

Also by Stephen Law
The Philosophy Files

The Philosophy Gym

25 SHORT ADVENTURES IN THINKING

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ILLUSTRATED BY DANIEL POSTGATE

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Conclusion

My conclusion is not that we shouldn't attempt morally to educate our children. In fact, I can't think of anything more important. Nor am I suggesting that this should never be done in religious schools. My aim has simply been to question the increasingly popular assumptions that morality is dependent on God and religion, that there cannot be moral value without God, and that we will not be good unless religion is there to show us the way.

What to read next

Chapters 7, Does God Exist?, and Chapter 1, Where Did the Universe Come From?, also discuss arguments for and against the existence of God.

Further reading

James Rachels, *The Elements of Moral Philosophy* (Singapore: McGraw-Hill, 1999), Chapter 4.

IS CREATIONISM SCIENTIFIC?

PHILOSOPHY GYM CATEGORY

WARM-UP

MODERATE

MORE CHALLENGING

What makes for a good scientific theory? The answer to this question isn't as obvious as you might think. Even scientists struggle with it. This chapter examines the claims and methods of creationists in order to bring out some of the difficulties in pinning down precisely what good science really is.

Creationism v. Orthodox Science

Creationists believe that the biblical account of the creation of the universe is literally true. God brought into existence the earth and all its life forms in just six days. According to creationists, this event took place less than 10,000 years ago (they base their calculation of the age of the universe on the number of generations listed in the Bible). They also believe that the biblical account is at least as well supported by the available scientific evidence as its rival.

The overwhelming majority of contemporary scientists, however, hold that the universe is much, much older. The universe, they say, started between ten and twenty billion years ago with the Big Bang, an unimaginably violent explosion in which matter, space and time itself came into being. The earth, according to the orthodox theory, is approximately four and a half billion years old. The first embryonic life forms emerged some three and a half billion years ago. Evolution, via the process of natural selection, then produced more complex life forms, including the first mammals about 200 million years ago and modern man – *Homo sapiens* – some 120,000 years ago.

Creationism has its own institute – The Institute of Creation Science – as well as its own conferences, publications and PhD-qualified researchers. For many of these people, creationism isn't just a scientific crusade, it's a moral crusade. According to H. M. Morris, a leading creationist:

Evolution is the root of atheism, of communism, nazism, behaviourism, economic imperialism, militarism, libertinism, anarchism, and all manner of anti-Christian systems of belief and practice.*

* H. M. Morris, *The Remarkable Birth of Planet Earth* (San Diego: Creation-Life Publishers, 1972), p. 75.

In the United States, creationists have fought hard to get creationism taught in schools. Two states, Arkansas and Louisiana, have now passed 'balanced treatment' laws, requiring that creationism be taught alongside evolution as equally respectable science. Even President George W. Bush believes creationism and evolution should be taught alongside each other; a spokesman said: 'He believes it is a question for states and local school boards to decide but believes both ought to be taught.'

Creationists have succeeded in persuading large swaths of the general public that their theory is at least as scientifically respectable as the Big Bang/evolution alternative. Recent Gallup polls indicate that about forty-five per cent of US citizens believe that God created human beings 'pretty much in [their] present form at one time or another within the last 10,000 years.'^{*} Even college graduates are drawn to creationism: about a third of college-educated Americans believe that the biblical account is literally true. A Tennessee academic who recently surveyed his own students writes that scientists like himself are 'having to fight the battles of the Enlightenment all over again. Medieval ideas that were killed stone dead by the rise of science 300 to 400 years ago are not merely twitching; they are alive and well in . . . schools, colleges and universities.'[†]

Yet there seems, on the face of it, to be overwhelming empirical evidence against creationism.

Take, for example, the *fossil record*. Examination of the rock beneath our feet reveals strata that have been laid down apparently over many millions of years. Fossils can be found embedded in these strata. And one finds different life forms fossilised in different levels. At the lowest levels, only very simple creatures are found. Higher up, one discovers more complex forms, including the dinosaurs. Higher still, one finds mammals. Only most recently deposited layers reveal traces of man.

