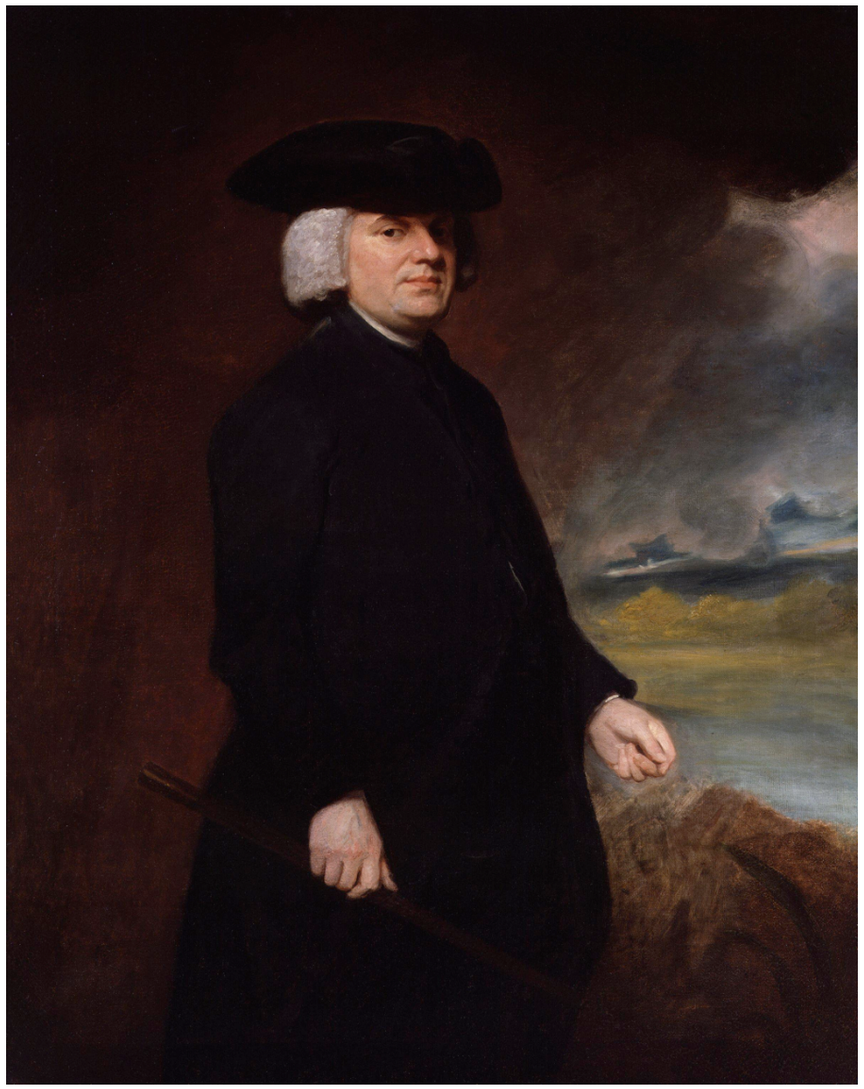
the design argument

The different arguments from Aquinas and Leibniz we've discussed over the last few classes were arguments for the existence of God based on extremely abstract and general features of the universe, such as the fact that some things cause other things, and that there are some contingent things.

The argument we'll be discussing today is not like this. The basic idea of the argument is that if we pay close attention to the details of the universe in which we live, we'll be able to see that that universe must have been created by an intelligent designer.

