GOD AND EVOLUTION

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Are religion and Darwinian evolution at odds?

1. Was Darwin an atheist and did he think evolution was atheistical?
2. Is modern evolutionary theory atheistical?
3. Are creationists right when they say evolution leads to atheism?
4. Are atheists right when they say the same thing?

1. DARWIN AND GOD

BACKGROUND

- Darwin was a straight theist when he went on his voyage at age 22 (raised Unitarian, but studied to become an Anglican priest)
- Darwin's wife (married when he was 29) was a devout Christian (Unitarian, not orthodox) all her life (she survived Darwin)
- Some historians believe Darwin lost his faith because his daughter Annie died at age 10

DARWIN'S LOSS OF FAITH

- In his *Autobiography* he says it was slow and peaceful, and occurred **before** he came to his evolutionary views
- He rejected divine activity **as an explanation** of natural processes (including natural selection)
- But he never attacked religion, nor did he think atheism was the necessary outcome of evolutionary thinking

THE LADY HOPE FRAUD

- In 1915, an Australian evangelist (Lady Hope) claimed she visited Darwin shortly before his death and that he had reconverted to Christianity
- Story rebutted by the family, in public
- Lady Hope was a known fabulist, but even if true, which runs contrary to all we know of Darwin, it does not change his scientific theory

2. DARWINISM AND GOD

Asa Gray, 1876: “one who is scientifically, and in his own fashion, a Darwinian, philosophically a convinced theist, and religiously an acceptor of the ‘creed commonly called the Nicene,’ as the exponent of the Christian faith.”

- **Darwin 1868:** “If we assume that each particular variation was from the beginning of all time preordained, the plasticity of organisation, which leads to many injurious deviations of structure, as well as that redundant power of reproduction which inevitably leads to a struggle for existence, and, as a consequence, to the natural selection or survival of the fittest, must appear to us superfluous laws of nature. On the other hand, an omnipotent and omniscient Creator ordains everything and foresees everything. Thus we are brought face to face with a difficulty as insoluble as is that of free will and predestination.”
  - *The variation of animals and plants under domestication*

RELIGIOUS REACTIONS

- Rev. Baden Powell: “Mr Darwin’s masterly volume supports the grand principle of the self-evolving powers of nature.”
- Rev. Charles Kingsley (author of *The Water Babies*): “I have gradually learnt to see that it is just as noble a conception of Deity, to believe that he created primal forms capable of self development into all forms needful pro tempore & pro loco [for the time and place], as to believe that He required a fresh act of inter-vention to supply the lacunas wh he himself had made.” Letter to Darwin 18 November 1859
- German Catholic bishops in 1860: “man as regards his body, emerged finally from the spontaneous continuous change of imperfect nature to the more perfect, is clearly opposed to Sacred Scripture and to the Faith.”

THE RISE OF CREATIONISM

- Evangelical reactions were cautiously positive: B. B. Warfield allowed evolution; *The Fundamentals* contained both criticism and acceptance of evolution
- First creationists were Seventh Day Adventists: George Macready Price published *Illogical Geology: The Weakest Point in the Evolution Theory* in 1906 and *The New Geology* in 1923.
- But creationism did not become widespread until after Morris and Whitcomb published *The Genesis Flood* in 1961.
- Not the default view of Christian churches.

DARWINISM AND RELIGION

RELIGIOUS AND SECULAR

- What do I mean by “metaphysical”?
  - Not scientific
  - Not political
- Two kinds of metaphysical responses:
  - Religious
  - Philosophical
- Overall message: while evolution itself has been widely accepted, many people have trouble with the idea of natural selection (“The Blind Watchmaker”)

PURPOSE IN LIFE

- Prior to Darwin there was a long history of teleological explanations for living things:
  - From Plato on, the explanation for organic growth and activity was determined by its *telos*, or goal
  - For Plato, this external, was given by the maker of the world (**providence**)
  - For Aristotle, this was innate, a part of the nature of organisms (**entelechy**)
  - Immanuel Kant famously said there would never be a Newton of a blade of grass, because purpose could not be given a material explanation

THE STANDARD STORY

- There is a textbook history that is common, but false:
  - All naturalists were creationists before Darwin [**False**: many naturalists back to Aristotle thought many species formed naturally, usually through spontaneous generation or interbreeding]
  - All naturalists thought that species were fixed and had eternal essences [**False**: people knew very well that species varied widely]
  - The church held that species did not form naturally [**False**: the Church's view was founded on Pliny's *Natural History*, which recorded Aristotle's views]
  - No Adam and Eve [**Partly true**] therefore theism is false

REACTIONS TO NATURAL SELECTION

- Few religious denominations made any objection to evolution (that species change over time and form new species)
- Until the 20th century, the target was **natural selection** itself
- The real objections to modern science by religions included Dalton's atomism (because it undercut the Catholic doctrine of transsubstantiation)
- What they objected to was the naturalisation of purpose, and the removal of providentialism
- There were also moral objections

MORAL OBJECTIONS

- If Darwin is right, thought some, then:
  - We should all be selfish and cheat
  - The poor should be left to die (called “social Darwinism” but actually a view that goes back to Malthus)
  - Kropotkin, a Russian anarchist, argued that cooperation, not competition, rules evolutio

THE HUMAN PROBLEM

- The Church swarms with people who have no spiritual sinew, and whose lungs cannot breathe the invigorating air of Truth: they take up the cry of that timid and decorous spinster who, on hearing an exposition of the Darwinian theory that men are descended from apes, said, “Let us hope it is not true, or if it is, let us hush it up.” [1893 sermon by R. F. Horton]
- Oddly, many religious agreed with human evolution, as it allowed some races to be considered less than fully human, a view still held today

THE LION OF THE SEASON.

GORILLAS AND IRISHMEN

MR. BERGH TO THE RESCUE.

THE DEGRADED GORILLA. "That *Man* wants to claim my Pedigree. He says he is one of my Descendants."

MR. BERGH. "Now, Mr. DARWIN, how could you insult him so?"

THE DESCENT OF MAN.

Figurative Party. "SO LONG AS *I* AM A MAN, SORR, WHAT DOES IT MATTHER TO ME WHETHER ME *GREAT-GRANDFATHER* WAS AN ANTHROPOID APE OR NOT, SOBR!"

Liberal Party. "HAW! WATHER DISAGWEEABLE FOR YOUR *GWATE GWAND-MOTHER*, WASN'T IT!"

THE ROMAN CATHOLIC CHURCH'S RESPONSE

- Initially, none
- There were responses by Catholics, both theologians and scientists, but not by the church *per se*
- In fact, the real issue in the 1870s was with the problems introduced by atomistic chemistry
  - If there is no "form/substance" in Dalton's chemistry, then the Host cannot be the form of bread and wine and the substance of the body and blood of Christ
  - The "solution" was to redefine "substance" as a metaphysical property.
- In 1909, Pius X declared special creation of the soul applied to people only.

THE CHURCH'S LINE: THE SOUL IS CREATED

- 36. ... the Teaching Authority of the Church does not forbid that, in conformity with the present state of human sciences and sacred theology, research and discussions, on the part of men experienced in both fields, take place with regard to the doctrine of evolution, in as far as it inquires into the origin of the human body as coming from pre-existent and living matter – for the Catholic faith obliges us to hold that **souls are immediately created by God**. However, this must be done in such a way that the reasons for both opinions, that is, those favorable and those unfavorable to evolution, be weighed and judged with the necessary seriousness, moderation and measure, and provided that all are prepared to submit to the judgment of the Church, to whom Christ has given the mission of interpreting authentically the Sacred Scriptures and of defending the dogmas of faith. Some however, rashly transgress this liberty of discussion, when they act as if the origin of the human body from pre-existing and living matter were already completely certain and proved by the facts which have been discovered up to now and by reasoning on those facts, and as if there were nothing in the sources of divine revelation which demands the greatest moderation and caution in this question. [Pius XII, Humani generis, 1950]

In his encyclical *Humani generis* (1950), my predecessor Pius XII has already affirmed that there is no conflict between evolution and the doctrine of the faith regarding man and his vocation, provided that we do not lose sight of certain fixed points. ... Today, more than a half-century after the appearance of that encyclical, some new findings lead us toward the recognition of evolution as more than a hypothesis. In fact it is remarkable that this theory has had progressively greater influence on the spirit of researchers, following a series of discoveries in different scholarly disciplines. **The convergence in the results of these independent studies—which was neither planned nor sought—constitutes in itself a significant argument in favor of the theory**.

...

Theories of evolution which, because of the philosophies which inspire them, regard the spirit either as emerging from the forces of living matter, or as a simple epiphenomenon of that matter, are incompatible with the truth about man.

