) only if there were no religious ways of looking at the world *at all* into which it could be coherently incorporated. Only inconsistent scientific theories, I suppose, could qualify for that distinction. Rather, I meant to point out a much more specific way in which, as I see it, the Grand Evolutionary Story is not religiously neutral. GES plays an important role in the conflict between Christian theism and naturalism (taken as a mythology, a deep account of ourselves and the world around us). This role is that of providing an answer to a question that is both insistent and monumentally difficult from a naturalistic perspective: how did all this astounding variety of life with its millions of species get here? Their ancestors can't have just popped into existence; but

neither, from a naturalistic perspective, could they have been created by God; so where does all this life come from, and how did it get here? Evolution gives an answer the naturalist can accept, and it gives the only such answer anyone can presently think of. So it isn't just that evolution can be incorporated into naturalism; that is of course so, but it can also be incorporated into theism and most anything else. It is rather that evolution serves to answer what would otherwise be a crushing objection to naturalism. It functions as a "defeater-defeater" for naturalism: it offers a way to answer and hence defeat what would otherwise be a crushing objection or defeater for naturalism. It is therefore crucially important to naturalism; and this, I said, partly accounts for the insistence that this theory is no mere theory but a rock-hard certainty, and the venom, the *odium theologicum* with which dissent is greeted. Another example of that *odium theologicum*: according to the January, 1991, issue of *First Things*, the *New York Times* reported recently that

Scientific American denied a job to the gifted science writer, Forrest M. Mims, HE Mr Mims had been doing a column for the magazine, titled "Amateur Scientist." But then his awful secret was discovered. According to Armaund Schwab, who was managing editor when the decision was made, Mr. Mims "was a nonbeliever in evolution."... Ever vigilant against extremisms, editor Jonathan Piel determined that hiring Mims would compromise the magazine's integrity (p. 64).

One can see why. A nonbeliever in evolution at *Scientific American* would be like a Unitarian minister who was a closet follower of Jerry Falwell or a seventeenthcentury Scottish Calvinist who secretly accepted the authority of the Pope: at best appalling.

So I say that neither GES nor TCA (the Theory of universal Common Ancestry) is neutral with respect to the issue between Christian theism and naturalism. Now Van Till seems to think that the only question of interest, with respect to this neutrality issue, is the question whether these theories are *logically consistent* with Christian theism (as well as naturalism). This is a reasonable place to start; and the answer (roughly speaking anyway) is that of course evolution is indeed

logically consistent both with Christian theism and with naturalism. But this doesn't anywhere nearly suffice to show that GES and TCA are neutral with respect to these two world views. You might as well argue that the evidence for relativity theory is neutral with respect to that theory; after all, it is consistent both with that theory and with its denial. You might as well argue that the evidence for the universe's being very old is neutral with respect to the dispute between young earthers and old earthers; after all that evidence is consistent with both views. This question about logical consistency is a reasonable place to start; but it is not a reasonable place to end. Another good question to ask is whether GES or TCA *offers evidence* for or against Christian theism and for or against naturalism; another question to ask is whether its conjunction with things we all believe, offers such evidence; another question is whether GES makes it easier to accept naturalism; and another question is whether the Grand Evolutionary Story is equally probable, with respect to Christian theism and naturalism, Here I wanted to argue that TCA does indeed make it easier to believe naturalism (by offering that defeater-defeater) and that it is indeed much more probable with respect to naturalism than with respect to theism; this is one source of those claims of certainty for it. But of course a Christian or other believer in God won't have *that* reason for thinking it certain; so unless there is some *other* reason, a reason a *Christian* might have for that conclusion, a Christian ought to *reject* that claim of certainty and all the sociological trappings that go along with it.

Accordingly Dawkins is right or partly right: evolution does something to make it easier to be an intellectually fulfilled atheist. No doubt it is still extremely difficult (and in the long run impossible); but GES answers what would otherwise be an unanswerable objection. Van Till, indeed, claims that this answer "encourage(s) a mischievous misconstrual of the issue. The central problem ... is a failure to distinguish authentically religious questions from questions accessible to modern empirical science-the common error of treating *creation* and *evolution* as if they were in essence alternative answers to the same question." But in this context they *are* alternative answers to the same question. God created all of life; we ask

how he did it: did he do it by way of TCA or even GES, the Grand Evolutionary Story? We may answer either "yes" or "no"; and of course these are alternative answers to the same question.

Finally, there is a theological issue that separates us; but since the same theological issue separates McMullin and me, it will be convenient to treat what Van Till and McMullin say on this head together. In conclusion, however, I wish to say that I entirely applaud Van Till's conclusion: that faith and reason should *cooperate*. Indeed they should. This is the heart of the suggestion I meant to make about Christian scholarship: in understanding the issues involved in sociology, or psychology, economics, or biology or whatever, we should use *everything* we know-what we know by faith as well as what we know in other ways. Faith and reason must indeed cooperate; this is precisely why we need distinctively Christian scholarship in these areas. We must approach a topic like evolution from the perspective of faith-of the deliverances of the faith-as well as that of current science; what faith teaches here is of crucial importance and must not be silenced.

II Ad McMullin

A. Misunderstandings

As with Van Till, so with my friend and colleague Ernan McMullin: before turning to real disagreement I want to try to clear up some misunderstandings (which, again, are not to be laid to his account rather than to mine).

1. *God of the gaps?* I begin with a serious misunderstanding: McMullin suggests that my view is an example of "God of the gaps" thought:

God of the gaps? It certainly sounds like that [McMullin's emphasis]. Whatever science cannot currently explain, or, more exactly, whatever one can make a case for holding science could never in principle explain, is to be deemed the "special" work of God. One is reminded of 18th century natural theology.

I say it doesn't sound like that at all. God of the gaps thought, as McMullin recognizes, is essentially an *apologetic* enterprise. One who takes part in this project argues for the existence of God by pointing to phenomena science can't

currently explain, suggesting that the only explanation is to be found in the activity of a divine being. From a theistic perspective, of course, this leaves a great deal to be desired. First, this procedure suggests that God is a gap plugger, that his activity in the natural world is limited to plugging gaps in a few areas of the natural world, while in the rest of nature everything goes on entirely independent of him and his activity. But the theist does not, of course, think of God as a mere gap plugger; God is crucially active in every transaction in nature, from the smallest most insignificant event to the largest cataclysmic event. God was active in the Big Bang; he is equally active in the sparrow's fall. According to traditional theism, this activity is at least of two sorts. First, theists have agreed that in any natural transaction, God conserves the transactors in existence; were he to withdraw this conserving activity the created universe would vanish like a computer image when you pull the plug. Furthermore, many theistic thinkers have added that every causal transaction on the part of creatures requires a concurrent causal act on the part of God, a kind of concurrent ratifying activity. A second danger of God of the gaps thought: if science progresses, the area of God's activity gets progressively diminished. And third, this procedure suggests that the correct way to believe in God is as in a scientific or explanatory hypothesis: there are some things such that the best explanation for them is the work of a divine agent.

But nothing could be further from my intent. What I said had no apologetic intent at all; I certainly wasn't proposing anything like a theistic argument. Furthermore, I don't for a moment think that belief in God is properly taken as an explanatory or scientific hypothesis: certainly not. It is no more to be taken as such a hypothesis than our beliefs that there are other persons, and a past, and an external world.⁴ Instead, I was thinking of the matter as follows: a Christian (naturally) believes that there is such a person as God, and believes that God has created and sustains the world. Starting from this position (taking it for granted and not trying to argue to it), we recognize that there are many ways in which God could have created the living things he has in fact created; how, in

fact, did he do it? Did he create matter, with its nature and its ways of working, in such a way that he could foresee that the result of its working in those ways would eventually be life, and then the various kinds of plants and animals, and then finally human kind? Or did he do something special in the creation of life? And did he do something special in the creation of his image bearers, human beings? And did he perhaps do something special in the creation of some other kinds of creatures? Did it all happen just by way of the working of the laws of physics, or was there further divine activity (activity not restricted to the upholding of matter in existence and concurring in the causal transactions expressing its nature)? That's the question, and the way to try to answer it, so it seems to me, is to ask two others: first what is the antecedent probability of his doing it the one way rather than the other? And second what does the evidence at our disposal suggest? Can we see how it could or would have happened just by the workings of the laws expressing the behavior and activity of matter? (I shall argue below that the second sort of consideration is more important than the first.) Starting from the belief in God, we must look at the evidence and consider the probabilities as best we can. But of course none of this has anything at all to do with "God of the gaps" apologetics, which in this context is nothing but a red herring.