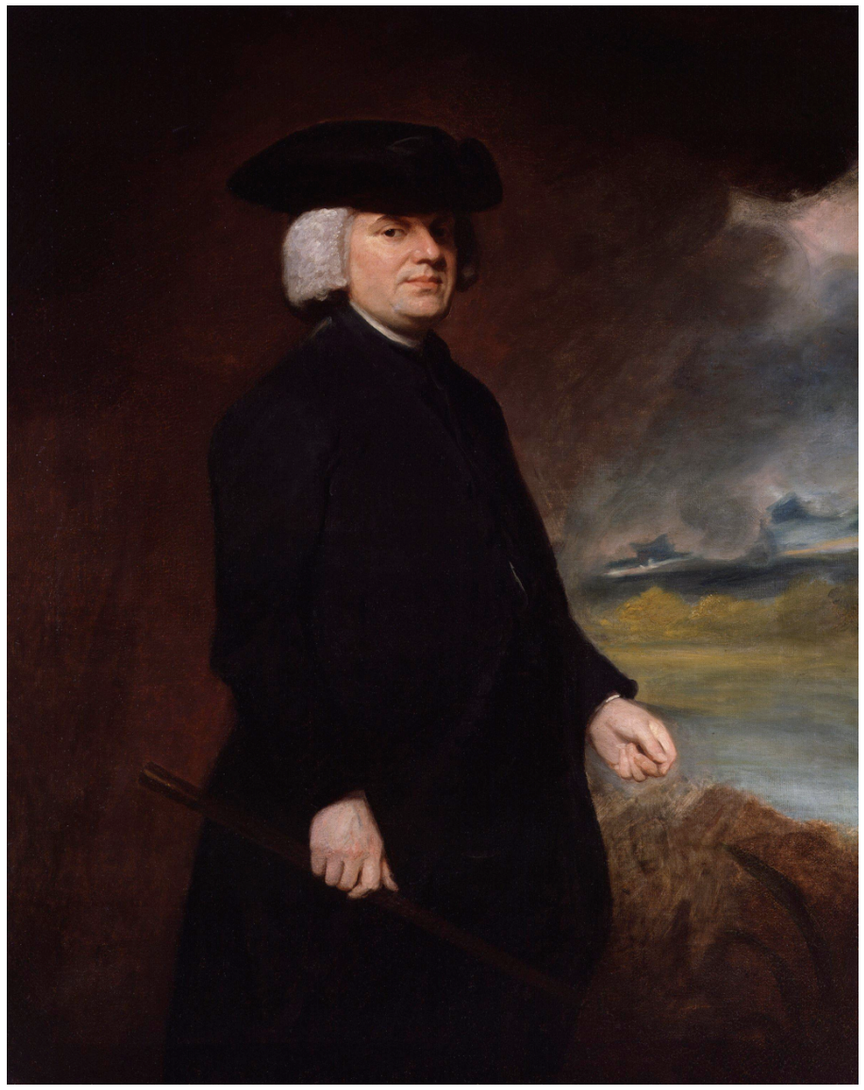
This design argument, or, as it is sometimes called, the teleological argument, has probably been the most influential argument for the existence of God throughout most of history.

A very influential version of the argument was provided by William Paley, an 18th century English philosopher and theologian, in his book Natural Theology.



A very influential version of the argument was provided by William Paley, an 18th century English philosopher and theologian, in his book Natural Theology.

This book is filled with careful and detailed discussions of various facets of the natural world, each of which Paley employs in his argument for the existence of an intelligent designer of the universe. A representative, and historically important, example is Paley's discussion of the eye.



"I know no better method of introducing so large a subjection than that of comparing a single thing with a single thing; an eye, for example, with a telescope. As far as the examination the instrument goes, there is precisely the same proof that the eye was made for vision, as there is that the telescope was made for assisting it. ... [the] laws require, in order to produce the same effect, that the rays of light, in passing from water into the eye, should be refracted by a more convex surface, than when it passes out of air into the eye. Accordingly we find that the eye of a fish ... is much rounder than the eye of terrestrial animals. What plainer manifestation of design can there be than this difference?"

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Of course, we know that telescopes were designed by human beings. But what, Paley asks in a famous thought experiment, would we think if we found something like a telescope simply laying on the ground?

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> "... suppose I found a watch on the ground, and it should be enquired how it happened to be in that place, I should hardly think of the answer ... that the watch had always been there. Yet why not? ... For this reason: ... when we come to inspect the watch, we perceive ... that its several parts are put together and framed for a purpose ... that if the several parts had been differently shaped from what they are ... no motion at all would have been carried on in the machine ..."

Notice that Paley is not here saying that it is **impossible** that random natural forces combine to produce a watch; he is just saying that it would be extremely improbable. It is extremely improbable that random forces would conspire to produce something whose parts fit together for some end as intricately as the parts of a watch.

Let's suppose that Paley is right about this. How might one use this fact about probability to argue that the watch had a designer?

To answer this question, we'll have to think about how to reason using probabilities.

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Consider the following two theories:

T1. It rained last night.

T2. It did not rain last night.

Suppose that I am considering these two theories this morning as I walk out of my front door, and, as I walk out the door, I come across a bit of evidence which might help me decide which of T1 and T2 are true:

E. My sidewalk is wet.

Does E count in favor of T1 or T2? Why?

T1. It rained last night.

T2. It did not rain last night.

E. My sidewalk is wet.

One natural answer is that E counts in favor of T1 because of the following fact: if T1 is true, then E is quite likely to be true, whereas if T2 is true, E is quite unlikely to be true.

To talk about the likelihood of an event happening is to talk about its probability, which can be represented as a number between 0 and 1.

We can also talk about conditional probability, which is the likelihood of something to happen in the condition that something else happens. When we want to talk about the likelihood of X happening if Y happens, we talk about the probability of X given Y.

You can abbreviate “the probability of x” as “P(x)”. You can abbreviate “the probability of x given y” as P(x | y).”

Let’s talk about a few examples of conditional probability to make it clearer what we are talking about.

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What is the probability of you winning a lottery, conditional on there being 10 tickets in the lottery?