John Paul II, October 1996

OTHER CHRISTIAN TRADITIONS

- Anglican: No comment; tends to accept evolutionary theory
- Presbyterian/Methodist: a mixture of opposition and acceptance
- Baptist [UK]: No comment
- Baptist [US]: mixture
- Seventh Day Adventists: total opposition, and creationism

OTHER RELIGIONS

- Hindu – no single aetiologies
- Muslim – some creationism (usu. rural Islam); urban sophisticates tend to accept
  - al-Jāḥiẓ (8thC) held to an evolutionary view
  - The Ahmadiyya school adopts theistic evolution
- Buddhist – no central view; some (Dalai Lama) object to randomness
- Marxist* – generally accepting; Stalinists adopted inheritance of acquired characters (Lamarckism, under the name of Lysenkoism)

* Yes, it's a religion…

IS DARWINISM ATHEISTICAL?

- Historically, no, but it depends on what counts as "Darwinism"
    1. Evolutionary change and the natural origin of species
    2. Natural selection, the lack of purpose and guidance
    3. Random variation

RESPONSES

- On **evolutionary change**, there is generally religious acceptance, although human relatedness to animals (apes) is often distasteful; however, this goes back to the devout Linnaeus
- **Natural selection** is widely rejected by religious thinkers in favour of divine evolutionary guidance
- **Randomness** is contentious; since many sciences (e.g., physics) involves random events, it is hard to reject, but it runs counter to an all-powerful and all-knowing deity
    - Worth noting that Darwin said random variation is not uncaused or chaotic, just not change for the benefit of the organisms

DARWINIAN ACCIDENTS

- Just in passing, I have argued that a creator might create a universe with chance events, which the creator knows ahead of time, by creating all of time at once
- This was Augustine's view; and also Leibniz's

Wilkins, John S. "Could God Create Darwinian Accidents?" *Zygon* 47, no. 1 (2012): 30–42. https://doi.org/10.1111/j.1467-9744.2011.01238.x.

THE SCOPE OF DARWINISM

- Darwinism (the science) applies to already existing **living** things
  - Not the *origin of life*
  - Not the *origin of the universe*
  - Not *metaphysics*
- Catholicism and evangelicalism often conflate the **science** with the views of **philosophers and public thinkers**

DOES DARWINISM LEAD TO ATHEISM?

- There are those atheists who think it does:
  - Haeckel (a pantheist)
  - Huxley (an agnostic, like Darwin)
  - Haldane (a Marxist)
  - Dawkins (a rationalist)

“Although atheism might have been *logically* tenable before Darwin, Darwin made it possible to be an intellectually fulfilled atheist.”

Richard Dawkins *The Blind Watchmaker*. New York: Norton, 1986, 6

FULFILLED ATHEISM

- What is an intellectually fulfilled atheist?
  - Dawkins clearly seems to think that it means one has an explanation for why things in the living world look designed (cf. also his *Climbing Mount Improbable*, 1996, p6)
- Yet biology is **not** designed like human objects are designed
- So, is there, in fact a problem, or was it created by natural theology (e.g., Paley)?

CONCLUSIONS

- Many evolutionists have been Christian, Muslim, Jewish, Hindu and Buddhist
- Many religious authorities and institutions have had no problem with evolution
- Many have had problems with natural selection

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Van Wyhe, John, and Mark J. Pallen. "The 'Annie Hypothesis': Did the Death of His Daughter Cause Darwin to "Give up Christianity"?"" *Centaurus* 54, no. 2 (2012): 105–123. [Available]

WEB RESOURCES

Cambridge University Darwin Correspondence Project:

- What did Darwin believe?
- Darwin and religion
- Darwin and Design

Darwin Online

- *Autobiography*
- Emma's (his wife) letter to Darwin

Other resources

- Talk Origins: The Lady Hope Story
- Wikipedia: Islamic views on evolution
- Wikipedia: Buddhism and evolution
- Wikipedia: Hindu views on evolution
- Wikipedia: Mormon views on evolution
- Wikipedia: Acceptance of evolution by religious groups
- Wikipedia: Theistic Evolution
- Vatican: Humani Generis [1950]
- HuffPost: Michael Ruse – Is Darwinism a Religion?
- Robert J. Richards: The Struggle over Evolution and Religion in the Nineteenth Century, with Ernst Haeckel as the Anti-Pope

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God And Evolution

The common view these days is that religion and evolution are in some manner incompatible, but ironically evolution was widely and almost universally adopted by the major denominations in the nineteenth century after Darwin published the *Origin* in 1859. One of Darwin's first defenders and popularisers was the Rev. Charles Kingsley, an Anglican minister, whose *The Water Babies* was published in 1862 and 63. In it he made use of a somewhat distorted account of evolution:

> Does not each of us, in coming into this world, go through a transformation just as wonderful as that of a sea-egg, or a butterfly? and do not reason and analogy, as well as Scripture, tell us that that transformation is not the last? and that, though what we shall be, we know not, yet we are here but as the crawling caterpillar, and shall be hereafter as the perfect fly. The old Greeks, heathens as they were, saw as much as that two thousand years ago...[Chapter 2]

The Water Baby in question, Tom, encounters a Professor Ptthmllnsprts who argues that men did not come from apes:

> He held very strange theories about a good many things. He had even got up once at the British Association, and declared that apes had hippopotamus majors in their brains just as men have. Which was a shocking thing to say; for, if it were so, what would become of the faith, hope, and charity of immortal millions? You may think that there are other more important differences between you and an ape, such as being able to speak, and make machines, and know right from wrong, and say your prayers, and other little matters of that kind; but that is a child's fancy, my dear. Nothing is to be depended on but the great hippopotamus test. If you have a hippopotamus major in your brain, you are no ape, though you had four hands, no feet, and were more apish than the apes of all aperies. But if a hippopotamus major is ever discovered in one single ape's brain, nothing will save your great-great-great-great-great-great-great-great-great-great-great-greater-greatest — grandmother from having been an ape too. No, my dear little man; always remember that the one true, certain, final, and all-important difference between you and an ape is, that you have a hippopotamus major in your brain, and it has none; and that, therefore, to discover one in its brain will be a very wrong and dangerous thing, at which every one will be very much shocked, as we may suppose they were at the professor.— Though really, after all, it don't much matter; because — as Lord Dundreary and others would put it — nobody but men have hippopotamuses in their brains; so, if a hippopotamus was discovered in an ape's brain, why it would not be one, you know, but something else.

> But the professor had gone, I am sorry to say, even further than that; for he had read at the British Association at Melbourne, Australia, in the year 1999, a paper which assured every one who found himself the better or wiser for the news, that there were not, never had been, and could not be, any rational or half-rational beings except men, anywhere, anywhen, or anyhow; that nymphs, satyrs, fauns, inui, dwarfs, trolls, elves, gnomes, fairies, brownies, nixes, wills, kobolds, leprechaunes, cluricaunes, banshees, will-o'-the-wisps, follets, lutins, magots, goblins, afrits, marids, jinns, ghouls, peris, deevs, angels, archangels, imps, bogies, or worse, were nothing at all, and pure bosh and wind. And he had to get up very early in the morning to prove that, and to eat his breakfast overnight; but he did it, at least to his own satisfaction. Whereon a certain great divine, and a very clever divine was he, called him a regular Sadducee; and probably he was quite right. Whereon the professor, in return, called him a regular Pharisee; and probably he was quite right too. But they did not quarrel in the least; for, when men are men of the world, hard words run off them like water off a duck's back. So the professor and the divine met at dinner that evening, and sat together on the sofa afterwards for an hour, and talked over the state of female labour on the antarctic continent (for nobody talks shop after his claret), and each vowed that the other was the best company he ever met in his life. What an advantage it is to be men of the world!
>
> From all which you may guess that the professor was not the least of little Ellie's opinion. So he gave her a succinct compendium of his famous paper at the British Association, in a form suited for the youthful mind. But, as we have gone over his arguments against water-babies once already, which is once too often, we will not repeat them here.
>
> Now little Ellie was, I suppose, a stupid little girl; for, instead of being convinced by Professor Ptthmllnsprts' arguments, she only asked the same question over again.
>
> "But why are there not water-babies?"
>
> I trust and hope that it was because the professor trod at that moment on the edge of a very sharp mussel, and hurt one of his corns sadly, that he answered quite sharply, forgetting that he was a scientific man, and therefore ought to have known that he couldn't know; and that he was a logician, and therefore ought to have known that he could not prove a universal negative — I say, I trust and hope it was because the mussel hurt his corn, that the professor answered quite sharply:
>
> "Because there ain't."