This layering of the fossil record tallies well with the theory of evolution but seems to contradict the biblical account, in which all life forms were produced more or less simultaneously less than 10,000 years ago. If the biblical account were correct, one would presumably expect to find examples of the entire range of life forms fairly randomly distributed throughout the strata (assuming, that is, that the few thousand years that have elapsed since creation would suffice to allow such rock strata even to form).

^{*} *Guardian*, p. 14 of 'The Editor' section, 17 November 2001.

[†] *Ibid.*

According to creationism, for example, man and all the other mammals walked the earth at the same time as the dinosaurs. So surely one should expect to find fossils of both man and these other mammals muddled up in the same layers as dinosaur fossils. Yet mammals only ever appear in the higher strata. This seems to count fairly decisively against creationism.

Another piece of evidence that appears to weigh heavily against the claim that the universe is only a few thousand years old is provided by the light we see coming from long-dead stars. A light year is the distance travelled by light in one year. Many of the visible stars are many millions of light years away. It seems, then, that the light coming from these stars must have left them many millions of years ago. But if the universe is only a few thousand years old, how is this possible? It seems that God must have created the light *on its way* to the earth. But this entails that many of the astronomical events that we are now witnessing never happened. For example, suppose we seem to observe a supernova explosion 30,000 light years away. No such explosion took place. Rather, God created the illusion that it happened by sending these patterns of light and other radiation from a point less than 10,000 light years away. But this requires that God is a deceiver – He has deliberately produced the illusion of a much older universe, presumably in order to fool us. This is a conclusion few creationists are willing to accept.

Further evidence of a very old universe is supplied by, for example, plate tectonics. The observed rate at which the continental plates move across the surface of the earth, combined with the ample evidence of the plates having journeyed many thousands of miles, points to the earth being many millions of years old, not a few thousand.

How Creationists Defend Their Theory

The empirical evidence against creationism might seem overwhelming. But creationists argue that the situation is not so simple. Indeed, they have shown considerable ingenuity in trying to show how their theory also fits the available data.

Take the fossil record, for example. Creationists maintain that the layering in the fossil record can be explained by reference to the biblical Flood. The rains that caused the Flood were responsible for producing huge mud deposits that then metamorphosed into the rock strata we find beneath our feet. Creationists insist that the ordering of the life forms within these layers can also be accounted for in their theory. For example, some have suggested that the reason one finds dinosaurs below mammals is that

dinosaurs were slow, cumbersome and relatively unintelligent creatures that were likely to have been buried before the faster and more intelligent mammals that would have run to higher ground. As www.christiananswers.net attempts here to explain, nor should one expect to find fossils of humans in the lower sedimentary layers.

The layering we find in the fossil record can be more reasonably explained by Flood geologists as due to the order of burial of the different ecological zones of organisms by the Flood waters. For example, shallow marine organisms/ecological zones would be first destroyed by the fountains of the great deep breaking open, with the erosional runoff from the land due to torrential rainfall concurrently burying them. On this basis we would probably not expect to find human remains in the early Flood strata, which would contain only shallow marine organisms. The fossil record as we understand it at the moment certainly fits with this.*

Defenders of creationism have also shown imagination in accounting for the light we see coming from distant stars. For example, some have suggested that the impression of great age is due to a 'time dilation' caused by the rapid expansion of the universe out from the centre point at which the earth is located. Technical papers filled with equations have been published in support of this rival theory.

So creationists have been busy constructing a theory of increasing complexity to account for what we observe of the universe around us. They also believe that their theory 'fits' the evidence at least as well as the orthodox alternative. What creationist scientists practise certainly *looks* to many like solid, respectable science. As I say, some hundred million American citizens, many of whom are intelligent, college-educated people, believe that the earth is less than 10,000 years old. Have all these people been duped? Or is creationist science good science after all?

Falsificationism

One of the most intriguing theories of how science develops is offered by Karl Popper (1902–94). Popper actually accepts David Hume's (1711–76) extraordinary conclusion (explained in Chapter 14, Why Expect the Sun to Rise Tomorrow?) that scientific theories are never confirmed (we need not bother ourselves with Hume's argument here). However, in Popper's view, this is not a problem, as science does not proceed by means of theories being confirmed, but by means of theories being *falsified*.