2. *Does it look as if TCA is true?* A second misunderstanding: I considered the evidence Stephen Gould gives for TCA (the Theory of Common Ancestry, according to which any two living things can trace their line of descent back to a common progenitor). Included in this evidence is that offered by homologies, and 4 by the similarity in the biochemistry of all life. Since this is evidence that is supposed to support TCA as opposed to the hypothesis that God did something different and special in the creation of some of the various kinds of creatures, I pointed out that these two kinds of phenomena (homologies and the biochemical similarities) are also at least reasonably probable on the view that God created some creatures specially. McMullin says:

Plantinga ... deals with them, to my mind, in a quite unsatisfactory way.... Any attempt to reconstruct the past on the basis of traces found in the present can, of course, always be met with the objection: but God could have disposed matter so as to make it look as though it happened that way, even though it didn't.

But this, again, is a misunderstanding. My claim was not that it looks as if TCA is true, but God could nonetheless have done things differently (so he probably *did* do things differently?)-a sort of contemporary reflection of Philip Gosse's proposal that God put fossils into the rocks to deceive agnostic scientists. Not at all. That would be like conceding that it looks as if it is more than five miles from South Bend to Chicago, but claiming that it really isn't, on the grounds that God could bring it about that things would look like that even if they aren't that way; clearly enough that would not be the method of true philosophy. But it also isn't what I did. My claim is that from the perspective of theism, it *doesn't* look as if TCA is true-too many huge gaps in the fossil record; too many questions about whether TCA is even biologically possible, or whether, if it is, there has been enough time; too many epicycles needed to deal with some of the recent discoveries in molecular biology; and so on. A main issue between McMullin and me is just whether it *does* look (from a theistic perspective and given the empirical evidence) as if TCA is true.

3. An Alternative Explanation? Another misunderstanding: McMullin apparently thinks I mean to be proposing an *explanation* of the various forms of contemporary life, an explanation at the same level as evolution: "Like creation scientists, he maintains that the best explanation of the origin of many 'kinds of plants and animals' is an interruption of the ordinary course of natural process, a moment when...." And later on in his paper he says:

The presumed inadequacy of current theories of evolution is part of what leads Plantinga to propose his own alternative. What exactly is it? Is it that God brought to be in a miraculous way *each* of the millions of species that have existed since life first appeared on earth? ... Perhaps he means that God just created the phyla.... But why not all species? How is Plantinga to decide just which thesis is more probable than TCA? Presumably by checking to see what evolutionary

theory has, in *his* view (McMullin's emphasis) been able to explain successfully. And then whatever is left over, God is more likely to have brought about miraculously.

Now as a matter of fact I think *many* hypotheses are more likely than either GES or TCA. So far as GES goes, I think it overwhelmingly likely that God did something special in creating life. And as for TCA, that God did something special in creating human beings, for example, everything else going much as according to TCA, seems to me more probable than TCA. That God did something special in creating initial forms of life, then something special in creating some other forms of life, then something special in creating human beings is also more probable. But in fact McMullin's question is mistaken. Speith, Ayala, Gould, Denton and others claim that TCA is *certain*, as certain as that the earth revolves around the sun. My primary claim, as you recall, was that this is at best foolish exaggeration, due in part to the religious role evolution plays. Secondly, what I claimed is that from a theistic point of view TCA is unlikely, not more likely than not, less likely than its denial. But of course that does not commit me to finding some *other* explanation (some other explanation on the same logical level as TCA), and claiming that *that* one is probable with respect to the evidence-not unless we mistakenly take the denial of TCA as *itself* an explanation or explanatory hypothesis. What I say is that from a theistic or Christian point of view, TCA is unlikely, somewhat less likely than its denial. That is all I am claiming; I am not proposing an alternative explanation (unless, of course, the *denial* of TCA is an alternative, in which case my answer to the question, "What *exactly* is [his alternative?]" is "The denial of TCA"). In order to claim quite properly that an explanation is improbable, you are not obliged to be able to point to a better alternative. We might very well know that a given theory is improbable, even if we don't know of a more probable alternative to it (again, unless we take its denial to be an alternative to it). I may think is unlikely that Oswald shot Kennedy, even if I don't have a good idea as to who did.

"How is Plantinga to decide just which thesis is more probable than TCA? But of course I don't have to be able to do that in order to hold, quite properly, that TCA itself is unlikely on the evidence; all I need to know is that the *disjunction* of these theses is more likely than TCA. I may think it unlikely, on the evidence, that I will be the next Pope; that doesn't commit me to having a candidate I think is likely to win. Of course I am committed to thinking that *there is* a theory that is both true and incompatible with TCA; but thinking TCA unlikely doesn't require that I know which theory that is. You and I find a watch in the woods behind your house; I propose the hypothesis that it was dropped there by Saddam Hussein; you are entirely within your rights in pointing out that this hypothesis is unlikely, on our evidence, even if you are not prepared to propose as probable some hypothesis as to who *did* drop it there.

4. *Creation Science* McMullin says he is willing to apply the term "fanatic" to certain creation scientists (Henry Morris, for example) despite the fact that the term carries moral as well as epistemic disapproval. And here again he seems to be misunderstanding me, at least if he thinks he is disagreeing with what I said. What I said is that one could reject the current deliverances of science and hold that the earth is young without being ignorant, immoral, fanatical, deranged or whatever. Of course it is quite consistent with that to hold that it is *also* possible to reject the current teachings of science, and be ignorant or fanatical or deranged or whatever—just as it is possible to *endorse* contemporary evolution and display those unhappy properties. (In fact, I gave an example of an argument found in creation science literature that seems to me either ignorant or badly confused.) So here we have no disagreement.

But I do feel obliged to add something here. Creation scientists are wrong (so I think), but some of them are nonetheless admirable. Their aim is to be faithful to the Christian faith and to the Lord; they do their best to do so, often at considerable personal cost. (They don't, after all, *enjoy* being called fundamentalist ignoramuses; nor do they take delight in the rest of the ridicule and disapprobation heaped upon them by the scientific establishment.) I happen

to think they are mistaken; but their errors, to my mind, are enormously less important than the errors of many of those-the Dawkins and Provines and Sagans of this world, for example-who load abuse upon them. It is vastly more important to be clear that the Lord created the heavens, the earth, and all that they contain, than to know that he didn't do it 10,000 years ago.⁵ I disagree with the creation scientists, and, like most other academics, I don't relish the scorn and obloquy that goes with being associated with them; but at a deep level I feel much closer to them, both spiritually and intellectually, than to their cultured despisers. Christians who disagree with them should treat them as Christian brothers and sisters who, perhaps through an excess of zeal, err on a point of some importance; but Christians should not treat them as intellectual pariahs, or join in the cultural chorus expressing scorn, contempt, and disdain for them. Creation scientists reject wholesale large areas of well confirmed theory; the other side insists that on the empirical evidence alone, evolution is certain; from the point of view of respect for the evidence is there much to choose from between these two excesses?

5. *Semi-deism* A final locus of misunderstanding has to do with my use of the term "semi-deistic." Here perhaps my expository inadequacy is particularly evident; perhaps I should not have used that term at all. I referred to a certain as "semi-deistic"; I used that term to highlight a claim that view shares with deism. According to deism, God originally created the world and started it off; then he sat back to watch, not acting upon his creation in any way at all. So the deist of course rejects miracles (though he concedes that surprising things can happen) and he also rejects divine conservation and concurrence. The semi-deist I had in mind concurs with the deist in supposing that once God has created things and started them off, he does nothing more special. (Semi-deism, of course, is topic specific: you might be a semi-deist about the creation of the various forms of life but not about salvation history.) But I did not mean for a moment to suggest that the view I called "semi-deist" was unorthodox; when McMullin says, "His characterization of the first alternative as 'semi-deistic' is intended to validate the

second alternative as the appropriate one for the Christian to choose" he errs, as when he says (on the same page) "All this [starting everything off, conservation, concurrence] would, apparently, not be enough to make such a view orthodox from the Christian standpoint." The label is meant to be a description of the view in question, not a subrosa way of impugning its orthodoxy. McMullin goes on to add that I must mean by "semi-deist" one who thinks God could not do anything other than go along with the laws of physics and chemistry, could not do something different and special in the creation of life, or human life, or other plant or animal life. But that's a misunderstanding; I meant the term to refer to those who say God doesn't do this, whether or not they go on to add that he couldn't.⁶

6. *Galileo, Scripture, and Scripture Scholarship* According to "Galileo's Principle," "in cases of apparent conflict the literal interpretation of Scripture is to be maintained, unless the opposing scientific claim can be demonstrated" (McMullin's emphasis). He goes on:

What must be disputed, to my mind, is a modern analogue of the first of Galileo's principles, which would, equivalently, reaffirm the presumption that the Biblical text was partially intended as a cosmology, so that in cases of apparent conflict between the Biblical and current scientific account we should evaluate the strength of the scientific account as a means of deciding which of the two "competitors" to accept. Plantinga proposes such a "balancing of likelihoods" methodology: a literalist understanding of God's making the ancestors of the main natural kinds, he concludes, should be preferred unless and until a far stronger case can be made for the evolutionary alternative.