Here the debate being parodied is between Richard Owen, who said that there was no hippocampus major in the brains of apes, only in humans, which Thomas Huxley took great delight in showing to be wrong. Owen argued in favour of the "divines", the Anglican hierarchy to which he owed his station and position; Huxley in favour of a secular science. Both, however, were empiricists. Facts took priority over theory, even for Owen. I think I must have missed that British Association paper in 1999, though, for all that I am a Melbourne resident.

Kingsley's account was one of the reasons why evolution was so quick to be adopted. At the end of the 1860s, almost all scientists, and a large number of public

intellectuals, counted themselves "Darwinians", at least to the extent that they agreed that existing species had evolved from previous species by a process of modification. Even Owen accept the idea of modified descent, as evolution was called. What he and others did not accept, though, was the idea that the driving mechanism of evolution was an unguided process of natural selection. While evolution was adopted, natural selection was considered disagreeable to morality and religion. In fact, the notion that natural selection even *could* be an engine of evolution was at issue until almost 70 years later, although there were plenty of advocates for it, both scientific, and political.

Until the 1960s, the idea that evolution itself did not happen, that all living things are now as they were created a few thousand years ago, was the province of a few crackpots and the Seventh Day Adventist church, within which creationism developed in the early part of the twentieth century. While Darwin did object to "special creationism" (where the adjective "special" means "of species), it was a different beast. By Darwin's time, those who believed in special creationism held that species were the result of divine intervention, not natural processes, but they had accepted that this was an ongoing process over at least several millions of years, a view proposed by Georges Cuvier in the early part of that century.

Modern creationism, which held that the Bible was scientific and that the world was young, was invented, more or less, out of whole cloth by George Macready Price, a Canadian amateur geologist, in the 1910s. Objections to evolution itself had been made by a few, especially during the Scopes trial of 1925 by William Jennings Bryan, who used Price's ideas.

On the whole, though, religious institutions did not object to evolution. In fact, the Catholic intellectual community, when it met to discuss the latest innovations in science, objected first to Dalton's atomism, as it undercut the rationale for the doctrine of transubstantiation in the Mass. Darwin was discussed, but opinions were split. In the 1910s, though, German Catholic entomologist Erich Wassmann, argued that species could only modify so much, a view that dated back to Buffon in the late 18th century. The objections to evolution, and not just natural selection, were gathering pace.

In the 1960s, certain fundamentalists began to argue that the Bible (or in some cases, the Qurān) was scientific, and that what the holy writings asserted must be taken literally. This is therefore called 'literalism', and although it is a view that has persisted over the last two thousand years, it has always been a minority opinion amongst

believers. Most of the time, the scriptures were taken as being a mixture of allegory (metaphor and hidden theological meaning) and factual claims.

Still, there was something faintly worrying about evolution for many religious. It was taken to be a stalking horse for atheism, for immorality, and for opposition to religion. The proponents of evolution themselves did not help in this impression, either. From Thomas Huxley's agnosticism, to the views of the so-called "social Darwinists", traditional beliefs were seen to be under challenge. It did not matter that many religious also thought evolution was correct; only the opponents of religion were seen.

Today a similar trend exists: old arguments never die, as the philosopher John Dewey once noted, we merely get over them. Many proponents of evolution now say much the same things, although a lot more forcefully than in the older times. Evolution requires a loss of faith, a loss of belief in human specialness, and the relativising of morality. In this series, I aim to consider these and other issues that arise for the ordinary person trying to make sense of it all.

Moses Mainonides, a Jewish philosopher of the 12th century, wrote a book entitled *A Guide for the Perplexed*, about the philosophy of the day. This is something like that. While I will give my own views, I won't insist upon them. I have my conclusions; you come to yours. What this series will be predicated upon is the view that evolution *is* true. I won't argue for that. There are plenty of books and sites that do that. So if you think that evolution is not true, stop reading. You have nothing to learn from this, except how those with whom you disagree may think. That might be worthwhile, though.

Objections to evolution from the particular perspective of religion come in three forms: *the problem of creation, the problem of purpose* and *the problem of chance*. All other objections are general philosophical ones, and I'll discuss them under that heading.

The problem of creation

The majority of believers in the world either think God created the universe or shaped it from some prior substance. Consequently, when a scientific explanation reduces some previously divine work to natural phenomena, religious sensibilities are raised. Only the so-called 'Abrahamic' religions — Judaism, Christianity and Islam and their offshoots — are truly creationist in the sense that they believe God created the universe out of nothing, or as it is expressed in theological Latin, *creatio ex nihilo*, but all religions have a role for God or the gods making some things, especially humans.

This raises an immediate problem: if science tells us, based on evidence and explanation, that something that was thought to be the work of God is a natural process, it has both the effect of reducing God's effective action and undercutting some of the reason for believing in God. This is the problem of *naturalism*, or making natural what was God's domain. The term 'naturalism', however, is ambiguous. On the one hand it can mean giving a natural explanation through the use of scientific methods such as the use of human reasoning and observation. Or, it can mean the claim that only 'natural' things exist. The first is sometimes called 'methodological naturalism', and it is the underpinning of all science, and indeed all learning about the world. The second is sometimes called 'metaphysical naturalism', although I think it is instead a claim about what exists (which is called 'ontology' amongst the philosophical community). God might be natural in that sense. There is no real sharp dividing line between the natural and the supernatural that would satisfy most believers. For example, human nature for some is held to include a soul, which is divine. So let us call the second kind *ontological* naturalism.

'Nature' is a very variable word. It can mean many things, including the world apart from human intervention, or it can mean what is physical, or it can mean the underlying causes of behaviours (as in 'human nature'. So when a philosopher or theologian talks about 'naturalism', it pays to pay attention to what they think it contrasts with. In theology it often means what is not divine, that is, what is not *super*natural. However, theology, at least in the Islamic-Christian tradition, has several alternative accounts of God's actions and cause. One of these is called 'occasionalism', a view devised by the Muslim philosopher al-Ghazali in the 11th century: there is *no* natural cause for anything. If you light a match and it burns, it is because God made it do so, not because matches are made from chemicals that tend to burn when struck. Few Christian thinkers accept this, however, and they often make a different distinction: between *primary and secondary causes*.

A *secondary* cause is a usual natural cause. Matches burn because they *are* made from stuff that ignites when struck. But the *existence* of that stuff is God's doing. This is the *primary* cause. The idea that God is the primary cause of what exists, comes from an idea of Aristotle's, the Greek philosopher. He thought that nothing changed ('moved') unless something acted on it. Since it is clear that change occurs in a regular way, then what makes *this* thing change must have been, in its turn, moved by something else. The Greeks didn't much like infinity, and so there must, he reasoned, have been a first mover; it had to terminate in something that was, of its nature, in motion. Incidentally, this is

what made Newton's first law so radical: he thought the exact opposite of Aristotle, that things tend to move (in a straight line) unless they are *stopped* by something from doing so.

With this in hand, we can ask if things are caused by something to exist. Another argument from the Muslim thinkers is the so-called *Kalam Argument*. According to this view, which is championed today by William Lane Craig, if we observe that something has a cause, then it has to have had a cause in its own fashion, and so on. This implies to Craig that there had to have been a cause for everything that exists, by extrapolation from what we observe. Critics say that a cause *within* a universe is one thing, a cause *of* a universe is another. As David Hume, the 18th century Scottish philosopher noted, you can't make inferences from things you observe *in* the universe *to* the universe itself.

This of course doesn't stop people from trying. That subsection of physics known as 'cosmology' offers explanations of our universe as something generated by prior or larger universes in what is called the 'multiverse', a staple of many bad science fictions shows. But this is untestable (so far) and anyway it just pushes the issue back a step. In such arguments, you can simply replace 'universe' with 'multiverse'.

But none of this has anything much to do with evolution. There is a common misunderstanding that evolution is about the origins of the universe or of life itself. In fact, modern evolutionary theory is about what happens *after* both events. For the origins of life, you have to go to the chemists and geologists, who have not so much a lack of theories as too *many* theories. Every second month, it seems, there is another way that life could arise published in the literature, all of which are quite feasible. In such cases, we know that it is *possible* that life could arise naturally, but we may never know exactly *how* it did. If there were only one feasible way that life could arise, then we could have some confidence in that explanation being true, but as it is we have partial explanations for what might even be separate steps in the origin of life. They may all be true, and what life we now see is what 'won'. At least one philosopher has proposed that there might be 'life' now we don't even notice, because it uses vastly different chemistry from our own, but this is so far just a supposition.