* www.christiananswers.net/q-aig/aig-c014.html

Take, for example, the hypothesis that all swans are white. An observation of a single non-white swan is enough to falsify this hypothesis. Similarly, an observation of an action unaccompanied by an equal and opposite reaction is enough to falsify the hypothesis that all actions are accompanied by equal and opposite reactions.

That's not to say that all scientific hypotheses yet to be falsified are equally scientifically respectable. Popper points out that some theories are more falsifiable than others.

A vaguely formulated theory, for example, can be extremely difficult to falsify. Whatever happens, it may be possible for a defender of the theory to sidestep an apparent falsification by saying: 'Ah, but that is not quite what I meant.' A theory that's precisely formulated using clearly defined terms can be more easily falsified than one that is woolly.

In Popper's view, the more easily a theory can be falsified, the better. Wide-ranging and precisely stated theories are to be preferred to theories that have only a narrow focus or are vaguely formulated. Science progresses by means of the construction and testing of bold, highly falsifiable hypotheses.

Indeed, in Popper's view, a theory that is unfalsifiable – because whatever happens will be consistent with it – cannot properly be considered 'scientific' at all. Any *genuinely* scientific theory must have empirically testable consequences.

A Falsificationist Criticism of Creationism

Some falsificationists have attacked creationism on the grounds that it's unfalsifiable, and so not really science. Is this criticism fair?

Note, first of all, that creationism is not particularly precisely stated: it's difficult to say exactly what we should expect to observe given that creationism is true. This, by itself, makes creationism hard to falsify.

Secondly, the method adopted by creationists is not to test their theory by trying to falsify it. Rather, almost all their energies are expended on trying to protect their theory from being falsified. New bits are constantly being added to the basic creationist theory in order to account for what would otherwise be anomalous empirical data.

For example, when *still* no human fossils are found in the same layers as dinosaur fossils, creationists invoke an extra bit of theory to explain this, stating that the reason no human fossils are found is that God did not just drown these human beings, but He obliterated all sign of them: '[s]uch is God's abhorrence

of sin that its penalty must be seen for what it is – utter destruction and removal of all trace.”

In short, whatever is discovered that might at first sight seem to falsify creationism is always, with some ingenuity, shown by the creationists to be consistent with their theory after all. Either the basic creationist theory is amended or added to in some way, as with the addition of the God-destroyed-all-the-human-remains hypothesis to explain the absence of human fossils below a certain point, or else the veracity of the contrary ‘evidence’ is challenged.

So there is, according to the falsificationist, a fundamental difference between the creationists’ method and the scientific method. The creationists’ energies are expended almost entirely on devising ways of protecting their theory from being falsified. Whether or not one is prepared to accept falsificationism as a general theory of how science proceeds, the fact that the creationists’ method takes this form does appear quite damning.

A Creationist Reply

But hang on a moment. Is this really a fair criticism of creationism? Perhaps the situation isn’t quite as simple as this simple falsificationist criticism of creationism makes out. Surely the strategy of ‘adding on’ a bit to a theory in order to protect it from being falsified is actually perfectly respectable. Mainstream scientists do it, too.

Here’s an example. Newton’s theory of universal gravitation predicted a particular path for the planet Uranus. However, Uranus’s actual orbit deviated from the predicted path. The planet was seen to wobble in and out of its projected orbit as it travelled around the sun. This observation appeared to falsify Newton’s theory.

So why wasn’t Newton’s theory abandoned? What happened was this. Some scientists supposed that there must be *another*, as yet undiscovered planet in the vicinity of Uranus, a planet near enough and massive enough to affect Uranus’s orbit, thus explaining the wobble in a manner consistent with Newton’s theory.

THERE MUST BE
A PLANET HERE...



It subsequently turned out that there was such a planet: the planet Neptune. Indeed, it was those wobbles in Uranus’s orbit that led to Neptune’s discovery.