Galileo's principle seems clearly false.⁷ It seems to imply, for example, that we should suppose it is possible to shout back and forth between hell and heaven, as in the parable of the rich man and Lazarus, unless we have scientific demonstration that this cannot be done; and that is not at all plausible. As it stands, furthermore, Galileo's principle will have little application: there is hardly ever a knock-down, drag-out demonstration of anything of much scientific interest.⁸ But even if there were, it doesn't seem at all obvious that the face value of scriptural teaching must always be preferred to any deliverance of science that

isn't backed up by something as strong as demonstration. Couldn't it happen that Scripture, taken at face value, seems to teach some proposition P, where it isn't at all obvious that P is what in fact the Lord intends to teach us, and where there is massive evidence from other sources that P is false? In such a case, shouldn't we reject P even if that massive evidence falls short of demonstration?

Indeed, a good example is offered by the very case under consideration: perhaps you think, with many Christians over the ages, that it initially looks, at any rate, as if early Genesis means to teach that the earth is young. Suppose you are also aware of Augustine's idea that early Genesis really isn't intended to teach us this, but you think the face value understanding slightly more likely to be correct than Augustine's. Then suppose (as in fact has happened to the Christian community) you encounter powerful and massive evidence that the earth is in fact very old; but though the evidence is powerful and massive, it stops short of being a full demonstration. I should think the sensible course, under these conditions, would be to move to the Augustinian understanding. Of course there won't be anything like an algorithm here. It would be nice if there were always some way to say just how strong the warrant (on a scale from 0 to 1, perhaps) is for the claim that the face value understanding P of a given passage is in fact the correct understanding, how strong the scientific evidence against P is, and what level of evidence of the latter kind defeats what level of warrant of the former. But there isn't.

Now McMullin attacks Galileo's Principle by arguing that it has a "disastrous consequence: it sets theologians evaluating the validity of the arguments of the natural philosophers, and natural philosophers defending themselves by composing theological tracts." If I understand him, I disagree with him here.

Where there is apparent conflict between Scripture and science, we must try the best way we can to see how to resolve it; given present academic arrangements, this will inevitably result in someone's making pronouncements that are outside her field. (Thus, in the present context, Van Till makes pronouncements on theology and philosophy, and McMullin and I do the same for biological and

theological matters.) This could be avoided only if there were professionals, experts, who were expert in the relevant science, and also in philosophy and philosophy of science, and also in theology. None of us, as I said in my paper, fills a bill like that.

So if McMullin means to suggest that philosophers should stick to their philosophy, theologians to their theology, and scientists to their science, then no one could address apparent conflicts of the sort that occasioned my paper. But we, the Christian community, *need* answers to these questions; we need to know how to think about these matters from a Christian perspective; we need to know whether thinking about them from that perspective will make a difference; we need to know how much of current culture-current scientific culture included-is to be seen as deliverance of reason, and how much comes from broadly speaking religious sources. If no one seriously addresses these questions, the answers we accept will be at best superficial and at worst calamitous for the intellectual and spiritual health of the Christian community. *That*, to my mind, is what would be disastrous.

In the passage I just quoted, McMullin apparently rejects my suggestion that what one must do, in cases of apparent conflict, is try to see how strong the case is for supposing that God teaches P in the Scripture under consideration, how strong the evidence from reason and science for the denial of P is, and then try to come to some resolution. Perhaps in some cases where the scientific evidence is very strong and the evidence for P's being what God intends to teach weak, we should move to another understanding of P; in cases where the evidence from science and reason is weak and the evidence for P's being what the Lord intends to teach strong, we should reject the bit of science in question. On the next page, however, he says something that leads me to wonder whether I have properly understood him:

When the theologian is unsure of the best interpretation to give to a text, it is not inappropriate, of course, to take into account that some of the possible interpretations may be closed off by the findings of the natural or social sciences.

But even in such a case, primary weight should be given to the *hermeneutic* issue as to what the disputed text was originally intended to convey....

I find this puzzling for two reasons: first, the first sentence seems to enjoin what is a special case of the procedure I was suggesting, and opens the believer or more exactly the believing community to precisely the sort of balancing of likelihoods McMullin describes as disastrous.

And second (with respect to the second sentence), what I was proposing is, of course, a hermeneutical principle: it makes a suggestion as to how to interpret Scripture in circumstances of apparent conflict. As we have just seen, it implies, for example, that if there is powerful evidence from reason for the claim that not-P, and some but much less powerful warrant from other considerations for the claim that God intends to teach us P, then we should take it that God does not intend to teach us P. But I suspect that's not the sort of hermeneutics McMullin has in mind. I think *lie* thinks what is decisive here is what the *human author(s)* of the text in question had in mind. If that is what he means, I am obliged to disagree with him. In order to understand Scripture, we must know who its author and audience is. As to the latter, it is the Christian church over the ages; as to the former, as Aquinas and Calvin agree, the principle and primary author of Scripture is the Lord. (Of course this doesn't imply any kind of crude dictation theory.)

What we really need to know, therefore, is what *lie* intends to teach in the text in question. This may very well be what the human author had in mind in writing that text; but of course it needn't be. It might be that the Lord proposes to teach us (coming where we do in the whole history of his interactions with his children) something that hadn't occurred to the person or persons actually composing the text in question. I would concur with those Christians, for example, who see various Old Testament passages (Isaiah and elsewhere) as really referring to Christ, the second person of the Trinity, and making assertions about him; it is unlikely, however, that the original author intended to make assertions about the second person of the Trinity. What the original authors had in mind will ordinarily

be of importance, but it will not necessarily settle the issue as to how to understand the text in question.

I was surprised to read the last sentence of the above quotation ("a literalist understanding of God's making the ancestors of the main natural kinds"), since I explicitly and in more than one place said I proposed to set aside the evidence, whatever exactly it is, from early *Genesis*. McMullin apparently finds it hard to credit my explicit claims here: "Despite his silence in regard to *Genesis*, I do not think that a linkage between his argument and the more traditional Genesis-based argument can be denied." But let me assure him (and you) that I really am leaving out of account questions about the right understanding of early Genesis, because I am unsure about the answers to some of those questions. Because I am unsure of these matters, I am not resting any part of my argument on them. I appeal instead only to (1) the theistic claim that God constantly supports and sustains all his creatures in existence⁹ (2) the Christian claims that God did indeed create the heavens and the earth, and that he did many things in a special way in connection with salvation history and (3) the empirical evidence. McMullin speculates that perhaps my reason for thus keeping my council about early *Genesis* is a prudent desire to avoid confrontation with the theologians: "He already has the scientists on his hands. Why open a second front and take on the theologians too?" He claims that "the great majority of contemporary Scripture scholars agree" that to interpret early *Genesis* "literally or quasi-literally is to misunderstand the point that the writers of those narratives were trying to make." These theologians rise as one man (or woman), to assure us, says McMullin, that the writer(s) of the early chapters of *Genesis* meant to tell us no more than that the world was indeed created by and is dependent upon God. They do not mean to tell us anything at all about how God created-whether he did it in seven 24-hour days, whether he created humankind separately, whether there was an original human pair in the garden of Eden-they mean to tell us only that the world depends upon God: "...and if the Biblical theologians are right in holding that the cosmological references in the Old Testament ought to be

understood as conveying fundamental truths about the dependence of the natural and human worlds on their Creator, rather than explaining how exactly these worlds first took shape, then perhaps we ought to be just as wary. . . ."