So the real issue for theology with evolution has to do with the idea that there are things in the universe that are the result of a natural process, and in particular living things, and in particular again, us. Almost everyone (except occasionalists) think that some things naturally cause other things. So we can take that as read. If you don't think that, then science itself becomes impossible, and we are no longer able to argue about the

issue. The beginnings of science can be found in the very early Greek speaking philosophers who thought that things had natures, and were not just the actions of gods on whim. This was a major break with previous ideas. It made possible attempts (very crudely at first) to explain why things happened, rather than simply repeating 'the gods did it', which, as it applies to everything that possibly could happen, explains precisely nothing. But if things have natures, that is, internal properties that cause them to behave as they are seen to behave, then the task of the natural philosopher (which is what scientists were called before that term was invented in the 19th century) is to uncover these natures. This permits us to predict how they will behave, such as predicting what will burn and under what conditions, or when an eclipse might occur. This allows us to manipulate these things.

Of course, all learning about the world, whether scientific in a formal manner or not, involves observing it, and well before science evolved this is how we learned to make spears, smelt iron, grow crops and breed animals for our purposes. But prescientific thinking often invented 'explanations", like the Chinese notion of Chi or the idea there is a 'vital force' in living animals, which turned out not to have any real scientific basis. We can have useful knowledge without understanding it. A good example is the case of Balinese agriculture before the arrival of Europeans. Over hundreds of years, the Balinese planted rice and diverted water according to a Hindu calendar of festivals, but when the Europeans came, they inserted European techniques. However, these techniques did not take into account the special developmental requirements of rice, and the result was a series of poor crops and erosion. The Hindu system contained knowledge (justified by theological narratives and festivals) that made Balinese agriculture successful. Nobody 'knew' this knowledge, but it worked because the festivals were modified to make it work over many years. The explanations offered, however, were not themselves scientific.

Likewise, in the Bible, and right up until the invention of modern genetics, it was common 'knowledge' that the experience of a pregnant animal would affect its progeny's characteristics. In Genesis 30:37–43, Jacob tricks Laban by placing striped and speckled poles before the stronger breeding sheep and cattle so they would be striped and speckled, and he would get them under the terms of his agreement with Laban. Likewise, as late as Darwin you find accounts by breeders of experience of the mother affecting the progeny. Yet, for all these errors, breeders were still able to breed varieties of quite remarkable diversity, as the pigeons Darwin bred indicate. So their explanations of their success is quite different from the explanations we now hold to be true in our best science.

Thus, it does not follow that all our knowledge is based on science, nor that all we do know was gained through the use of scientific method. We gain knowledge by trial and error, but we do not always *understand* why it is knowledge. The idea that all knowledge is based on science, and that religion is not a way of knowing, is a far more complex question than it may seem. All knowledge is gained by trial and error through observation, but it need not be the case that the religious explanations are correct. Nor need they be false in one way: they *can* encode information gained that way.

That said, the conflict between religious stories, sometimes called *etiologies* (from the Greek for 'causes' or 'accounts'), and science can be severe. People have a great emotional commitment to stories that play a role in traditions, and which serve to shore up communal identity. In particular, they find scientific reductions of ideas like the origins of life, of species, and of humans in particular very challenging. This is understandable. Similar things happen in other domains as well, such as national myths. While this is psychologically understandable, it isn't philosophically interesting: it gets called 'psychologism' in those debates. Psychologism is the view that our psychology is the same thing as our knowledge or logic. Philosophers distinguish between what we want to think and what we should if we are being reasonable. Even though we may wish things to be one way, if reason and evidence points in another direction, we should follow them, not our preferences. As Bishop Butler wrote in the 18th century:

> Things and actions are what they are, and consequences of them will be what they will be: why then should we desire to be deceived? [Bishop Joseph Butler, *Fifteen Sermons*, Sermon VII, §16.]

The interventionist belief

All religions bar a few rather philosophical varieties have God or the gods intervening in the 'natural' order. This is because gods are *agents*, which is to say they have goals and purposes and act to realise them. Some religions have inactive gods (Epicurus' gods contemplated their own perfection, and had no interest in the finite and imperfect world) but almost all the religions that people follow have active deities.

Many people accept that evolution occurs, but deny that it happens naturally, at least when God's purposes are involved. Darwin himself argued (in the final chapter of the *Variation*) that evolution was independent of God's interventions, when debating his friend and defender, the Christian botanist Asa Gray, who held that God intervened in evolution to make humans come out as the end product, by making the right chance

mutations occur. Darwin's response was that this would undercut the whole point of evolution by natural selection, since selection is the 'designer' and not the processes (which he didn't understand, since mutation was not known at the time) that provided the building blocks.

The idea that God intervened, as a micromanager would in ensuring that their staff delivered the 'right' outcomes, is sometimes called 'theistic evolution' or TE. This is a widely held view. Strict naturalists think of it as a kind of creationism, and it is, but not in the usual sense of God creating species *ex nihilo*.[1] It is creationist in the sense that God is the primary cause of all that is, and occasionally a secondary cause of individual events. In short, it is an occasional occasionalism. We'll address God's purposes in the next section, but for now let's consider the role of causation here.

Saving creation, Darwin and naturalism

'Darwinian' evolution is the idea that events cause variation on which natural selection acts to modify a population to become better adapted to the 'conditions of life', or the environment in which that population lives. This is not to say that every change that happens to a population is the result of natural selection. A process known as genetic drift is caused when the next generation randomly samples the genes of the past generation, and the sample is not representative of the genes that existed. However, what is often called 'Darwinian' evolution is natural selection, so we'll focus on this.

It is possible to set up a situation where the 'right' mutations exist so that an outcome can be forced by natural selection, so long as you also know the conditions in which the population will live. This can be, and has been, done experimentally and in computer simulations. But for God to do it, he needs to know that the mutations exist, and what the environment is in which they will be selected, as well as the size and distribution of the population. This involves there being a world in which the right conditions happen.

So God would need to ensure these conditions and mutations. It is well understood that in natural terms mutations are chance events. A mutation occurs when for one reason or another a gene is copied incorrectly in a number of ways. These are chance events, but not uncaused — every mutation is caused by surrounding conditions, which might be a chemical, or a radiation particle, or just thermal energy acting on the

[1] *Creatio ex nihilo* is a late doctrine in Jewish scriptures, arising in II Maccabees 7:28, after the Hellenic world invaded Palestine. The Genesis creation stories have YHWH or El creating order from prior chaos.

molecule at replication (that is, when the DNA molecule is duplicated when a cell divides).Also, he would need to ensure that the environment is what it needs to be. Since all these things are caused by physical processes ranging from weather, incoming meteors, geological processes, an so on, nothing remains to be explained in other than physical terms.

The sense of 'chance' will be explored later, but for now it means, roughly, that an event cannot be predicted. God, however, has no such limitations: He *can* predict how things will turn out, because he has complete information and no limits on how much computing he can do, by definition. So if things are caused in a predictable fashion, God can design a world in which all these things will happen as he wants, without intervention.

But what if he cannot? What if, for example, quantum events are unpredictable even in theory? Could God create a world in which Darwinian accidents occur such that they will lead to the goals he has in mind? I think he could, and here is my argument:

Suppose God can simulate entire universes in his mind. As an analogy, suppose God has a supercomputer on which he can simulate all possible universes or worlds, the way we now simulate evolution on computers. Computers are generally determined: they run programs in a way that the results are forced by the programming. However, when simulations of evolution are run on computers, they often introduce a degree of randomness by using a RAND() function. These, in our computers are only pseudorandom; they are not properly random. But presumably God has either a truly random function, or his pseudorandom function is in every observable respect random to those within the universe.

Now God can simulate any universe, and so he runs full simulations for all possible universes, and picks the one that best meets his providential goals. This is, according to Gottfried Wilhelm Leibniz, a 17th century philosopher and polymath, 'the best of all possible worlds'. This notion was parodied by Voltaire in his novel *Candide*, but Leibniz never said that every event *in* the world was optimal, only that the whole universe was, so it allows for there to be individual cases of evil and tragedy within it.

So God runs either a very large number of simulations or all possible simulations including those with random events, picks the best world, and makes it real (pours in the ontological cement, as it were). In this world, we have fully Darwinian accidents, a contingent evolutionary process, but it's a world that realises God's goals. This is a higher

level kind of theistic evolution. God is not a micromanager on this account, but truly a creator. This would permit God to be a creator of Darwinian accidents and secondary causes, without contradicting God's role as primary cause.

This allows theists to be both committed to natural science and the basic beliefs of creation.

The problem of purpose

When Darwin published the *Origin*, he was lauded by his Christian friend and correspondent Asa Gray, who wrote:

> "...Darwin's great service to Natural Science in bringing back to it Teleology: so that instead of Morphology versus Teleology, we shall have Morphology wedded to Teleology"

Darwin replied soon after in a letter:

> What you say about Teleology pleases me especially and I do not think anyone else has ever noticed the point.

Gray later wrote a long essay arguing for an evolutionary teleology. The term *teleology* means the study of the purposes of things, and we can just replace it with "'purpose".