So here, too, we find an extra bit of theory being bolted on to the original in order to protect it from falsification. The ‘mystery planet’ hypothesis was added to Newton’s theory in order to save it from being falsified. And the addition of this hypothesis was considered scientifically respectable even before any mystery planet was discovered. So why shouldn’t creationists make similar moves?



Ad Hoc Moves

A falsificationist may point out that there’s at least one important difference between the creationist’s God-destroyed-all-the-human-remains hypothesis and the Newtonian mystery planet hypothesis. For the mystery planet hypothesis introduces all sorts of *additional, independently testable consequences* to Newton’s original theory, thereby making it *even more falsifiable than it was before*. The destructive God hypothesis, on the other hand, does not.

To illustrate this, note that the mystery planet hypothesis is highly falsifiable. For one can look and see if there really is a planet at the position at which one would expect to see one if Newton’s theory is correct. This becomes a further, independently testable consequence of the original theory. And, of course, a planet was discovered at the predicted position. On the other hand, the addition of the God-destroyed-all-the-human-remains hypothesis to the original creationist theory adds nothing to that theory in terms of independently testable consequences. This, according to many falsificationists, makes it an ad hoc manoeuvre, and so scientifically disreputable. While you can legitimately protect your core theory from being falsified by ‘adding on’ a hypothesis to protect it, such an addition must not be ad hoc.

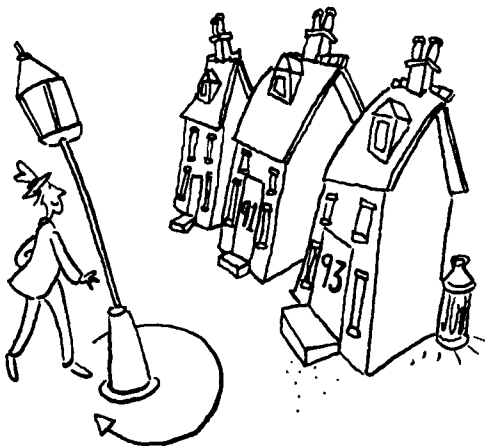
Are Ad Hoc Moves Always Disreputable?

In their defence, creationists may point out, again correctly, that even this sort of ad hoc move is sometimes made by mainstream scientists.

* Ibid.

Consider, for example, the heliocentric model of the universe on which the earth revolves about the sun. Soon after the heliocentric model was formulated by Copernicus, it was criticised by defenders of the old Aristotelian earth-centred model on the grounds that there was no observable *parallax*.

To illustrate: imagine that you walk around a lamppost while continuing to look exactly due north towards the houses across the street. As you rotate around the lamppost, your viewing position moves from side to side, making the houses in front of you wobble back and forth across your field of vision.



To begin with, number 93 is directly in front of you. Then it is number 91. Then it is number 93 again. Now if the earth goes round the sun, one would similarly expect the fixed stars to 'wobble' back and forth across our astronomical field of vision. But no such wobble could be detected. This appeared to falsify the new heliocentric theory. Indeed, it seemed strongly to confirm the old Aristotelian model on which the earth is fixed, with the sun rotating about it. However, some defenders of the heliocentric model suggested

that the reason there is no observable 'wobble' is that the stars are *too far away for the effect to be discernible*. The effect of parallax diminishes the further the relevant bodies are away from the observer. Just as one should not expect to discern any wobble if the houses viewed from one's lamppost vantage point are across the other side of town rather than just across the street, so one should not expect to discern any wobble in the stars' position if they, too, are at some relatively vast distance from us.

But by adding to the heliocentric theory the hypothesis that the stars are at some much greater distance than previously thought, weren't those defenders of the heliocentric model making an ad hoc manoeuvre? Yes, they were. For the addition of that hypothesis added little, if anything, to the original theory in terms of independently testable consequences. Yet the addition of the distant stars hypothesis did not and does not now strike us as being particularly scientifically disreputable.

The question, then, is: why shouldn't creationists indulge in similarly ad hoc moves?

Are Cats Martian Secret Agents?