What is the probability of you winning a lottery, conditional on there being 1000 tickets in the lottery?

What is the probability of you passing this course, conditional on you completing every assignment well?

What is the probability of you passing this course, conditional on you skipping every class and doing none of the assignments?

T1. It rained last night.

T2. It did not rain last night.

E. My sidewalk is wet.

Let's now return to the example of the wet sidewalk.

The key point there seems to be that P(E | T1) > P(E | T2).

The fact that we take our evidence in this case to favor the first theory over the second suggests that we are tacitly assuming the following principle:

> The principle of confirmation
>
> E is evidence for T1 over T2 if P(E | T1) > P(E | T2)

This principle suggests the following further claim: if E is extremely likely to be true if T1 is true, and extremely likely to be false if T2 is true, then if E is true, this is very strong evidence that T1 rather than T2 is true. Later on we will talk about how one might quantify this somewhat vague talk of "extremely likely" and "very strong evidence."

The principle of confirmation

E is evidence for T1 over T2 if P(E | T1) > P(E | T2)

We can use this principle to make sense of Paley's reasoning about the watch.

For we can consider two theories:

Theory 1: a designer placed an object here

Theory 2: this object was the result of random natural forces

Then the following claim seems very plausible:

Pr (there is a watch here | T1) > Pr (there is a watch here | T2)

So, given the principle of confirmation, the discovery of the watch is evidence for the design hypothesis.

The principle of confirmation

E is evidence for T_1 over T_2 if $P(E \mid T_1) > P(E \mid T_2)$

What does any of this have to do with the question of whether God exists?

Paley thinks that examination of the intricate composition of living organisms shows that we are, in the relevant sense, just like watches or telescopes. Indeed, as he emphasizes in the reading for today, our complexity greatly exceeds that of any artefact.

So, Paley thought, we could give precisely the same argument for the conclusion that human beings (and other organisms) were designed as we can for the watch.

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We might state the argument simply as follows:

1. Pr (complex life | a designer of the universe) > Pr (complex life | no designer).
2. The principle of confirmation.

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C. The existence of complex life is evidence for the claim that the universe was designed.

Paley might add that — as in the case of the watch — the probabilities are not especially close. So the existence of complex life seems not to be just evidence, but strong evidence, for the claim that the universe was designed.

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Before evaluating the argument, it's worth emphasizing one sense in which this argument is different in kind from the other arguments we have discussed. It is not really an attempt to demonstrate that God exists; we do not have an attempt at a valid argument whose conclusion is "God exists."

Instead, we have an attempt to give evidence for the claim that God exists. This is to try to argue for the claim that God exists in something like the way that scientists argue for their theories. Scientists typically do not try to give valid arguments whose conclusion is a statement of the theory. Rather, they try to show that their theories are best supported by the evidence. That is kind of like what Paley is doing here.

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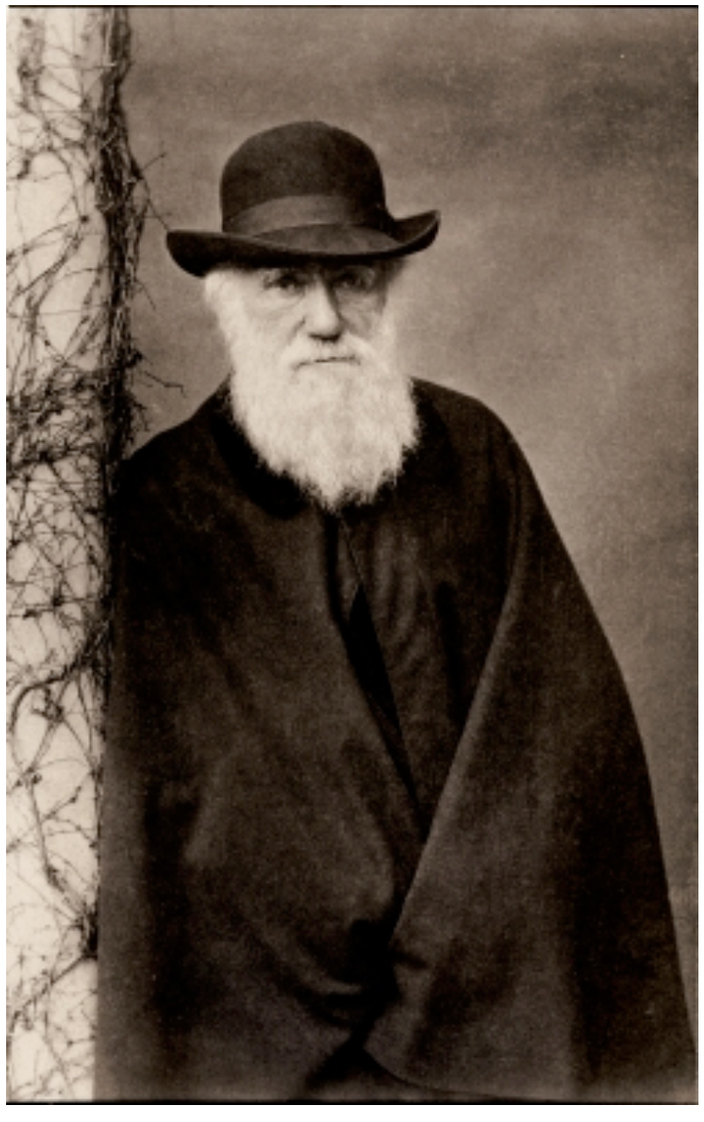
But even if the argument is of a perfectly legitimate form, from our current vantage point, it is open to a very obvious challenge.