Under Aristotle's philosophy, there were four 'causes' (or accounts, *aitia*) of why things occurred. They were: the material it was made of (material account), the thing that made it change (efficient account), the form it had (formal account) and what it was for (final account). Thus, a house might be made of brick, be built by artisans, have the shape of a box, and be for living in. Explanations in terms of 'final causes' or goals or purposes were the stuff of science for the next two thousand years.

At the beginning of modern science, though, Francis Bacon wrote:

> '... the research into Final Causes, like a virgin dedicated to God, is barren and produces nothing. [*The Advancement of Learning*, 1605, book III, ch V]

Bacon's barren virgin theme became the standard for most sciences thereafter, except in biology. Living things were thought by all to have purposes. The famous philosopher Immanuel Kant even went so far as to declare that there would never be a Newton of a blade of grass, because living things had 'purposiveness' (*Zweckmassigkeit*) which could not be explained in physical terms.

The natural theology movement from the 17th to the 19th centuries attempted to explain living things in terms of the purposes for which they were made by God, and from this to uncover the aims God had. Unlike the modern intelligent design movement, rather than working from the appearance of design to proving God's existence, they reasoned from the functions and roles of things *to* God's nature and providence. This culminated in the work of authors like William Paley, who found design in everything based on the assumption of God's goodness and plan.

There are two kinds of purpose in the tradition. One is the *external* purpose of God or Nature. The other is the *internal* purpose that things, especially living things, might have in their nature (*entelechy*), and drives them to their natural end. To illustrate the difference, external purpose might bring order to an otherwise unruly nature, by command or imposition. If the world tends to be chaotic, then God gives it a purpose by imposing harmony and order, a view that had a lot of traction in the early and medieval period of Christianity.

Internal purpose, however, implies that things are innately going to fulfil their purpose without any guidance. Evolution might be progressive towards some 'Omega point' if living things have internal purpose. This view, too, has forerunners in the middle ages, and found its best expression in the work of Teilhard de Chardin, a Jesuit theologian of the early 20th century.

Both of these kinds of purpose are widely accepted in various theistic theologies. But the standard view, expressed by Aquinas, is that internal purpose is what God gave to things:

> The natural necessity inherent in things that are determined to one effect is impressed on them by the Divine power which directs them to their end, just as the necessity which directs the arrow to the target is impressed on it by the archer, and does not come from the arrow itself. There is this difference, however, that what creatures receive from God is their nature, whereas the direction imparted by man to natural things beyond what is natural to them is a kind of violence. Hence, as the forced necessity of the arrow shows the direction intended by the archer, so the natural determinism of creatures is a sign of the government of Divine Providence.

External purpose is not the primary reason things have purpose, but a secondary reason. Roughly, if God has to intervene, then that is because he needs to cause something that would not have otherwise occurred.

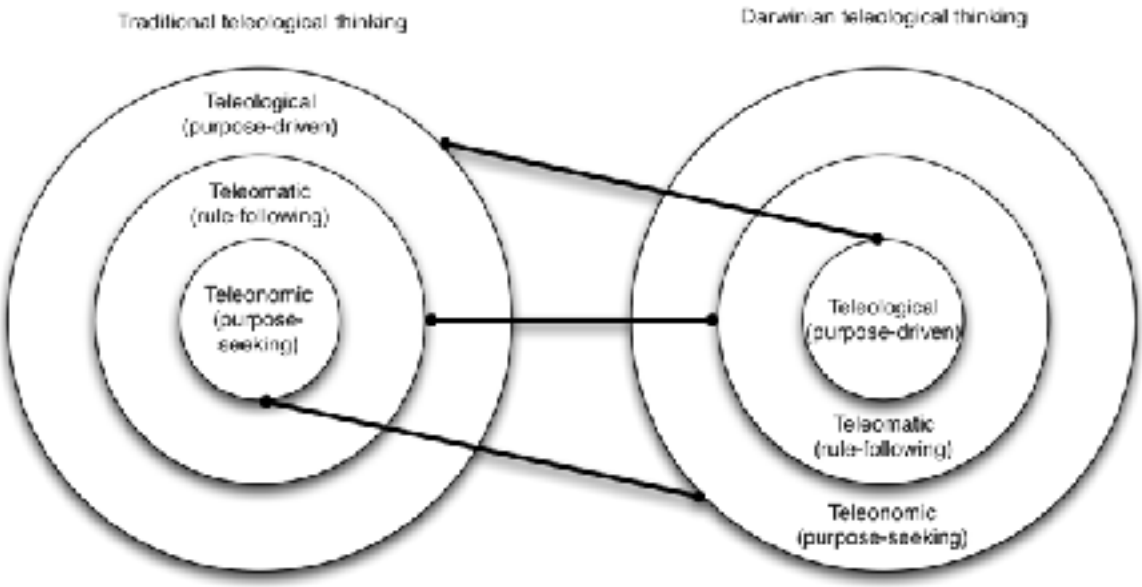
The purposes of selection

Despite Darwin's approval of Gray's comments, natural selection was profoundly problematic for believers. It implied that the appearance of purpose in the living world was a byproduct on an unintelligent designer. Selection was simply a physical process that resulted in organisms and organs that were fit for the environment in which they lived. In short, Kant's purposiveness was a byproduct of unpurposeful processes. Many believers felt this removed the natural world from God's plan. It meant that God was no longer needed to explain why the world had harmony: things that were not harmonious (adapted) tended to die out.

So the real issue was this: natural selection involved purpose *after* and not *before* the adapted part evolved. Forethought implies God's design, but if purposes can be evolved themselves, this means that what has happened had no general purpose, just lots of local little ones, and they might in fact be competing as well.

In short, natural selection delivers neither internal nor external purpose, because it doesn't imply that the purpose is the result of a plan or goal. Progress towards goals therefore becomes a limited and immediate thing, not generaliseable.

In modern philosophy of biology, this gets called 'teleonomic', in which the purpose or meaning of some trait or gene has the 'purpose' of doing what it does because it allows the organism that carries the trait or gene to survive and reproduce. The other two kinds of purpose are called teleology, as mentioned, and teleomatics. **Teleology** is *purpose driven*, teleomatics is *rule following* (law-driven behaviour) and teleonomy is *purpose seeking*. We can illustrate this with a diagram:



Where the pre-scientific, sometimes called 'Aristotelian', view held that the laws of nature (teleomatic processes) were the result of purpose, and so things had innate purposes (teleonomics), the Darwinian and modern view seems to hold that the laws come first, then things evolve that have purpose-like behaviours such as functioning parts, and then, and only then, are there goal seeking things like humans with plans and intentions. Purposes become a fact of nature, shrunk down from the global nature of things to a small part of things. Organisms have purposes because they evolved them, and there is no place in this conception of nature for teleology to be the driving force of the world. At least, that is how it is seen by those who think Darwinian evolution presents a problem for belief. This includes not only theists, but those who think theism is incompatible with science, such as atheists who are exclusivists, that is, think that science precludes belief in gods.

Providence and plans

The problem for theists is that most theisms assume that God has a plan. This is sometimes called providence: God provides for goals he has, for the benefit of the organisms, and in particular for humans, and for the achievement of his purposes. As soon as Darwin published, this became an issue, especially among evangelicals in America. Charles Hodge, the famous Princeton theologian, published his *What is Darwinism* in 1874 in which he argued that there were only three alternative views available to Christians: God created everything, God intervenes in physical processes, or atheism, and Darwinism was atheism, because it eliminates design from the universe.

Not all theisms are providential. Some, for example Japanese Shinto, or Buddhism, allow that the universe is a process in which things happen according to their natures, and humans either have to find ways to survive this or find redemption or nirvana themselves. But the major theisms of Judaism, Christianity and Islam are providentialist, and for them, Darwinism seems to present the conundrum that Hodge engaged. He decided that the existence of physical law itself was a providential act, but that was insufficient: God had to have done more than provide 'chance and necessity' to create. He had to act personally.