Now strictly speaking, this is doubly irrelevant to the questions under consideration. For first, I didn't rest any part of my case on the correct understanding of the first chapters of Genesis; and second, as I argued above, the question what the early authors had in mind is not the primary question. (Furthermore, as a glance at contemporary Scripture scholarship will attest, questions as to what they *did* have in mind often become enormously speculative.) Still, I cannot forebear noting that McMullin's appeal to contemporary Scripture scholarship is extraordinarily selective, not to say tendentious (or perhaps it is only that he and I have not met the same theologians). There are indeed theologians who deny that the (human) writer(s) of Genesis meant to say more than that the world depends upon God; but there are many more who think that the original (human) authors had a great deal more in mind.

First, of course, there are whole coveys or phalanxes of conservative critics e.g., E. J. Young and G. C. Aalders—who think that the writer(s) of Genesis meant to teach much more than that creation depends upon the Lord. (There is also, of course, Thomas Aquinas, who took early Genesis to teach that God created the world in six 24 hour days.) But the same goes for their more liberal colleagues. Thus for example, Julius Wellhausen¹⁰ speaking of the author of Genesis,

He undoubtedly wants to depict faithfully the factual course of events in the coming-to-be of the world, he wants to give a cosmogonic theory. Anyone who denies that is confusing the value of the story for us with the intention of the author.

Wellhausen's last point, here, deserves careful attention: many who claim that the author(s) of Genesis did not mean to say anything about "the factual course of events" seem to be motivated more by what they think is the correct view of the matter than by what it is likely the historical authors had in mind. This is a

common human phenomenon and we can easily think of many other examples (for example, the way the medievals often found "the Philosopher" holding just what they thought the truth of the matter). Nevertheless it is hard to see how it makes for accurate Scripture scholarship.

We may add the voice of Herman Gunkel, here, who says, "People should never have denied that Genesis 1 wants to recount how the coming-to-be of the world actually happened."¹¹ I Still further, James Barr, Regius Professor of Hebrew in the University of Oxford until he joined the brain-drain to the US, and an Old Testament scholar than whom there is none more distinguished, writes as follows:

To take a well-known instance, most conservative evangelical opinion today does not pursue a literal interpretation of the creation story in *Genesis*. A literal interpretation would hold that the world was created in six days, these days being the first of the series which we still experience as days and nights.¹²

After buttressing this claim that most evangelicals (he also calls them "fundamentalists") indeed do not pursue a literal interpretation, he writes In fact the only natural exegesis is a literal one, in the sense that this is what the author meant.

Elsewhere he goes much further:

... so far as I know there is no professor of Hebrew or Old Testament at any world-class university who does not believe that the writer(s) of *Genesis 1-11* intended to convey to their readers the ideas that: (a) creation took place in a series of six days which were the same as the days of 24 hours we now experience; (b) the figures contained in the *Genesis* genealogies provide by simple addition a chronology from the beginning of the world up to the later stages of the Biblical story, and (c) Noah's flood was understood to be worldwide, and to have extinguished all human and land animal life except for those in the ark.¹³

Here we must bear in mind the polemical context in which Barr is writing: he means to discredit the "fundamentalists" or "evangelicals" by showing that they

profess to take Scripture at its literal word, but in this case clearly do not do so, since it is obvious (at any rate to those professors at the world class universities) that the writer(s) of *Genesis* meant to assert the three things Barr mentions. According to Albert Wolters, this second quotation certainly contains exaggeration, since "the highly respected German commentaries on *Genesis* by G. von Rad and K. Westermann (who both taught at major German universities) would not fit his description" (personal communication). Even allowing for a bit of exaggeration, however, the picture presented by Barr, the distinguished Old Testament scholar, is enormously different from that presented by McMullin. McMullin's claims about "the great majority of contemporary theologians" are dubious at best. But, as I say, this issue is really peripheral to what concerns us.

B. Disagreements

1. *Science and "Science."* I say the Christian community ought to think about the subjects of the various sciences-the so-called natural sciences, such as physics and chemistry and biology, and also the human sciences, such as psychology, sociology, economics-from an explicitly theistic or Christian point of view; and I suggested calling the result "Unnatural Science," or "Creation Science," or "Theistic Science." As far as I can see, McMullin agrees that the Christian community should pursue this sort of study, but he objects to calling the fruit of such study "science":

I do not think, however, that theistic science should be described as science. It lacks the universality of science, as that term has been understood in the Western tradition. It also lacks the sort of warrant that has gradually come to characterize natural science, one that points to systematic observation, generalization, and the testing of explanatory hypotheses. It appeals to a specifically Christian belief, one that lays no claim to assent from a Hindu or an agnostic.

Now in a way, perhaps, it doesn't matter what we *call* this enterprise that (as McMullin and I agree) ought to be undertaken by the Christian community-and no doubt we would agree further that it is the scientists of the Christian community,

the practitioners of the discipline in question, who ought to undertake it. But there is something (research grants, for example) in a name, and I disagree with McMullin's reasons for denying the name of science to this enterprise. He makes two points. First, theistic science lacks the *universality* of science properly so called; it couldn't be practiced by an agnostic or a Hindu. And second, it lacks the sort of warrant that "points to systematic observation, generalization, and the testing of explanatory hypotheses." As for the second point, here again there is misunderstanding. The way to try to understand, from a theistic perspective, how God created plants and animals and human beings is to take account of all that you know: what you know by faith, what you know as a Christian, as well as what you know in other ways. In the case at hand, what would be relevant would be what Scripture teaches or suggests on the matter, together with the antecedent probability from a theistic perspective, together with the "empirical evidence": the fossil record, the molecular evidence, homologies, and the like. Clearly this involves precisely the sort of systematic observation, generalization and testing of explanatory hypotheses that McMullin cites as the hallmark of science. It may involve more; but it certainly involves this much. To establish his point along these lines, McMullin would have to argue something else: that science (properly so called) somehow *couldn't* involve the other matters, the looking to see what (if anything) Scripture says on the matter and the consideration of the antecedent probability of a theory on theism. And I haven't the faintest idea how that could be argued. Where is it laid down that anything that does that is not science?

The answer, McMullin thinks, lies in that methodological naturalism he thinks essential to science (or perhaps natural science). Speaking of methodological naturalism, he writes, "Scientists *have* to proceed in this way; the methodology of natural science gives no purchase on the claim that particular event or type of event is to be explained by invoking God's creation directly." But where does this embargo come from? It is ordinarily supported only by bad arguments of the type "God is not part of the universe; in science we can only refer to parts of the universe; therefore...."; or even "To refer to God in science is to treat God as an

object, which is idolatry; therefore Why believe that scientists have to proceed the way McMullin says they have to? You might as well argue that science can't start from the assumption that inductive procedures will continue to be successful (or that there has really been a past), on the grounds that scientific method isn't competent to decide these matters.

Consider the question how life originated: as a theist I believe that God created it in one way or another, and now the question is: how did he do it? Did he do it by way of the ordinary workings of the laws of physics and chemistry (the ordinary behavior of matter, so far as we understand it) or did he do something special? If after considerable study, we can't see how it could possibly have happened by way of the ordinary workings of matter, the natural thing to think, from that perspective, is that God did something different and special here. (Such a conclusion, of course, would not be written in stone; the inquiry wouldn't be finally closed at any point.) And why couldn't one conclude this precisely as a scientist? Where is it written that such a conclusion can't be part of science? Where is it written that science inevitably involves that methodological naturalism?

We must note that nothing is settled by a definition: you can define the word "science" as you please, but no questions are settled and no perplexities answered just by offering a definition. In particular, it isn't settled whether a proper scientific understanding of nature may include a reference to God. You may insist that the answer is just given by the very definition of "science": "Science," you say, means something like "empirical inquiry in which one never refers to God." But this doesn't answer the original question; it just means that you now have to use different words to ask the question.