This challenge came not from a philosopher finding a flaw in Paley's argument, but rather from Darwin's development of the theory of evolution.



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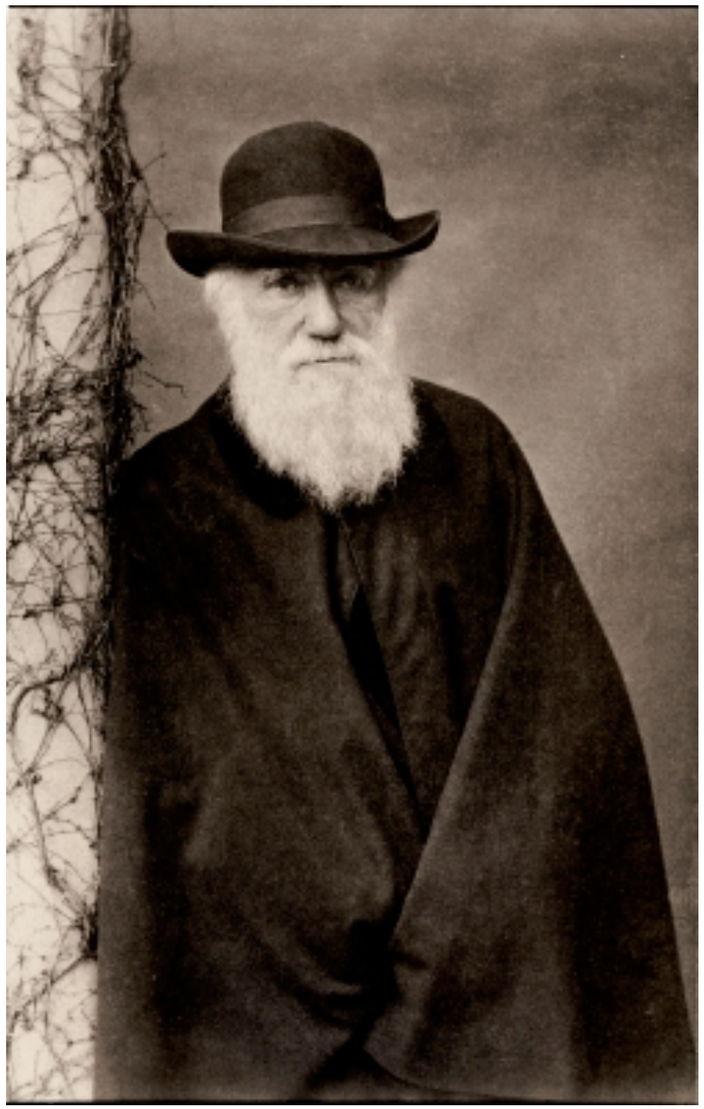
This challenge came not from a philosopher finding a flaw in Paley's argument, but rather from Darwin's development of the theory of evolution.

That theory showed how it is possible, through mutation and natural selection, for complex life to evolve in the absence of a designer.

Research since has provided (massive) evidence that we and other complex life forms did indeed evolve from simpler ones.