Darwin, on the other hand, argued that giving credit to God undercut the very need for natural selection as a physical process. In the final chapter of the *Variation of Animals*

and Plants under Domestication (1868), he took Asa Gray to task for suggesting that God made available to selection the variations it needed to achieve God's plan:

> ... if an architect were to rear a noble and commodious edifice, without the use of cut stone, by selecting from the fragments at the base of a precipice wedge-formed stones for his arches, elongated stones for his lintels, and flat stones for his roof, we should admire his skill and regard him as the paramount power. Now, the fragments of stone, though indispensable to the architect, bear to the edifice built by him the same relation which the fluctuating variations of each organic being bear to the varied and admirable structures ultimately acquired by its modified descendants.
>
> Some authors have declared that natural selection explains nothing, unless the precise cause of each slight individual difference be made clear. Now, if it were explained to a savage utterly ignorant of the art of building, how the edifice had been raised stone upon stone, and why wedge-formed fragments were used for the arches, flat stones for the roof, &c.; and if the use of each part and of the whole building were pointed out, it would be unreasonable if he declared that nothing had been made clear to him, because the precise cause of the shape of each fragment could not be given. But this is a nearly parallel case with the objection that selection explains nothing, because we know not the cause of each individual difference in the structure of each being.
>
> The shape of the fragments of stone at the base of our precipice may be called accidental, but this is not strictly correct; for the shape of each depends on a long sequence of events, all obeying natural laws; on the nature of the rock, on the lines of deposition or cleavage, on the form of the mountain which depends on its upheaval and subsequent denudation, and lastly on the storm or earthquake which threw down the fragments. But in regard to the use to which the fragments may be put, their shape may be strictly said to be accidental. And here we are led to face a great difficulty, in alluding to which I am aware that I am travelling beyond my proper province. An omniscient Creator must have foreseen every consequence which results from the laws imposed by Him. But can it be reasonably maintained that the Creator intentionally ordered, if we use the words in any ordinary sense, that certain fragments of rock should assume certain shapes so that the builder might erect his edifice? If the various laws which have determined the shape of each fragment were not predetermined for the builder's sake, can it with any greater probability be maintained that He specially ordained for the sake of the breeder each of the innumerable variations in our domestic animals and plants;— many of these variations being of no service to man, and not beneficial, far more often injurious, to the creatures themselves? Did He ordain that the crop and tail-feathers of the pigeon should vary in order that the fancier might make his grotesque pouter and fantail breeds? Did He cause the frame and mental qualities of the dog to vary in order that a breed might be formed of indomitable ferocity, with jaws fitted to pin down the bull for man's brutal sport? But if we give up the principle in one case, —if we do not admit that the variations of the primeval dog were intentionally guided in order that the greyhound, for instance, that perfect image of symmetry and vigour, might be formed,—no shadow of reason can be assigned for the belief that variations, alike in nature and the result of the same general laws, which have been the groundwork through natural selection of the formation of the most perfectly adapted animals in the world, man included, were intentionally and specially guided. However much we may wish it, we can hardly follow Professor Asa Gray in his belief "that variation has been led along

> certain beneficial lines," like a stream "along definite and useful lines of irrigation." If we assume that each particular variation was from the beginning of all time preordained, the plasticity of organisation, which leads to many injurious deviations of structure, as well as that redundant power of reproduction which inevitably leads to a struggle for existence, and, as a consequence, to the natural selection or survival of the fittest, must appear to us superfluous laws of nature. On the other hand, an omnipotent and omniscient Creator ordains everything and foresees everything. Thus we are brought face to face with a difficulty as insoluble as is that of free will and predestination. [volume 2, pages 430–432]

Darwin is claiming that if we grant the theory of natural selection is sufficient to explain adaptation, then we have no need to impose God's plan, and indeed God would be responsible for every 'injurious' variant as well, which seems impious. However, in his last sentence, the final sentence of that work, he leaves open a solution, and it is a solution leapt upon by many theologians.

One such theologian is William Temple, who once said

> I prefer a God who once and for all impressed his will upon creation, to one who continually busied about modifying what he had already done.

In his Gifford Lecture, *Nature, Mind and God* (1934), he wrote

> '... no Law of Nature as discovered by physical science is ultimate. It is a general statement of that course of conduct in Nature which is sustained by the purposive action of God so long and so far as it will serve His purpose. No doubt it is true that the same cause will always produce the same effect in the same circumstances. Our contention is that an element in every actual cause, and indeed the determinant element, is the active purpose of God fulfilling itself with that perfect constancy which calls for an infinite graduation of adjustments in the process. Where any adjustment is so considerable as to attract notice it is called a miracle; but it is not a specimen of a special class, it is an illustration of the general character of the World-Process. [Lecture X]

For Temple, God's plan is the choice of a world process that delivers his goals, although he can act upon it differently if he chooses, which is a form of occasionalism. More recently Holmes Rolston III has argued that while the world is able to generate information, and hence purpose, without an 'informer', still

> [t]he creation of matter, energy, law, history, stories, of all the information that generates nature, to say nothing of culture, does need an adequate explanation: some sources, source or Source competent for such creativity. '¦ This portrays a loose teleology, a soft concept of creation, one that permits genuine, though not ultimate, integrity and autonomy in the creatures. [*Genes, Genesis and God* (1999), page 367]

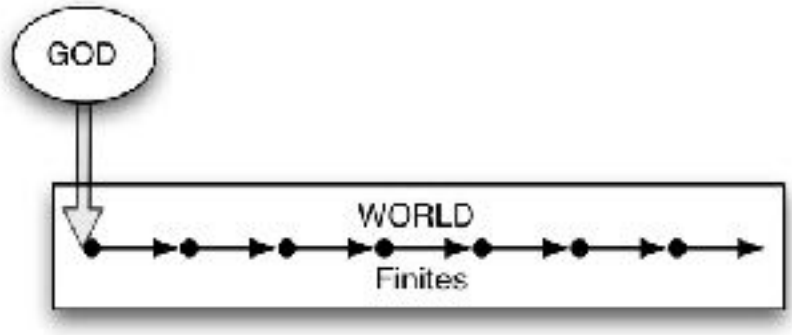
So we are left with several options. We can say God is actively involved in the provision and maintenance of natural law, and may vary it at any time, or that God set up

a world which would realise his aims, and if the latter, either he knew ahead of time that it would do so, or he ensures that it does. The choice is between necessity created by God, or chance.

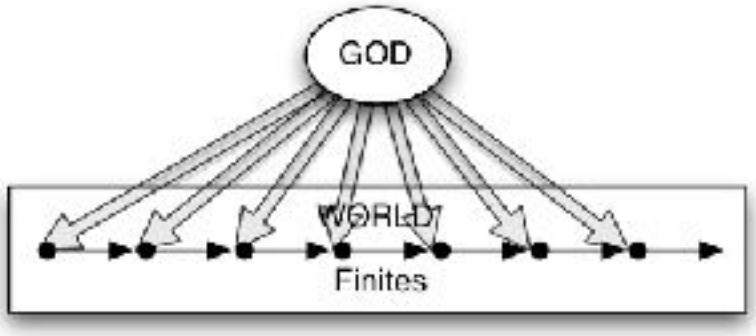
Many evolutionary thinkers, however, have stressed the chance aspect of evolution, to which we will return in the next post. For now we can diagram the sorts of views available to the theist:

Deism: God sets the world going and stands back.

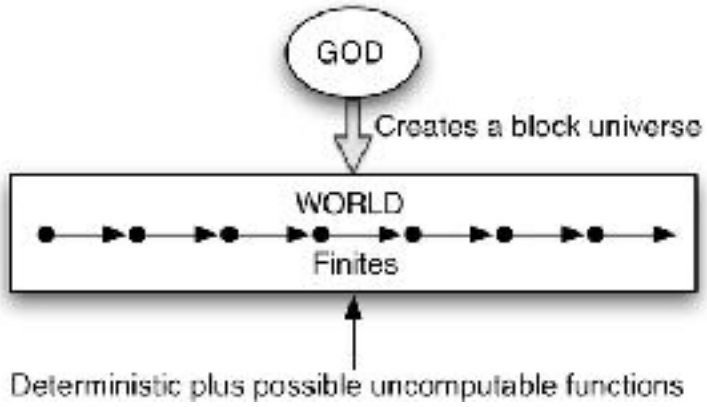
Creationism



Occasionalism: God creates each finite event at each moment, so that causation is a series of divinely chosen events.



Leibnizianism (after Leibniz, who held that God created the best of all possible worlds): God chooses a world to create (from start to finish, hence referred to as a 'block' universe) in which every event that occurs in that universe is part of a larger providential plan (including chance events).



These four possibilities are, I think, exhaustive of the theist options. Given the medieval distinction between God as a primary cause (of things existing as they are) and secondary causes (natural law), only the occasionalist and the Leibnizian views are tenable. Both allow natural things to achieve God's plan. The deist version involves God in effect waiting to see what happens, and the traditional creationism does not allow for natural processes to change things very much, and is inconsistent with our scientific knowledge of nature. The existence of God's intervention (miracles) involves some occasionalism but one might adopt a Leibnizian view and still allow God to get involved from time to time, although that then implies that a natural explanation of some events is going to fail.

So in order for a theist to accept design and nature and Darwinian evolution simultaneously, either they have to deny causality (secondary causes) or they have to accept that God chose to create a universe in which his goals were realised by secondary causes. If you accept the latter view, this raises the problem of evil in the world.