And now consider the first point, "the universality of science, as that term has been understood in the Western tradition." Here we must remind ourselves that in the Western tradition, *theology*, of course, was long thought to be a science. (And not just any old science, but the *queen* of the sciences.) Until fairly recently, hardly anyone would have doubted that theology is a science-even though, of course, it is based upon principles laying no claim to assent from a Hindu or an

agnostic. McMullin might be closer to the truth, here, if he appealed, not to the whole Western tradition, but to the Western tradition since the mid-nineteenth century or so; and if he spoke, not of "science" *simpliciter*, but of "natural science." Then the point would be just that as a matter of fact "natural science" hasn't been applied, in that stretch of our tradition, to what I called "Theistic Science"; that might be right, but it is hardly determinative. On the other side, it is also clear that science, if it is practiced in such a way as to honor the methodological naturalism McMullin urges, is by no means always universal. Think again of the piece by Simon I mentioned above, according to which (1) the rational thing to do is to act so as to increase your personal fitness, i.e., so as to maximize the probability that your genes will be widely disseminated, and (2) the (or an) explanation of the behavior of someone like Mother Teresa or The Little Sisters of the Poor is "bounded rationality" (i.e., not to put too fine a point upon it, stupidity) together with docility. I should think no Christian could even for a moment take this seriously as an explanation of their behavior. The explanation is something wholly different, something much more along the lines, I mentioned above. Of course someone might insist that Simon's piece and perhaps even sociobiology more generally really isn't science. But why not? Perhaps it isn't *good* science; but on what grounds are we to declare that it isn't science at all? It is published in scientific journals and written in that stiff, impersonal scientific style; people get grants from the National Science Foundation to pursue it; it involves experiments, mathematical models, and the attention, customary in science, to the fit between model and data; it certainly has all the earmarks and trappings of science. It if looks like a duck, walks like a duck, and quacks like a duck, it's best thought of as a duck. We know better, in this post Kuhnian and post-positivistic age, than to try to give precise criteria for distinguishing science from non-science; we know about the notorious problem of demarcation.¹⁴

2. *Antecedent Probabilities*. The last two areas of disagreement I want to mention both have to do with the probability of TCA from a theistic perspective. The first has to do, we might say, with its *antecedent* likelihood-its likelihood on

Christian theism prior to the consideration of the empirical evidence such as the fossil record, the homologies, the molecular evidence, and the like of that; and the second has to do with the evidential force of that empirical evidence. Both Van Till and McMullin argue that the antecedent probability of TCA, on Christian theism, is much greater than the antecedent probability of God's doing something special in creating life, or humankind, or other forms of life. I shall look first and briefly at what Van Till has to say.

Van Till argues that "the world created by the God who reveals himself in Scripture is a world characterized by ... functional integrity." What is functional integrity?

By this term I mean to denote a created world that has no functional deficiencies, no gaps in its economy of the sort that would require God to act immediately, temporarily assuming the role of creature to perform functions within the economy of the creation that other creatures have not been equipped to perform.

The suggestion seems to be that God does nothing *immediately* in creation; everything he does, he does mediately, indirectly, by way of having some *creature* do the immediate acting. And the suggestion seems further to be that if God *did* act immediately in creation, he would be assuming the role of a creature; the divine role is to act only mediately and indirectly. Van Till attempts to buttress his case by appealing to a passage from the theologian John Stek, who writes "[creation] contains no gaps that have to be filled with continuous or sporadic immediate operations of divine power; God is not himself a component within the internal economy of his creaturely realm."¹⁵

Here I wonder whether Van Till and Stek really mean what their words seem to say. For (as I have already noted) of course theists have always held that God acts immediately upon his creation by way of conserving it in existence; this divine activity is absolutely essential to the existence of creation. (Many theists have added that every creaturely causal transaction also requires an additional immediate divine concurrent action.) The view that God does nothing *immediately*, there is another important point, one familiar from discussions of

public education; if you hew to the methodological naturalism McMullin favors, you are very likely to wind up with the very sort of science you would aim at if your naturalism weren't merely *methodological* but (as you see it) the sober metaphysical truth of the matter. I therefore think "provisional atheism" is a good name for methodological naturalism, not because anyone who employs it is properly called an atheist (of course not), but because the results of using it in a given area will often be the very same as the results of assuming atheism or taking it for granted and arguing from there.

But perhaps Van Till doesn't really mean to say that God does nothing immediately; perhaps the idea is that God does nothing immediately, in creation, in addition to the conservation and perhaps concurrence necessary for creaturely existence and causal activity. Instead, he creates the world with all its potentialities and then restricts his activity to conservation and coherence. But why should we believe this? What is the reason for this assumption? Is there anything in Scripture to suggest it? I should think not; Scripture seems to be full of accounts of divine activity (miracles, for example) that go far beyond conservation and concurrence. And towering above all, of course, there is the *Incarnation*, which can hardly be described as an act merely of conservation or concurrence.

Is it perhaps Van Till's idea that God limits his activity to conservation and concurrence, except for the events of salvation history? But what is the reason for believing that? Scripture does not so much as slyly suggest it; the fact that God does in fact go beyond conservation and concurrence in his salvific activity suggests that at any rate he is not averse to so doing. Van Till produces no arguments for this assumption; so what is the backing for it? Why should we believe it? In considering our topic-how God created life and whether he did so by way of Theory of Common Ancestry or even the Grand Evolutionary Story-I suggest that we should pay more attention to the empirical evidence, rather than rely upon unsubstantiated and apparently *a priori* theological assumption. Here,

perhaps, is a place where theological assumption ought not intrude into empirical science.

So far then, we have been given no reason at all for supposing that there is a substantial antecedent probability of God's creating by way of TCA, or that antecedent probability of TCA is greater than that of its denial. I turn now to McMullin's suggestions on this topic. He makes initial heavy weather over the very asking of the question what God is likely to do; if I understand him, however, he goes on to claim that in fact it is unlikely, indeed *very* unlikely, that God would do something special and different, create something special and different in bringing it about that there are human beings, or certain kinds of plants and animals, or even, presumably, life itself:

To carry the argument a stage further: what would the eloquent texts *of Genesis, Job, Isaiah* and the *Psalms*, lead one to expect? What have theologians made *of* these texts? This is obviously a theme that far transcends the compass of an essay such as this one. I can make a couple of simple points. The Creator whose powers are gradually revealed in these texts is omnipotent and all-wise, far beyond the reach of human reckoning. His Providence extends to all His creatures; they are all part of His single plan, only a fragment of which we know, and that darkly. Would such a Being be likely to "intervene" in His creation in the way Plantinga describes? (*I am uncomfortable with this language of "likelihood" in regard to God's actions, as though we were somehow capable of catching the Creator of the galactic universe in the nets of our calculations. But let that be.*) *If* one can use the language *of* antecedent probability at all here, it surely must point in the opposite direction.¹⁶

A couple of comments on this passage: first, I am not suggesting, of course, that there is some way to *calculate* the probability that God would do this or that; at best, on a topic like that, we have little more than crude guesses. And I agree that any ideas we might have about the antecedent likelihood that God would do things a certain way should be at best extremely tentative. What I said was only that I thought it a bit more probable that God would do something different and special in the creation of life, and human beings, and perhaps some other forms

of life. But any such views, surely, should be tentative and held with appropriate diffidence. It certainly befits no one to be at all cocksure here.

This said, however, I fail to see any force in the considerations McMullin puts forward. God is indeed omnipotent and all wise; his providence does indeed extend to all creatures; and we know only a fragment of his total plan. These things are all true; but how do they bear on the question whether God would or would not, for example, create in stages: first creating inanimate material, say, then later doing something special in creating life, perhaps, and then still later in creating human life? (It is part of the major theistic religions to think that God has created humankind *in his own image*; might he not have thought it appropriate to create human life in a special way, by way of an act of special creation?) We know, after all, that God is not averse to acting in special ways, as the many miracles recorded in the Bible attest.

True, McMullin insists that what God does with respect to salvation tells us nothing about how God would create: "The story of salvation is a story about men and women, about the burden of being human. It is not about plants and animals; it provides no warrant whatever for supposing that God would have brought the ancestors of the various kinds of plants and animals to be outside the ordinary order of nature." There is of course some question as to what the *ordinary* order of nature is. According to McMullin, Pope Leo XII taught that God creates specially a new human soul or a new person whenever a human being is conceived; if so, then the order of nature regularly and ordinarily involves very many acts of special divine creation.