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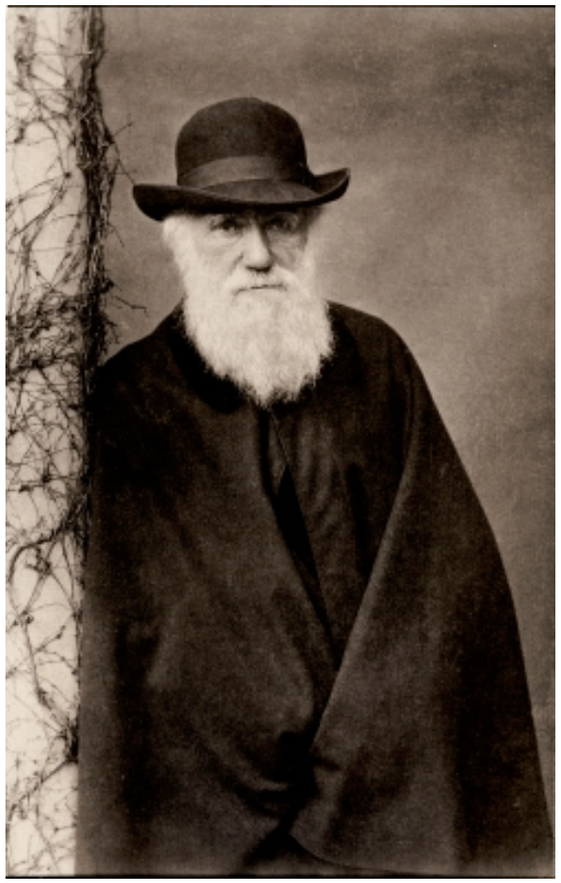
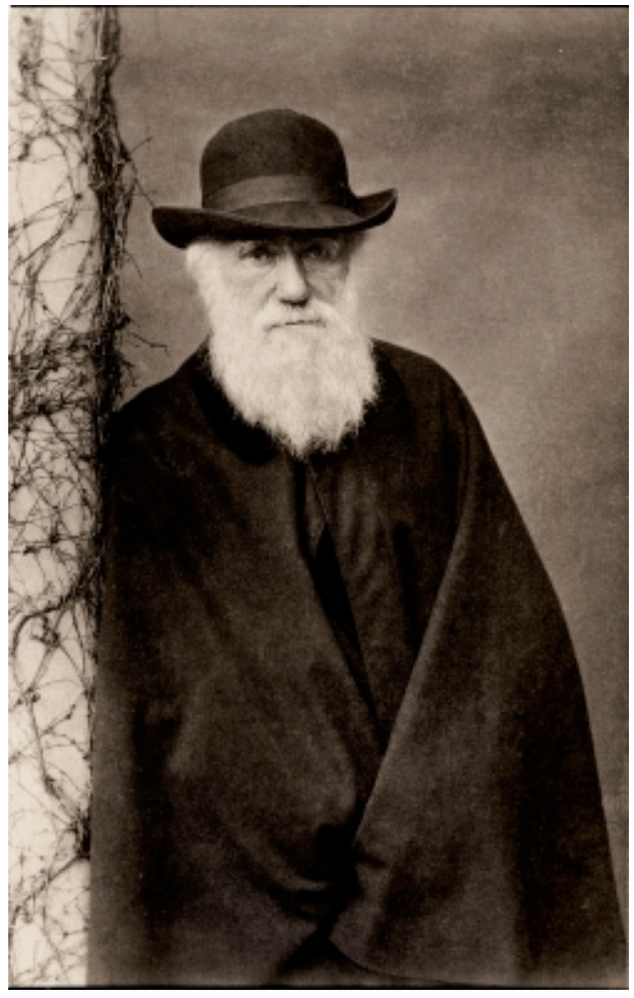
The result is that the support for premise (1) of Paley's argument — which seemed so obvious to Paley — is undermined.



This is just what Darwin concluded in his autobiography:

"The old argument of design in nature, as given by Paley, which formerly seemed to me so conclusive, fails, now that the law of natural selection had been discovered. We can no longer argue that, for instance, the beautiful hinge of a bivalve shell must have been made by an intelligent being, like the hinge of a door by man. There seems to be no more design in the variability of organic beings and in the action of natural selection, than in the course which the wind blows. Everything in nature is the result of fixed laws."



Often very bold claims are made on behalf of the theory of evolution by natural selection; sometimes it is even claimed that the theory shows that God does not exist. It is hard to see why this should be so. But the theory does undermine a historically very important argument for the existence of God.

One might think of Darwin's reply to Paley as posing a challenge to the defender of the design argument: which aspects of the universe are not explained by the theory of evolution by natural selection, and yet are such that they are better explained by God than by chance?

Recent attempts to answer this question have focused on a phenomenon which is sometimes called ‘the fine-tuning of the universe.’

The best way to understand what this means is to begin with a simple explanation of what contemporary physics aims to do, and how it does it:

> “The standard model of physics presents a theory of the electromagnetic, weak, and strong forces, and a classification of all known elementary particles. The standard model specifies numerous physical laws, but that's not all it does. According to the standard model there are roughly two dozen dimensionless constants that characterize fundamental physical quantities.”

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The fine-tuning of the universe has to do with a fact about these dimensionless constants:

> “Physicists have determined the (approximate) values of the fundamental constants by measurement. (There's no way to derive the values of the fundamental constants from other aspects of the standard model. Any quantities that could be so derived wouldn't be fundamental.) Still, the underlying theory favored some sorts of parameter-values over others. ... Physicists made the startling discovery that––given antecedently plausibly assumptions about the nature of the physical world–– the probability that a universe with general laws like ours would be habitable was staggeringly low.”