Darwin famously thought that the existence of things like ichnumenid wasps, which lay their eggs in the living flesh of caterpillars which are then eaten alive by the grubs, was horrific. He wrote to his friend Joseph Hooker, the botanist, in 1856 before he published the *Origin:*

> What a book a Devil's Chaplain might write on the clumsy, wasteful, blundering low and horridly cruel works of nature.

Natural selection involves waste, pain, and savage competition (which is not all it involves: some competition can be relatively benign) and the world is full of cases like

this, as when predators start eating prey that is still alive. If God chose this world to create, then God is responsible for this evil. But the problem of evil is not in the first instance raised by Darwinian evolution — it is an old problem (going back at least to Epicurus), and in any case if God is infinitely wise, good and powerful a *single* instance of evil is enough to cause the problem to arise. Natural evil just adds a large but finite amount of evil to what would already be a finite amount of evil.

One solution to this might be to say that in order to have a world of process, in which good things intended by God would evolve, one has to be able to have lesser outcomes in order to achieve greater outcomes. If we start with a universe that lacks humans, for example (or Mind, or whatever it is God desires), then at some point we have a suboptimal world. Necessarily, there has to be a lack of goodness in order to achieve goodness, over time. So it is logically required by a process view of nature that there be evil. The goodness lies in the creation of a regular process, not in any part of the process itself until the goal is reached.

This, however, is hard to accept. Voltaire famously tweaked Leibniz's view that this was the 'best of all possible worlds' that God might have chosen to create by cataloguing the sorts of evil that occurred in the world, ranging from earthquakes to *auto da fe*s. Nevertheless, Leibniz's view is coherent and is a solution to the problem of evil. It just might not match our expectations.

Another solution might be that the evil in the natural world is not a moral evil, although that leaves open the problem of efficiency. Why would God use a wasteful process like natural selection? Perhaps God is constrained by logic, and this is the only logical way to achieve the ends he holds. Or perhaps it's a mystery, which is the goto solution for unresolveable theological problems.

In any case, natural evil is not a problem raised by Darwinian evolution alone. Any naturalist before or after Darwin knew of the lack of concord and harmony in the natural world. So the problem of evil is not a problem for theists to solve in respect of Darwinian evolution, but in general terms. As a universal issue, it doesn't much affect belief in Darwinian evolution.

The problem of chance

Many religious thinkers hold that chance is the enemy of God. God is omniscient in many theisms, and so if chance occurs, and chance is unpredictable even for God, then the

reality of chance means that God does not exist. This doesn't apply, of course, to gods that are limited in their knowledge. The Bible seems to imply that God is not omniscient in some passages (e.g., Genesis 3:9, 'But the Lord God called to the man, 'Where are you?'), but in many others the use of casting lots is seen as a way of determining God's will.

The meaning of a word like 'chance' along with similar words like 'random', 'luck', 'contingent', 'accident' and 'probable' are more complicated than ordinary use seems to imply. For now, we can distinguish several meanings:

- Uncaused
- Small likelihood
- Unpredictable
- Not necessary.

These meanings are often mixed into each other, so that a problem caused by one is taken to imply the others. If some event in the world is uncaused (such as a quantum particle appearing), it might in fact be of moderate likelihood and be both predictable to some extent and a necessary event given the laws of physics. Likewise an individual event might be of small likelihood and unpredictable, but be caused by those laws and so be (physically) necessary, and so on.

Evolution is not, in itself, a matter of physics, although most would agree that it happens on physical properties. So, of course, does everything else that science studies. The origins and nature of the universe are a problem for theists whether evolution happens or not, so we can leave these issues to the cosmologists and theologians, like Keith Ward, whose *God, Chance and Necessity* (1996) unfortunately conflates cosmology and evolution as theist issues. Nevertheless, chance and necessity are issues we must deal with.

Since Jacques Monod, the molecular biologist, published *Chance and Necessity* in 1972, the question of the role of chance in evolution has been widely debated. Monod, along with more recent authors like Dawkins, Hawking, and others, argued that the universe was a blind mix of chance and necessity with no purpose. Necessity is, in effect, the operation of natural law. Chance is its absence. However, the previous understanding of natural selection by evolutionary biologists is that natural selection operates *on* 'blind chance', but is in fact a *reducer* of chance. Natural selection is a probability raiser.

Theodosius Dobzhansky was a leading evolutionary biologist and thinker in the middle of the 20th century, and also a Russian Orthodox believer. He wrote in his *The Biology of Ultimate Concern* (1967):

> Natural selection is a chance process ... only in the sense that most genotypes [particular genetic instances — JSW] have not absolute but only relative advantages or disadvantages compared to others. ... Otherwise natural selection is an anti-chance agency. It makes adaptive sense out of the relative chaos of the countless combinations of mutant genes. And it does so without having a will, intention, or foresight. [60]

Mutations are chance, according to the consensus of biologists, but they merely provide the material on which natural selection operates, winnowing out those that are relatively less successful in a given population. What sort of chance is a mutation?

Mutations are clearly not uncaused. They are due to chemicals that interfere with the process of replication, that is, copying, the DNA of an organism when cells divide (often causing cancers in body cells). Or they are caused by occasional radiation, such as from cosmic rays emitted by collapsing stars or the background radiation of the earth itself. Put a Geiger counter to a house brick, and you will get a reading. Radiation is all around us. Mutations are the result of natural laws.

But what is chancy about mutations is that they cannot be predicted, and this is because they are 'accidents', which happen in ways nobody can determine ahead of time. Arguably, if we were all knowing we'd be able to predict not only when such events would occur, but exactly what mutations would occur. Since evolutionary biology deals with populations, though, and not individuals, it can only predict that mutations will occur with some frequency. Every individual carries a number of mutations. For mutations to genes to be passed on to progeny, they have to occur in the sex cells, the gametes, or else they will expire with the death of the organism. On average, a human being carries around 100—200 mutations.

Most mutations are not bad. Mostly they occur in what is called (slightly misleadingly) 'junk DNA', the vast majority of genes that have no function in the development of the organism. These just sit there generation to generation doing nothing much, being copies. Occasionally, though, the 'stop codon', or the full stop that sits between genes and junk or between genes that are functional, is itself deleted by a mutation event, and so this junk DNA gets 'read'.

In this way these neutral mutations can persist for quite a while, and even spread through a population, before they become subject to selection.

Also, many mutations are ‘silent’, which means the change didn’t alter the product of the gene. Genes are formed from sequences of three ‘letters’ or codons. Each codon ‘codes for’ a particular protein part (an amino acid), but several codons can code for the same amino acid, so changing one base pair (the ‘letters’ G, A, T, and C) may not affect the outcome.

Of those that are read off and produce proteins, often the difference is so low in functionality that the mutated gene makes no real change in the fitness of the organism. But natural selection, under the right conditions, can take even very small difference in relative fitness and drive a mutated gene to either a balance in the population (where an increase in the numbers of organisms that have the mutated gene would not lead to an increase in the overall fitness of the population) or to what biologists call ‘fixation’, where it takes over all alternatives at that place in the genome.

And some are just a lot fitter. This is another way of saying in that population, and in that environment, that mutated gene is an advantage to any organism that has it relative to the alternatives. In these cases, if the conditions are right, that gene will become fixed in the population.

Okay, so with all that behind us, what is the role of chance here? We already know that mutations are unpredictable. Are they accidents in the metaphysical sense? Are they undetermined or beyond God’s ability to predict them? If ‘undetermined’ means uncaused, then no, they aren’t undetermined, but are they the result of physical processes God could not foresee, for example, quantum decay in atoms that cause radioactivity? Possibly. It depends on how you reconcile not just evolutionary biology, but the whole of modern physics with your theology. And such ‘unpredictable’ events may in fact be predictable at scales we can’t access, but presumably God could. One physicist, Nobel winner Gerard t’Hooft in the Netherlands, has hypothesised that quantum events can be caused by deterministic processes smaller than our limit of resolution, the Planck Limit. If so, we could never predict them, but we could study, as we do, their outcomes using statistical methods. If this were so, then while quantum accidents are a problem for physicists, they presumably would not be for God.

But what if these accidents were unpredictable by God? What if chance is an irreducible fact of existence? This is a question for the theologians of your chosen faith community to resolve. For now I will make only a few comments.

The earliest Proto-Indoeuropean views of God had him or the gods in general striving against *chaos*. Chaos (KAOS) was one of the first *protogenoi* or primeval gods in ancient Greek religion, which the later gods opposed to create order. In the earliest parts of the Hebrew Torah and Tanakh, the Christian Old Testament, God imposes order upon the 'deep' (*tihom*). An earlier and possibly influential Babylonian myth, the *Enûma Elish*, has Tiamat, the sea god, as an agent of chaos opposed by Marduk who creates the universe as it now is. There are many such theogonies (origin stories of the gods and the world) in the Indo-European and Semitic traditions.