What we know, here, is this. First, God is in constant, close, intimate causal contact with his creation: he continuously upholds it, and perhaps also acts concurrently with every creaturely causal transaction. We also know that he has often done things in a special way, a way in which he doesn't ordinarily do them, so that, for example, water turns into wine, or human beings emerge from a fiery furnace unhurt, or a human being rises from the dead; he is apparently not averse to working in his creation in a special way. Accordingly, there is no

particular antecedent probability in favor of the idea that he wouldn't do anything different or special in the creation of life, say, or in the creation of special kinds of life. So it is hard to see how there is any antecedent probability in favor of GES. In thinking about the antecedent probability of TCA, furthermore, we must also note that we have every reason to doubt that life arose simply by the workings of the laws of physics. According to Francis Crick, life must be regarded as the next thing to miracle; according to Harold P. Keim of Santa Clara University, chairman of a National Academy of Sciences committee that recently reviewed origin-of-life research, "The simplest bacterium is so damn complicated from the point of view of a chemist that it is almost impossible to imagine how it happened." It therefore looks as if God did something special in the creation of life. (Of course things may change; that is how things look *now*.) And if he did something special in creating life, what would prevent him from doing something special at other points, in creating human life, for example, or other forms of life? These things taken together suggest that the Lord might very well have done something different in creating life, something different in creating human life, and perhaps something different in creating other forms of life. It would seem to be entirely in character. I am therefore inclined to maintain my suggestion that the antecedent probability, from a theistic point of view, is somewhat against the idea that all the kinds of plants and animals, as well as humankind, would arise just by the workings of the laws of physics and chemistry.

Of course these are deep and difficult waters; as we read in *Ecclesiastes*, I saw all the work of God, that man cannot find out the work that is done under the sun. However much man may toil in seeking, he will not find it out; even though a wise man claims to know, he cannot find it out." Perhaps the most reasonable attitude, here, is one of agnosticism: one just doesn't know what these antecedent probabilities are. What seems to me unreasonable, however, is to be confident that that antecedent probability favors TCA or GES. It seems to me unreasonable to suppose that there is an antecedent probability favoring what I called semi-deism. And if I am right, then we must rely most heavily, here, on the empirical

evidence. Our view should depend heavily upon our judgment as to the strength of that evidence for TCA. Does evidence suggest that the Lord did it by way of TCA? Or does it suggest something else? Here we should rely upon the empirical evidence much more heavily than upon *a priori* theological assumption. And when we look at the matter this way, then it looks as if the evidence is at best ambiguous. God *could* have done it by way of TCA; but, as it seems to me, it is somewhat more probable that he did not. For if he had done it that way, then we should expect much stronger evidence than we actually have. We shouldn't expect those enormous gaps in the fossil record; we shouldn't expect those epicycles; we shouldn't expect the problems with the molecular evidence. The actual empirical evidence must be allowed to speak more loudly than speculative theological assumption.

3. *The Empirical Evidence.* We now turn to that evidence. Here I don't mean to use the word "empirical" to mark any philosophically important property; in this context (but for intolerable prolixity) I could just as well enumerate the sort of evidence of which I mean to speak: the fossil record, homologies, geographical evidence, the molecular evidence, and so on. And here I must first join my critics in pointing out an error in my paper. I represent myself as arguing against TCA, the Theory of Common Ancestry; as a matter of fact, however, I am questioning the hypothesis that eyes, wings, brains and the like have developed according to the mechanisms suggested by contemporary evolutionary theory. These two hypotheses are of course intimately connected; in particular, it is hard to imagine (given naturalism) how the former could be true unless some version of the latter were. Nevertheless, of course, they are distinct hypotheses.¹⁷

With respect to the empirical evidence, I have three points. First, I said that the evidence for TCA was defective, in many ways, so that it was foolish exaggeration to declare the latter certain. Here McMullin reminds me that the evidence for TCA is *necessarily incomplete*, since TCA is an historical hypothesis: "...evolutionary explanation is of its nature *historical* and historical explanation is not like explanation in physics or chemistry. It deals with the

singular and the unrepeatable; it is thus *nccessarily* incomplete." This is true, but it is also part of my point; it is (partly) for this reason that it is absurd to claim that TCA is certain; those strident declarations of certainty must come from some source other than a cool, reasoned, dispassionate look at the evidence.

Furthermore, McMullin is right in pointing out that one shouldn't apply inappropriate criteria when assessing the merits of a particular explanation; but an explanation for which the evidence is necessarily weak is still an explanation for which the evidence is weak.

Second, the fossil evidence. As McMullin says, the fossil record contains many sequences of extinct forms (e.g., trilobites) "where the development of specific anatomical features can be traced in detail through the rock layers." This is indeed so, but does not bear on the main problems for TCA with the fossil record, which have to do with the lack, in that record, of sequences of intermediary forms between the really major taxa. Consider, for example, the Cambrian explosion. There is fossilized record of unicellular life going all the way back, so they tell us, to 3 or 3.5 billion years ago-only a billion years or so after the formation of the earth itself. There is no fossil record of the development of multicellular life until about 570 million years ago, 2.5 to 3 billion years after the appearance of unicellular life. Then there *is* a veritable explosion of invertebrate life, a riot of shapes and anatomical designs, with ancestors of the major contemporary forms represented, together with a lot of forms wholly alien in the contemporary context. ¹⁸ Now of course this enormous gap in the fossil record is logically compatible with TCA, but, given that God might very well have created specially, TCA seems at present unlikely. It requires epicyclic explanations of this and the other major gaps.

It is in areas like this that the problems lie; and finding sequences of intermediary forms between varieties of trilobites, e.g., does nothing to narrow such gaps. McMullin goes on: "They continue to uncover stage after stage in crucial "linking" forms, such as the therapsids, for example, the forms that related reptiles with the earliest mammals." This is misleading. It suggests that "they" have

discovered and continue to discover many linking forms that link, say, reptiles with birds or reptiles with mammals. But so far as I know, this is not so. So far as I know, for example, therapsids are the only candidates for a link between reptiles and mammals (and they have been known for some time). Although there is some controversy about the therapsids, perhaps they really could be thought of as linking forms between reptiles and mammals; but if TCA were true, one would expect vastly many more such forms. (Furthermore, Archaeopteryx, which was formerly the only serious candidate for a similar post linking reptiles and birds, has been demoted by the discovery of modern birds antedating it.) The fossil record fits versions of special creation considerably better than it fits TCA: it suggests the independent appearance of the major bauplans to which McMullin refers, with substantial evolution proceeding out from these Ur forms. The enormous gaps between the major forms would be much better accommodated on such a view than on TCA.

Finally, I referred briefly to the puzzles involving the molecular evidence in my paper; I'm happy to be given a chance to explain myself a bit. McMullin paints a rosy picture here: consilience piled upon serendipitous consilience. But I'd be inclined to see much of this thinking as more like a pious hope that has blossomed nicely into a foregone conclusion (as Quine says in another connection). As far as I can see, things here are not anywhere nearly as rosy as McMullin suggests. As a matter of fact (so it seems to me) the molecular evidence too fits better with some version of special creation than it does with TCA. McMullin summarizes the molecular evidence thus:

Comparison of the DNA, as well as of the proteins for which DNA codes, between different types or organisms show that there are striking similarities in chemical composition between them. Cytochrome C, for example, found in all animals, is involved in cell respiration. It contains 104 amino acids in a sequence which is invariable for any given species. For humans and rhesus monkeys, the sequence is identical except in one position; for horses and donkeys the sequence also differs in only one position. But for humans and horses, the difference is 13; for monkeys and horses the difference is 11. If instead of

cytochrome C another homologous protein is chosen, similar (though not necessarily identical) results are found. These very numerous resemblances and differences between the macromolecules carrying hereditary information can be explained by supposing a very slow rate of change in the chemical sequences constituting these molecules, and thus a relationship of common descent among the organisms themselves.

Cytochrome C is to be found in all living things (plants as well as animals); and the striking thing about it is that in general¹⁹ morphological differences among species are reflected in differences in their cytochrome C; that is, the greater the morphological difference between a pair of species, the greater the difference in their cytochrome C. Thus the cytochrome C difference between a horse and a dog is 6%; between a horse and a duck 10%; between a horse and a tuna fish, silkworm moth, sunflower, yeast, and bacterium it is respectively 18%, 27%, 41%, 42%, and 64%. (A similar pattern is found for hemoglobin, although nearby species differ more in their hemoglobin than they do in their cytochrome C.)

McMullin goes on:

Thus, the "molecular" differences between any two species become (on this hypothesis) a rough indication of how long since the ancestors of these species diverged; rather more securely, one can infer the relative order of branching between three or more species; one can infer whether *A* branched from *B* before *C* did. What is impressive here is the *coherence* [M's emphasis] of the results given by examining many different macromolecules in this light.