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Some striking examples of this phenomenon are laid out in this passage by Ernan McMullin:

> If the strong nuclear force were to have been as little as 2% stronger (relative to the other forces), all hydrogen would have been converted into helium. If it were 5% weaker, no helium at all would have formed and there would be nothing but hydrogen. If the weak nuclear force were a little stronger, supernovas could not occur, and heavy elements could not have formed. If it were slightly weaker, only helium might have formed. If the electromagnetic forces were stronger, all stars would be red dwarfs, and there would be no planets. If it were a little weaker, all stars would be very hot and short-lived. If the electron charge were ever so slightly different, there would be no chemistry as we know it. Carbon (^{12}C) only just managed to form in the primal nucleosynthesis

This is the basic physical fact with which the fine-tuning tuning argument gets started.

P(fundamental constants yield a habitable universe | fundamental constants are not set by design) is very low.

By contrast:

P(fundamental constants yield a habitable universe | fundamental constants are set by design) is very high.

P(fundamental constants yield a habitable universe | fundamental constants are set by design) > P(fundamental constants yield a habitable universe | fundamental constants are not set by design).

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P(fundamental constants yield a habitable universe | fundamental constants are set by design) > P(fundamental constants yield a habitable universe | fundamental constants are not set by design).

The principle of confirmation.

The fact that the fundamental constants yield a habitable universe is evidence that the universe was designed.

The simple fine-tuning argument

1. P(fundamental constants yield a habitable universe | fundamental constants are not set by design) is very low.
2. P(fundamental constants yield a habitable universe | fundamental constants are set by design) is very high.
3. P(fundamental constants yield a habitable universe | fundamental constants are set by design) > P(fundamental constants yield a habitable universe | fundamental constants are not set by design). (1,2)
4. The principle of confirmation.

———————————

C. The fact that the fundamental constants yield a habitable universe is evidence that the universe was designed. (3.4)

Is this argument valid?
Is it sound?

If recent physics is to be believed, this argument has a strong claim to be sound.

But its conclusion is pretty weak. It is easy enough to provide **some** evidence for almost anything.

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Consider the following argument that provides evidence for the claim that Satan controls the weather in South Bend.

The simple Satan-weather argument

1. P(freezing rain | Satan controls the weather) > P(freezing rain | Satan does not control the weather).
2. The principle of confirmation.

———————————

C. The fact that we have freezing rain in January is evidence that Satan controls the weather in South Bend. (1,2)

A reasonable case can be made that this argument is sound. But does it show that we should believe that Satan controls the weather in South Bend? No.

There would appear to be two reasons why not.

First: the hypothesis that Satan controls the weather in South Bend is antecedently extremely implausible. So even if this piece of evidence favors it, it is just making a wildly implausible hypothesis just less wildly implausible — but still very implausible.

Second: the difference in probabilities is only modest. Perhaps it is true that freezing rain is slightly more likely on the hypothesis that Satan controls the weather. But there are non-Satan-involving explanations of freezing rain in South Bend in January, so the difference in probabilities is not that large.

So one might raise similar worries about the simple fine-tuning argument. Perhaps the fact that the fundamental constants permit life is evidence that God exists. But that does not show anything in particular about what we should believe.

To answer this sort of objection we need something a bit more informative than our simple principle of confirmation.

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One way to answer these questions employs a widely accepted rule of reasoning called "Bayes' theorem," named after Thomas Bayes, an 18th century English mathematician and Presbyterian minister.

To arrive at the theorem, we begin with the following definition of conditional probability:

$$P(a|b) = \frac{P(a\&b)}{P(b)}$$

This says, in effect, that the probability of a given b is the chance that a and b are both true, divided by the chances that b is true.

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Let's work through an example. Suppose that this is some time before the 2008 election, and let a = 'Obama wins', and let b = 'a man wins.' Suppose that you think that each of Obama, Hilary, and McCain have a 1/3 chance of winning. Then what is the conditional probability that Obama wins, given that a man wins, using the above formula?

The conditional probability is that Obama wins, given that a man wins, is ½, since in this case P(a&b)=⅓ and P(b)=⅔. Intuitively, if you found out only that a man would win, you should then (given the initial probability assignments) think that there is a 0.5 probability that Obama will win.

$$P(a|b) = \frac{P(a\&b)}{P(b)}$$

Using this definition of conditional probability, we can then derive Bayes' theorem as follows.