Chaos as now understood by modern science is less disturbing. It is founded on the idea that very slight differences in starting conditions can lead, quite deterministically, to very different outcomes. Imagine a flat pinball machine on which completely rigid balls bounce around against pegs. A minute difference in the starting angle can multiply each time it hits a round pin so that you almost cannot duplicate a sequence no matter how hard you try. Although each bounce is quite exactly the result of the angle of attack, these minor differences will cause different pins to be hit, so that the final point of the ball will be unpredictably different.

So chaotic behaviour is not necessarily the outcome of chance, but instead of these contingent differences acting in determined ways. This leads us to necessity. If physical laws are fully determined, then God can predict what to us look like, and are in practical operation, random events. Chance (as we understand it) and necessity need not be in opposition at this level. God's necessity is our chance sometimes. It depends on how much knowledge, and how precisely we know it, that we have.

So in the end chance might boil down to our limitations. Of course if God is limited by chance, then all bets are off for the theist. But that is not raised by evolutionary biology. Instead it is a deep issue in theology, to be sorted in each tradition as the authorities and intellectuals of that tradition see fit.

Each tradition has its own ways of dealing with these issues, but a final point is worth making. In the so-called Abrahamic religions — Judaism, Christianity, Islam and their offshoots — chance is seen usually as the basis of atheism. In fact, the word for atheism in the Jewish Talmud is *apikoros*, a transliteration of the name of a Greek philosopher who came slightly after Plato, Epicurus. Epicurus is sometimes seen as a hedonistic atheist who challenges all religion, but the reality is somewhat more subtle. Although he certainly did not think that the gods desired our worship, he did not deny their existence. Instead, his deities were perfect, and so being perfect would only

contemplate their own perfection. Consequently our belief or worship was of no consequence to them. This is the philosophical tradition in Greek thought at its limit.

Epicurus is also famous for his 'Swerve' (*clinamen* in Lucretius' Latin). In his theogony, Epicurus proposed that at the beginning, the atoms were sleeting through the void in parallel, and an uncaused event led to one particle (or more) hitting another, causing a chain reaction in which the atoms eventually combined at random to form the physical world. With a suitable reinterpretation in modern terms, this is not so unlike the theory of the big bang. What happens after the swerve, or big bang, unfolds according to necessity (that is, the laws of nature).

Thereafter theists began to attack Epicureanism as atheism, hence the Talmudic interpretation (although I doubt the rabbis had ever actually *read* Epicurus, any more than most of the later Christian theologians). Charles Hodge had applied this to Darwin in the 1870s and more recently so too have Benjamin Wiker and William Dembski in their book *Moral Darwinism: How We Became Hedonists* (2002). This is very unfair on Epicurus. He was not a hedonist, but thought that since pleasure was all there was to life, it should be enjoyed, but in moderation, or else it became a lack of pleasure. Epicurus' theory was written up as a poem by the Roman Lucretius in the first century, *De Rerum Natura* (On the nature of things), which was rediscovered during the Renaissance and which influenced the development of modern thought. Most of Epicurus' own writings are lost.

The sense of indeterminacy in Epicurus' thinking seems to have been one of unpredictability, not a lack of cause, but it is unclear.

Is Darwinism atheism?

Many Christians and Muslims, and to a lesser extent Jews, think that Darwinian evolution requires or implies atheism, a charge first brought when Darwin was still alive. The Princeton theologian Charles Hodge argued this in his *What is Darwinism?* (1874). But Darwin himself, and many of his followers such as Kingsley, Asa Gray, and his friend Rev. John Innes, an Anglican local minister, thought not. Darwin, however, did lose his religious beliefs, ending up a self-confessed agnostic.

Partly the problem here lies in the term 'Darwinism'. While some, like Alfred Russel Wallace, the 'co-discoverer' of natural selection, used the term to refer to the general ideas of Darwin on evolution, others, such as the German naturalist Ernst Haeckel, used it

to refer to a melange of philosophical, theological and political views, and it came to be seen as an ideology that was anti-religion. Haeckel himself was very opposed to Catholicism, and his 'Monism' was a mixture of Enlightenment ideas, anti-clericalism and evolution. But he had a theology in which God was identical to the universe, and in which consciousness was innate.

Since the famous Scopes Monkey Trial in 1925 in Tennessee, it has become common to think that evolutionary biology is atheistic. However, as Dobzhansky and others such as modern biologist Francisco Ayala, demonstrate, many theists accept the reality of evolution. What they object to, if they do, is 'Darwinism'. Since this is largely undefined, each author giving their own interpretation based on what they think is implied by evolution (both those who think it is atheism and this is a good thing, and those who think it is atheism and this is a bad thing), we do not need to think the *biology* requires atheism. The reason for this is that claims about the existence of God or gods are a *philosophical* problem. Just as the physics of the big bang neither confirm nor deny the existence of deities, neither do any other facts about the world. Any theology that is realistic must deal with the world as it is, not as theology would want it to be.

Some theologies are not realistic. For example, to assert that the world was created around 6000 years ago requires not only the rejection of biology, but geology, chemistry, physics, astronomy and in general reason. Likewise any theology that says the world is older than science tells us, for example some Hindu theologies, are equally unrealistic. To assert these doctrines, a theology must deny that science even works. In short, they have to deny that facts are facts. Butler would be appalled. So too would Henry Drummond, who in his reconciliation of theology and science, *The Ascent of Man* (1894) argued that one ought not find God in the Gaps:

> There are reverent minds who ceaselessly scan the fields of Nature and the books of Science in search of gaps — gaps which they will fill up with God. As if God lived in gaps? What view of Nature or of Truth is theirs whose interest in Science is not in what it can explain but in what it cannot, whose quest is ignorance not knowledge, whose daily dread is that the cloud may lift, and who, as darkness melts from this field or from that, begin to tremble for the place of His abode? What needs altering in such finely jealous souls is at once their view of Nature and of God. Nature is God's writing, and can only tell the truth; God is light, and in Him is no darkness at all. [333]

Finding God in the gaps of knowledge means that if those gaps are filled by science the room for God is decreased. If a believer wants a realistic faith, then they must deal with the world as it is. This means that some beliefs — that humanity is only explicable as

the direct creation of God at one time, that the sun rises and sets because God makes it do so, or that life originated 6000 years ago — have to go. They are contrary to the facts.

It is a reasonable argument that in fact God of the gaps is itself a form of atheism. It implies that one can only believe in God if one disbelieves in the world, and since most (not all) religions *do* believe in the world, the only conclusion is that God does not exist. This is a view taken by critics of religion as well as creationists: believe that the world is older than (one interpretation of) the scriptures say, and the sole alternative is atheism. It is a black-and-white fallacy, or a false dichotomy. Disbelieve the world if you like (and be a Gnostic or Manichean), and then the problem does not arise, but if you believe the world exists as we know it, you have to deal with it in your theology. This is the modern problem facing religion, and not just with respect to evolution, but everything.

So Darwinian evolution presents no problem to religion that isn't presented by all the other sciences. It is not a special problem for faith. Some religious thinkers will attack what they call *scientism*, the view that all that can be known must be known by science, or the promise of science. Most conciliatory theology, however, assumes that while matters of fact can be known only by science, theological truths are known by revelation or intuition or meditation. This no science can undercut, although a thinker who believes that if there is no evidence for a belief that belief is objectionable will make that inference. The believer, however, will not. I leave it to the reader to decide which way they wish to jump. It is, in the end, a philosophical decision, not a scientific one.

Conclusion

I have tried to work through the threads of the most common problems and issues that religion has historically had with evolution. While my preferred solution is that God is best seen as a primary cause, not a secondary cause, that is only one among many solutions offered by religious thinkers, and anyway I am not a believer, so the problem does not arise for me. However, I think that it is possible to deal with Darwin's stone house and to believe in a providential God. The rest is up to you. As Darwin wrote shortly after the publication of *The Origin* to Asa Gray:

> I feel most deeply that the whole subject is too profound for the human intellect. A dog might as well speculate on the mind of Newton. Let each man hope and believe what he can. Certainly I agree with you that my views are not at all necessarily atheistical. The lightning kills a man, whether a good one or bad one, owing to the excessively complex action of natural laws. A child (who may turn out an idiot) is born by the action of even more complex laws, and I can see no

> reason why a man, or other animals, may not have been aboriginally produced by other laws, and that all these laws may have been expressly designed by an omniscient Creator, who foresaw every future event and consequence. But the more I think the more bewildered I become... [May 22, 1860]

Let each person hope and believe what they can.

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