A bit later he adds: "If TCA is correct, one would *expect* the sort of coherences that molecular biology is now turning up in such abundance." Now my reading of these matters is different. (Of course the reader must remember that neither of us is expert here.) First, in terms of the overall picture, there is indeed that similarity between the morphological and molecular differences: morphologically similar contemporary forms of life tend to be molecularly similar, and morphologically different contemporary forms of life tend to be molecularly different. This initially fits well with TCA, but of course equally well with various

versions of special creation. (It fits particularly well with those that involve typology, the idea that God created ancestors of the main types of animal and plant life, with subsequent evolution.) So far, this evidence seems equal with respect to TCA and its denial.

But second and much more important. There are a number of representatives of very ancient lines: cockroaches, cyclostomes or lampreys, lungfish, some kinds of reptiles, and some of the forms to be found in the Cambrian explosion. These lines vary at the molecular level to a great degree; lampreys are molecularly just as far from the lungfish as they are from modern fishes. If TCA is correct, this means that in the past these lines must have been much closer to each other, in terms of their molecules such as Cytochrome C, hemoglobin, and so on, than they are now. If so, then, molecular evolution must continue on when morphological evolution has stopped. Present day lampreys are morphologically very similar to their ancestors of 350 million years ago, which is more than half way back to the beginnings of multicellular life. But while they are *morphologically* similar to those ancestors, they are *molecularly* very different from them-on TCA. The same goes even more emphatically for those contemporary forms of life that have representatives all the way back in the Cambrian.

This same conclusion can be reached by a different route. Consider the fact that bacterial Cytochrome C displays almost the same degree of difference from all the major groups. Lampreys and lungfish, for example, display the same degree of difference from bacteria (some 65%) as do human beings, pigs, chickens, rattlesnakes, carp, fruit flies, and wheat. There is no trace, at this level, of the traditional sequence: invertebrate, fish, amphibian, reptile, and mammal. All these forms, so far as their proteins go, are equally distant from bacteria; none can be thought of as molecularly more primitive than others. The so-called "higher" forms of life are exactly as distant, from bacteria, as the lower forms. (The same pattern is repeated *within* each of the major groups.) Lampreys and lungfish, however, have remained morphologically unchanged for hundreds of

millions of years; but the line culminating in human beings, for example, has (again, according to the theory) undergone a number of enormous changes. This sort of evidence can be understood, on TCA, only if we suppose that molecular evolution is "decoupled" from morphological evolution, so that in a line like that of lungfish and lampreys, while their remote ancestors were *morphologically* very similar to present representatives of those lines, those remote ancestors must have been very different from these present representatives at the *molecular* level. Molecular evolution must continue on after morphological evolution ceases; there must be something like a "molecular clock" that goes on ticking, in these forms, through the hundreds of millions of years when morphological evolution does not occur. Given the typological pattern of molecular similarities and differences among present organisms, TCA requires some kind of molecular clock: it requires, as McMullin says, "a very slow rate of change in the chemical sequences constituting these molecules" in all lines²⁰, whether or not they have undergone much morphological change, even if they have undergone no significant morphological change for hundreds of millions of years.

Is this "what one would *expect* this emphasis] if TCA is correct?" I don't think so. It certainly wasn't what E. Zuckerkandl, one of the pioneers in this area and one of the first to endorse the idea of a molecular clock, expected. Writing in 1963 (when the idea of a molecular clock was first being broached), he says:

Contemporary organisms that look much like ancient ancestral organisms probably contain a majority of polypeptide chains that resemble quite closely those of the ancient organisms. In other words, certain animals said to be "living fossils," such as the cockroach, the horseshoe crab, the shark and, among mammals, the lemur, probably manufacture a great many polypeptide molecules that differ only slightly from those manufactured by their ancestors millions of years ago.²¹

This, it seems to me, is more like what one would expect; but things have turned out very differently. This decoupling of molecular and morphological evolution is

not what one would have expected, if TCA is correct, and it constitutes still another epicycle for that theory.

The rate of molecular change is supposed to be much the same, for a given molecule, in all the various lines. But here there is another problem. One would expect the rate of change of this sort of variation to be a function (among other things) of generational length: forms of life with more generations per unit time should change more rapidly than those with fewer generations per unit time. But of course in some lines generations are vastly longer than in others. Thus some plants don't reproduce until they are 80 years old or so; elephants have a generational length of some 14 years; mice of some 2 months or so, and the generational length of yeast can be measured in minutes. If so, how can it be that the rate of change in the homologous molecules of these forms of life is approximately the same? Michael Denton (who cannot be suspected of theological special pleading, since he is not a theist) may be exaggerating when he writes, "There is simply no way of explaining how a uniform rate of evolution could have occurred in any family of homologous proteins by either chance or selection; and, even if we could advance an explanation for one particular protein family, we would still be left with the mystifying problem of explaining why other protein families should have evolved at different rates." Human ingenuity is nearly limitless; almost anything can be explained in one way or another; but it looks as if any such explanation will exact an epistemic penalty in the form of another epicycle or two.

Finally, the whole idea of a molecular clock has recently come under heavy fire. In the 1990 volume of *Evolutionary Biology*, Sigfried Scherer, after what appears to the layman (this layman, anyway) to be an impressive and thorough study of the molecular clock hypothesis, summarizes his findings as follows:

The protein molecular clock hypothesis (i.e., linearity of amino acid replacements compared with geologic time) has been tested empirically using ten different proteins, altogether representing more than 500 individual sequences from plants, animals and prokaryotes [i.e., bacteria]. In no case a linearity within reasonable limits of confidence could be found as would be expected based on

the clock concept: a reliable molecular clock with respect to protein sequences seems not to exist. This holds also for proteins such as cytochrome C or fibrinopeptides which usually have been considered as being reliable molecular clocks. It is shown that the relative rate test of the molecular clock is inconclusive. Thus, the prediction of divergence times based on protein structure is prone to error. Different approaches accounting for a nonconstancy of the rate of molecular evolution, questioning the molecular clock concept for theoretical reasons, are reviewed. It is concluded that the protein molecular clock hypothesis should be rejected.²²

The picture McMullin paints of the molecular evidence as wholly coherent with TCA and offering one new confirmation of it after another, a picture of consilience unrelieved by the slightest suggestion of disharmony—this picture seems to me to be very much at odds with the facts of the matter. So far as I can see, the molecular evidence does not confirm TCA; if anything it disconfirms it, by requiring still more epicycles. On the other hand, the typological structure of the molecular evidence fits very well with various typological views as to how God might have created some forms of life specially.

By way of conclusion: after reflecting on the replies offered by Van Till and McMullin, I remain confident that TCA is relatively unlikely given a Christian or theistic perspective and the empirical evidence. But this isn't where I want to place central emphasis. I would prefer to leave that question to Christian biologists, to people who know the evidence much better than I do, but are also keenly aware of the philosophical and, theological issues involved. (People like Jitse Vander Meer of Redeemer College.) I am most interested, first, in emphasizing the fact that there is the sort of battle I mentioned in the paper, and that current science, crucially including current evolutionary theory, is intimately involved in it, thus partly accounting for the striking and unusual role played by evolution in contemporary society. Second, I wish to emphasize the fact that there is no antecedent probability that God would create either by way of TCA or by way of GES; third, I want to argue that at the moment, anyway, it looks as if GES is very unlikely, given theism and the empirical evidence; this is because of

the difficulties in seeing how life could have arisen from nonliving matter just by way of the workings of the laws of physics and chemistry. Last and not least, I think TCA is no more likely than its denial of theism together with the empirical evidence. McMullin finds these things worrisome; what worries him, he says, is the "implication that Christian intellectuals should ally themselves with critics of evolution, despite the almost universal support it has among experts in the relevant fields of natural science." I think he finds this worrisome because he is afraid it will subject Christianity to the "laughter" that Galileo, following Augustine, worried about: "I suppose this is what worries me most about the strategy Plantinga urges on his Christian readers. The reader who proceeds on his advice to do battle with defenders of evolution all too easily risks causing the sort of 'laughter' that Augustine deplors, because of its negative effects on the credibility of the Christian message generally." But first, the expert consensus doesn't have quite the monolithic solidarity we might think. It is rather solid in the United States, but (for reasons that are no doubt sociological but remain obscure) less so in Europe. Pierre Grassé's doubts on the matter have been long known, for example; and according to Paul Lemoine (professor at the Museum of Paris), writing in *Encyclopédie française* (1965):

The result of this expose is that the theory of evolution is impossible. Basically, despite appearances, no one believes it anymore, and one says—without attaching any other importance to it—"evolution" in order to signify a "series of events in time"; or "more evolved" or "less evolved" in the sense of "more perfected," "less perfected," because such is the language of convention, accepted and almost obligatory in the scientific world. Evolution is a sort of dogma which the priests do not believe in any more, but which they keep up for the sake of their flocks.