Perhaps the best answer to this question is to point out that while scientists may occasionally make such ad hoc moves in defence of a theory, they ought not to make a habit of it. If more or less all their energies are expended on defending their core theory by ad hoc means, then they're no longer doing science. Their core theory has become an item of faith, to be defended come what may.

In fact, *any* theory, no matter how absurd, can continuously be defended against falsification by constantly adding to the core theory in order to make it 'fit' the data.

Suppose, for example, that I were to suggest that cats are really Martian secret agents. The fact that cats have fairly small brains, do not appear to possess any linguistic ability, do not appear to possess a method of transmitting their secret reports back to Mars, and so on might seem straightforwardly to falsify my hypothesis. But in each case more or less ad hoc moves can be made to salvage my theory. Perhaps cats do possess language – they just hide this ability from us. Perhaps their brains, while small, are particularly efficient, thus accounting for their superior intelligence. Perhaps their transmitters are located in their brains, which explains why we don't find them secreted about the house. By constantly adding to my basic theory in this way, I can continue to make it 'fit' all the available empirical evidence.

However, the mere fact that my theory can, given sufficient ingenuity, be made consistent with all the available evidence clearly does not establish that my theory is as scientifically respectable as the orthodox theory that cats are comparatively unintelligent and benign creatures. For almost all my energies are being expended on protecting my theory from being falsified. *That*, surely, explains why the activity I'm engaged in is not really science. My method may *resemble* the scientific method in certain respects, but differs essentially from it. Indeed, were I to continue to defend my cats-are-Martian-secret-agents theory in this manner, not only would I start to infuriate my audience, but I would quite properly be suspected of suffering from some sort of mental illness.

Yet the approach of creationist 'scientists' is essentially similar. Orthodox scientists who attempt to dismiss creationism quickly by wheeling out evidence that seems straightforwardly to falsify it often find themselves tied up in knots by opponents, who, armed with an array of more or less ad hoc moves developed by

the Institute of Creation Science, are able to show how creationism really does 'fit' the evidence after all. We aren't talking about one or two ad hoc moves being used to save a theory: we're talking about a theory made up of almost nothing else.

Confirmation

I have pointed out that the fact that creationists expend almost all their energy on 'adding on' ad hoc hypotheses to protect their core theory from being falsified tends to undermine its claim to scientific respectability. I am not suggesting, however, that the theory of falsificationism – which states that science progresses *only* through theories being falsified – is correct. There are well-known problems with falsificationism. Perhaps the most obvious is that falsificationists actually *accept* Hume's conclusion (explained in Chapter 14) that we never possess *any* grounds for supposing that a scientific theory is true. This is highly counter-intuitive. *Surely*, there *are* grounds for supposing that certain scientific theories are true. Theories aren't just falsified; they are also confirmed. So let's set aside Hume's worries about confirmation in order to consider the following question. Assuming, for the sake of argument, that scientific theories *can* be empirically confirmed, under *what* circumstances are they *best* confirmed?

It seems that in order for a theory to be strongly confirmed it needs to *make predictions that are both surprising and true*. That's to say, the theory should predict things that are likely if the theory being tested is true but *unlikely* otherwise. And these otherwise-unlikely-to-be-true predictions should turn out to be correct.

Consider, for example, the discovery of Neptune. In order to account for the wobbles in the orbit of Uranus, Newton's theory of gravitation required that there be an as yet undiscovered planet at a specific location. Now the probability of finding a planet at that location by chance was, of course, extremely small: space is *mostly* empty. So when it was discovered that there really was a planet at the predicted spot, that very strongly confirmed Newton's original theory. This is because the appearance of a planet at exactly that spot would otherwise be very surprising – a huge coincidence, in fact.

When a prediction derived from a new theory and subsequently confirmed is, on the other hand, what one would have *expected anyway*, given the old theory, this provides little, if anything, in the way of support for the new theory. Consider, for example, Einstein's theory of relativity. This theory predicts the tidal effect of the moon on the earth's oceans. To what extent does the existence of tides support

Einstein's theory over Newton's earlier theory? Not at all. For Newton's theory also predicts tides. The prediction about tides didn't come as much of a surprise.