Derivation of Bayes' theorem

1. $P(a\|b) = \frac{P(a\&b)}{P(b)}$	def. of conditional probability
2. $P(b\|a) = \frac{P(a\&b)}{P(a)}$	def. of conditional probability
3. $P(a\|b) * P(b) = P(a\&b)$	(1), multiplication by =';s
4. $P(a\&b) = P(b\|a) * P(a)$	(2), multiplication by ='s
5. $P(a\|b) * P(b) = P(b\|a) * P(a)$	(3),(4)
C. $P(a\|b) = \frac{P(b\|a)*P(a)}{P(b)}$	(5), division by ='s

The conclusion of this argument is Bayes' theorem. Intuitively, what it says is that if we want to know the probability of some theory given a bit of evidence, what we need to know are three things: (1) the probability of the evidence given the theory (i.e., how likely the evidence is to happen if the theory is true), (2) the prior probability of the theory, and (3) the prior probability of the evidence.

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Bayes' theorem

$$P(h|e) = \frac{P(h) * P(e|h)}{P(e)}$$

This theorem is very useful, since often it is easy to figure out the conditional probability of the evidence given the theory, but very hard to figure out the conditional probability of the theory given the evidence.

Bayes' theorem basically gives us a way of turning the first piece of information into the second one.

Bayes' theorem

$$P(h|e) = \frac{P(h) * P(e|h)}{P(e)}$$

Let's return to the case of the fine-tuning argument. We want to know the answers to two questions. First, what is the probability of the design hypothesis given the evidence that the fundamental constants are in a range which permits life? Second, what is the probability of the non-design view given the evidence that the constants are in a life-permitting range?

To fix ideas, let's suppose that we are all perfect agnostics. We assign probability of 0.5 to the hypothesis that the universe was designed, and probability 0.5 to the hypothesis that it was not designed.

For simplicity let's further suppose that we assign probability 1 to the hypothesis that the constants are in a range which permits life.

Then we need to figure out what the probability of our evidence is, given our two hypotheses.

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Then we need to figure out what the probability of our evidence is, given our two hypotheses.

Physicists estimate that the probability of the constants being in a life-permitting range given that the fundamental constants are set 'at chance' is a very small number — one reasonable estimate is $1/10^{120}$.

If we plug these numbers into Bayes' theorem we get the result that the probability of the non-design hypothesis given the evidence that the constants are in a life-permitting range is

$$\frac{0.5 * 1/10^{120}}{1} = 1/(2*10^{120})$$

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It is difficult to think about numbers this large. But to give you some idea: the odds of winning Powerball are about 1 in 300 million. Now consider the odds of winning Powerball one trillion times in a row. Call that a "super Powerball."

Now consider the odds of winning a super Powerball one trillion times in a row. Call that a "super duper Powerball."

Now consider the odds of winning a super duper Powerball one trillion times in a row. The odds of this happening are about $1 / 10^{44}$ — so much, much higher than the odds of the universe being life-permitting by chance.

This means that if you simply take the physics at face value, and begin by assigning a probability of 0.5 to the non-design hypothesis, you should think that the chances of the non-design hypothesis being true are vastly lower than the chances of winning a super duper powerball a trillion times in a row.

This means that if you simply take the physics at face value, and begin by assigning a probability of 0.5 to the non-design hypothesis, you should think that the chances of the non-design hypothesis being true are vastly lower than the chances of winning a super duper powerball a trillion times in a row.

Of course, this oversimplifies in various ways. For example, one might think (reasonably) that there is some chance that current physics has things wrong. But it is useful to think about how things look if we simply take current physics at face value.

We might call the result of doing so the Bayesian fine-tuning argument.

The conclusion of this version of the fine-tuning argument depends on what you took to be the probability that the universe is designed prior to encountering the argument.

We've already considered the case where you assign probability 0.5 to both the design and non-design hypotheses.

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The conclusion of this version of the fine-tuning argument depends on what you took to be the probability that the universe is designed prior to encountering the argument.

We've already considered the case where you assign probability 0.5 to both the design and non-design hypotheses.

But suppose you begin by thinking that the design hypothesis has only a 1 / 1,000,000 chance of being true (and so that the non-design hypothesis has a 999,999 / 1,000,000 chance of being true. The change in the result of the argument is pretty insignificant — you should still, after the argument, assign the non-design hypothesis a probability vastly lower than the probability of winning a super duper Powerball one trillion times in a row on your first try.

The Bayesian fine-tuning argument is thus a powerful argument in favor of the view that the rational thing is to believe that the universe was designed so that life would exist.

Here is one prominent objection to the fine-tuning argument:

The anthropic objection

We could never observe the falsity of the claim that the constants permits life since, if it were false, we would not exist to observe it.

As it stands, this objection is a bit puzzling. It does not, by itself, seem to cast doubt on any of the premises of our argument.

One might turn it into an objection by saying that, if it is impossible for us to observe some fact, then the opposite of that fact can never be used as evidence for anything. This would show that there is something wrong with using the fact that the fundamental constants are life-life-permitting as evidence in our Bayesian argument.

But if we think about some examples, we can see that this principle is not very plausible.