It is necessary to have the courage to say this in order that the next generation may direct their research in another way.

And second, Augustine was speaking of stupid, or silly, or wildly uninformed ("delirious") mistakes: "Now it is very scandalous, as well as harmful and to be avoided at all costs, that any infidel should hear a Christian speak about these things as if he were doing so in accordance with Christian Scripture and should see him err so deliriously as to be forced into laughter."²³ That kind of error is, of course, deplorable; but opposition to current orthodoxy with respect to evolution does not automatically constitute delirious error. A Christian intellectual must

faithfully speak the truth as she sees it; the results can safely be left to God. Christians who oppose this current orthodoxy may no doubt sometimes have to put up with a bit of contempt or abuse from some quarters; but is that a matter of great concern? We Christians are called to speak the truth as best we can; if we do so, we run the risk of being despised by the cultured despisers; but is that really worth worrying about? I doubt it.

Notes

¹Although the paper by Scherer cited below suggests that Pun may be unduly optimistic about the molecular clock.

²*Science* (vol 250 (December, 19901) pp. 1665 ff. Simon won a Nobel Prize in economics, but also works in computer studies and psychology; he is currently professor of computer studies and psychology in the Department of Psychology at Carnegie Mellon.

³More simply, says Simon, "Fitness simply means expected number of progeny" (p. 1665). Why he thinks this is the rational course he doesn't explain; couldn't I sensibly say that while having lots of progeny might be best for my genes, I'm interested in my welfare, not theirs?

⁴See my "is Theism Really a Miracle?" *Faith and Philosophy*, April, 1986, pp. 131 ff.

⁵W. J. Bryant may have been a fool in many respects, but he had a more accurate picture of the cosmos than Carl Sagan (who if we may trust the Fourteenth Psalm, is also a fool)." Peter van Inwagen, "Genesis and Evolution" (The Kraemer Lecture at the University of Arkansas, March 31, 1989).

⁶In rejecting the semi-deist view, I am not claiming that God must have created "by bringing various kinds of living things suddenly to be" as McMullin suggests; it could be by a process as slow and gradual as you please. Claiming that TCA is improbable does not commit me to God's creating horses by, for example, saying

"Let there be a horse" and there immediately springing into being a horse. Perhaps God did it that way and perhaps not; but there are a thousand other ways he could have done it, and I make no suggestions as to which way he *did* do it. Augustine's seeds, for example, would do very nicely. (Augustine, by the way, did not accept TCA; he didn't believe, e.g., that mammals evolved from reptiles or amphibia from fish. Rather, what he held was that mammals arose from mammal seeds, reptiles from reptile seeds, amphibia from amphibia seeds, and so on.)

⁷Perhaps what Galileo really meant to say has less to do with the literal interpretation of Scripture, than with something else, something that isn't easy to state exactly, something like what the Scriptures seem initially, taken at face value, to teach, or what it seems initially (prior to much reflection) that the Lord intends to teach in the Scripture in question. In I *Kings* 7 v. 23 we read: "Then he made the molten sea; it was round, ten cubits from brim to brim, and five cubits high, and a line of thirty cubits measured its circumference." Taken at face value, this seems to suggest that the value of pi is 3. One supposes that Galileo would not hold that here the Lord intends to teach us that current mathematics is wrong about pi; no doubt he would agree that we shouldn't take this bit of Scripture at face value. This is not, however, because the bit of writing in question is to be understood figuratively.

⁸Consider even such an assured result as that the earth revolves around the sun and rotates on its axis. According to the usual interpretations of current relativity theory, there is no privileged frame of reference, no frame at absolute rest. But if that is true, then it isn't even clear what it means to say that in fact, contrary to Copernicus, the earth revolves around the sun rather than vice versa. That's true in some frames of reference, but not in others; and in principle (apart from matters of convenience, and the like) there is no more to be said for the former than for the latter.

It might be replied that at least Copernicus is controverted in that he held that there is a frame at absolute rest, which we now know is false. But the usual

interpretations of relativity theory are not themselves supported by knock-down drag-out arguments. One can also interpret relativity theory as nothing more than a recipe for translation from one frame of reference to another, so taken it makes no pronouncements on the question whether there is a frame at absolute rest. So taken, the claim that there is such a frame is quite consistent with it; perhaps the frame at absolute rest is given by the way God sees things. (And hence it could be, so far as knock-down drag-out demonstration goes, that the earth is the center of the universe after all!)

⁹ I also think reasonably plausible the traditional theistic affirmation of divine *concurrence* in the causal activity of his creatures.

¹⁰ *Prolegomena zur Geschichte Israels* (Berlin and Leipzig: 6th edition, 1905; republished in 1927) p. 296 (translation by Albert Wolters). Wellhausen is widely recognized as one of the giants of critical biblical scholarship. According to Albert Wolters, his *Prolegomena* has approximately the same status in biblical studies as Kant's first Critique in philosophy. My gratitude to Wolters for the references to Wellhausen, Gunkel, Young, Aalders, and Barr.

¹¹ *Genesis in Nowack's Hand konmentar zum Alten Testament* (translation by Albert Wolters).

¹² *Fundamentalism* (London: SCM Press, 2nd edition, 1981), p. 40.

¹³ Personal letter to David C. K. Watson, (April 23, 1984), published in the *Newsletter* of the Creation Science Association of Ontario, vol. 3, no. 4, 1990/91.

¹⁴ Here is another important point, on familiar from discussions of public education; if you hew to the methodological naturalization McMullin favors, you are very likely to wind up with the very sort of science you would aim at if your naturalism weren't merely *methodological* but (as you see it) the sober metaphysical truth of the matter. I therefore think "provisional atheism" is a good name for methodological naturalism, not because anyone who employs it is properly called an atheist (of course not), but because the results of using it in a given area will often be the very same as the results of assuming atheism or taking it for granted and arguing from there.

¹⁵ *Portraits of Creation*, ed. Van Tfil, Snow, Stek and Young (Grand Rapids: Eerdmans, 1990), p. 254.

¹⁶MCMullin's word "intervene" isn't a good one in the theistic context; God constantly supports every created thing in existence by way *of* activity without which the creature would disappear like your breath on a frosty morning; furthermore, according to the bulk of the theistic community, no creaturely action is so much as possible without his further concurrent activity. So he necessarily and constantly takes a hand in the operation of his creatures; he necessarily and constantly "intervenes" in his creation; were he to leave it to its own devices, even for an instant, it would vanish like a dream upon awakening. Creating something new-life, for example, or human life-isn't really in any sensible sense an "intervention" for him.

¹⁷ I am grateful to William Hasker and Richard Swinburne for calling this point to my attention.

¹⁸ "The real shocker for me is the worm that looks like it has kneecaps,' said Dr. Ellis L. Yochelson, a paleontologist at the Smithsonian Institution. He was referring to an animal known as Microdictyon." ("Spectacular Fossils Record Early Riot of Creation" *New York Times*, 4/23/91). (I am indebted to Phillip Johnson for this reference.) Until recently, the main source of fossils for the Cambrian explosion was the Burgess shale (in the Canadian Rockies) dating back, so they say, to 530 million years ago. In 1984, however, a sediment dating back to 570 million years was discovered in Yunnan, China, containing a vast wealth of fossils of invertebrate life-sponges, arthropods, worms, crustaceans, and the like. (Reported in the article just referred to.)

¹⁹Though not in every instance: cytochrome C differs in only one place between humans and chimpanzees, but in three places between very similar species of fruit flies.

²⁰"Another result may at first be surprising. Cytochrome C is still evolving slowly, and is doing so at a rate that is approximately constant for all species, when the rate is averaged over geological time periods. "The Structure and History of an Ancient Protein," by Richard E. Dickerson, *Scientific American*, April, 1972, p. 8.

²¹"The Evolution of Hemoglobin," *Scientific American*, 213 (5), p. 111.

²² I am indebted to Jitse Van der Meer for this reference, as for other good counsel and advice.

²³ *De Genesi ad Litteram Libri Duodecimi*, chapter 19.

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