Notice that the theory that life on earth has evolved is also strongly confirmed, for it also makes predictions that are both surprising and true.

Here's just one example. The theory of evolution predicts that, where fossils are discovered, they will be found in a particular order within rock strata. It predicts that there will be no *reversals* – one will never find, for example, even a single example of a mammal that was fossilised at the same time as and within the same rock layer as some very early, primitive life form. Evolutionary progression will be exhibited up through the strata. If, on the other hand, creationism is true and no process of evolution took place, then, *prima facie*, such reversals should be the rule rather than the exception. For example, mammals should appear more or less uniformly throughout the rock strata. Certainly, there should be a substantial percentage of such reversals (notice that, even if the creationists' Flood theory were correct, one should still expect a *reasonable percentage* of reversals: for example, at least *one or two* mammals among the millions of fossils excavated from the lower layers). The fact that, even today, after millions and millions of fossils have been excavated, not one single creditable and well-substantiated example of such a reversal has ever been recorded very strongly confirms the theory of evolution.

Is Creationism Strongly Confirmed?

This point about confirmation – that, in order to be strongly confirmed, theories need to *make predictions that are both surprising and true* – indicates another way in which creationism fails the test of scientific respectability. For it seems creationism is never strongly confirmed.

Evolutionists take risks, in the sense that they make predictions that, if their theory were false, would almost certainly be false. In predicting no reversals in the fossil record, for example, evolutionists take a huge risk. For, as I've explained, such reversals should otherwise be pretty common: if evolution were false, one would expect to find the fossils jumbled up across the rock layers. Were numerous, well-substantiated examples of such reversals suddenly to show up, that would spell disaster for the theory of evolution. But they don't show up, so the theory of evolution is strongly confirmed.

Creationism, on the other hand, generates few, if any, unexpected predictions, and still fewer predictions that are strongly confirmed. If, for example, we ask

creationists what we should expect to observe in the fossil record given their theory is true, they hedge. Were any species reversals found, they would, of course, be quick to claim that this confirmed their theory. But when no reversals are found, they deny this disconfirms their theory. Indeed, they claim that the absence of such reversals is what one should expect, given that the biblical account of the Flood is true. Because creationists are careful to take no risks with their predictions, their theory is never strongly confirmed.

Conclusion

It's tempting, when faced with creationist claims, simply to wheel out contrary evidence: the fossil record, for example. The problem with this strategy is that creationists soon tie their opponents up in knots. Just like a defender of my cats-are-Martian-secret-agents theory, they confound and infuriate their critics by constantly amending or adding to their core theory in order to protect it from being falsified.

In order to deal more effectively with creationists' claims and arguments, one needs to take a step back and look at their *method*. Sure, the approach adopted by creationists does in certain respects strongly resemble the scientific method. For in each case a theory of increasing complexity is developed, often with considerable ingenuity, to 'fit' the available empirical evidence.

However, despite the obvious resemblance to the scientific method, the strategy adopted by creationists is essentially unscientific. Almost all the creationists' energies are expended on devising ways of dealing with apparent falsifications. And, because they take great care not to make surprising predictions, their theory is never strongly confirmed.

In short, what creationists practise isn't good science – it's bunk.

What to read next

Chapter 14, *Why Expect the Sun to Rise Tomorrow?*, discusses Hume's famous argument, briefly alluded to above, that science is an essentially irrational activity.

Further reading

A thorough examination of the claims of creationism is provided by:

Philip Kitcher, *Abusing Science* (Cambridge, Mass.: MIT Press, 1982).

Popper's position on what distinguishes science from non-science is explained clearly and succinctly in:

Karl Popper, 'The Problem of Demarcation', in Nigel Warburton (ed.), *Philosophy: Basic Readings* (London: Routledge, 1999).

A short but penetrating discussion of creationism is also to be found in the excellent:

Theodore Schick Jr and Lewis Vaughn, *How to Think about Weird Things*, second edition (California: Mayfield, 1999), pp. 171–9.

For a useful Internet resource, see: <http://books.nap.edu/html/creationism>