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Consider, for example, the following case:

The firing squad

A prisoner is standing in front of a firing squad of 10 gunmen, all of whom are excellent shots. The guns all fire at the same time and, to his surprise, the prisoner realizes that he is still alive, and without a scratch. He infers that the gunmen were not trying to kill him.

Could one object to the prisoner's reasoning by saying that, if the gunmen had shot him, he would not have been around to observe this? This does not seem very plausible; the prisoner's reasoning seems perfectly fine. But this seems to rule out the version of the anthropic objection we are considering.

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Here is a way to make the anthropic objection seem more plausible.

The multiverse hypothesis
There are very many — perhaps infinitely many — distinct universes, which can have different initial conditions and different laws of nature.

Suppose for the sake of argument that this hypothesis is true. Then it is unsurprising that there are some universes whose physical constants have life-permitting values.

Further, it seems as though, if this hypothesis is true, we could not use the fact that the constants permit life to argue for the design hypothesis.

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Consider the following case:

The confused fisherman

A fisherman is using a net which has a 10” hole in it. So, of course, the fisherman never finds in his net any fish shorter than 10”. The fisherman concludes that, amazingly, there are no fish shorter than 10” in the lake.

Here, the fisherman’s reasoning is plainly bad. This sort of case involves what is sometimes called an observational selection effect. It is a situation in which one’s way of obtaining evidence restricts that evidence to exclude certain things. In such cases, the slogan goes, we should not take ‘absence of evidence to be evidence of absence.’

Just so, if we are confident that there are a huge number of different universes, we should not take the fact that we are in a life-permitting one to be evidence for much of anything.

Just so, if we are confident that there are a huge number of different universes, we should not take the fact that we are in a life-permitting one to be evidence for much of anything.

So the key question is: do we have good reason to think that the multiverse hypothesis is true?

A first point to note: it would be very surprising if this hypothesis were true. For, if it is, there are very many — perhaps infinitely many — other universes, each as real as ours, in which some near-duplicate of you exists. There is, for example, very likely one in which there exists some being with a qualitatively identical history to you who differs from you only in that she or he scratched his nose one second ago.

This does not show that the multiverse hypothesis is false; the universe might be strange, and science repeatedly shows us that it is. But it does suggest that the multiverse hypothesis is not one that we should believe without argument.

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One might think that the very facts used in the fine-tuning argument can be used to support the multiverse hypothesis. For consider the following argument:

> It is very, very improbable that our universe is the only one and, just by chance, the constants came to be set in such a way as to make life possible. But if there were many many universes, it would not be very improbable that one would be life supporting. So, the fact that our universe is life-supporting is strong evidence in favor of the multiverse hypothesis.

But, while this reasoning sounds plausible, consideration of parallel cases shows that something has gone wrong.

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But, while this reasoning sounds plausible, consideration of parallel cases shows that something has gone wrong.

I am sitting in my office, and I pick up 12 dice and decide to roll them. I roll all sixes. Amazed, I think to myself: there must be lots of people rolling dice in Malloy Hall right now. After all, what are the odds that someone rolls 12 sixes in Malloy in the case where there is just one person rolling dice?

This would be terrible reasoning; the fact that I rolled all sixes, however improbable, is not evidence for the existence of many rollers. What has gone wrong?

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One diagnosis is that we need to distinguish between two pieces of evidence we might have:

Evidence 1: I rolled 12 sixes.

Evidence 2: Someone in Malloy Hall rolled 12 sixes.

The existence of many rollers would make Evidence 2 more likely. Would it make Evidence 1 more likely?

If not, then it looks like (given the principle of confirmation) Evidence 2, but not Evidence 1, provides evidence for the many rollers hypothesis. Since in our imagined scenario what I possess is Evidence 1, my inference that there must be many rollers was illegitimate.

But now compare this to the case of the multiverse.

Evidence 1: This universe is life-supporting.

Evidence 2: Some universe is life-supporting.

Which of these, if either, does the multiverse hypothesis make more likely? What does this show about the idea that the fact that the fundamental constants permits life supports the multiverse hypothesis?

Summing up: it appears that, if we have good reason to believe the multiverse hypothesis, this would be bad news for the fine-tuning argument. But it also seems that the fact that our universe is life-supporting is not itself evidence for the multiverse hypothesis. So the key remaining question is: do we have any good reason to believe in the multiverse?

This is a question very much in dispute — though the dispute is as much among physicists as philosophers. Some physicists think that there is physical evidence in favor of the multiverse hypothesis. Others think that the very idea of physical evidence about universes distinct from our own makes little sense.

Here — as in the case of Paley and Darwin — we have another example in which philosophical reasoning and scientific theory are intertwined.

What seems clear is that if (1) there is just one universe and (2) current thinking about the fundamental constants is on the right track, then the fine-tuning version of the design argument is a powerful argument for the existence of a designer of the universe.