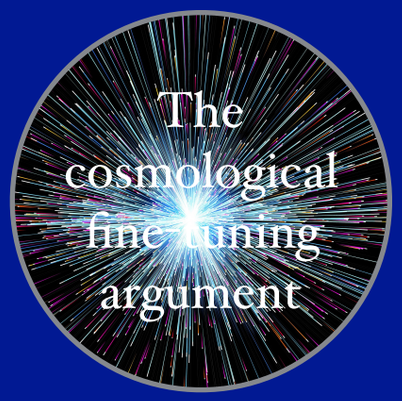


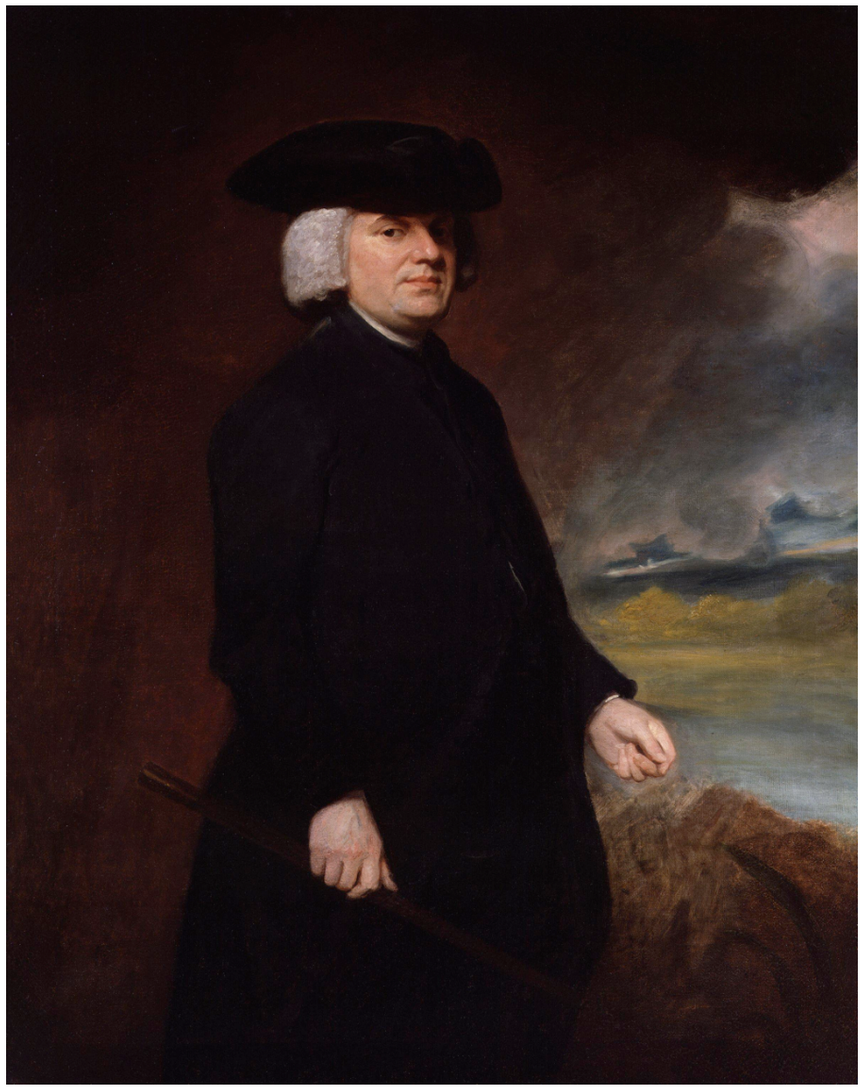
the design argument

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 those features of the universe are **best explained** 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*.

In this book, Paley employed an important thought experiment.

> "... 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 ..."

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The point Paley is making here is a simple one. If I found a watch on the ground, and saw how well its parts function together to keep the time, I would be strongly inclined to believe that the watch was made by an intelligent designer.

It seems as though this would be true even if I had never seen a watch before.

Why is this? Is it because it is **impossible** that something like a watch could come to exist as a result of unguided natural forces?

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Why is this? Is it because it is **impossible** that something like a watch could come to exist as a result of unguided natural forces?

It seems not. It is possible, however unlikely, that natural forces could combine to produce a watch.

Paley's point is rather than, even if this is possible, it is wildly unlikely. And so it seems that the **best explanation** of the watch would be that it was designed (even if we could not know with certainty that it was designed).

So what, you might ask? Well, Paley thought that there was a close connection between artefacts like watches and the parts of organisms.

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So what, you might ask? Well, Paley thought that there was a close connection between artefacts like watches and the parts of organisms.

> "I know no better method of introducing so large a subject 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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Here Paley seems to be thinking that we can reason about the human eye in much the way that we imagined reasoning about a watch. We find ourselves in a world in which creatures like us and fish have eyes which are extremely complex and extremely good at providing information about the environments in which those creatures live. Just as in the case of the watch we should think that its existence is best explained by a designer of the watch, so in the case of eyes we should think that their existence is best explained by a designer of our world.

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We might lay out Paley's argument like this (this follows the way that White lays things out in the reading):

The traditional fine-tuning argument

1. If E needs an explanation, and H provides a satisfactory explanation of E which is better than any other available explanation, then E provides significant support for H.
2. That our eyes are so well-functioning needs an explanation.
3. That God designed our eyes provides a satisfactory explanation for why our eyes are so well-functioning.
4. There is no comparably satisfying explanation available.

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C. That our eyes are so well-functioning provides significant support for God's existence. (1,2,3,4)

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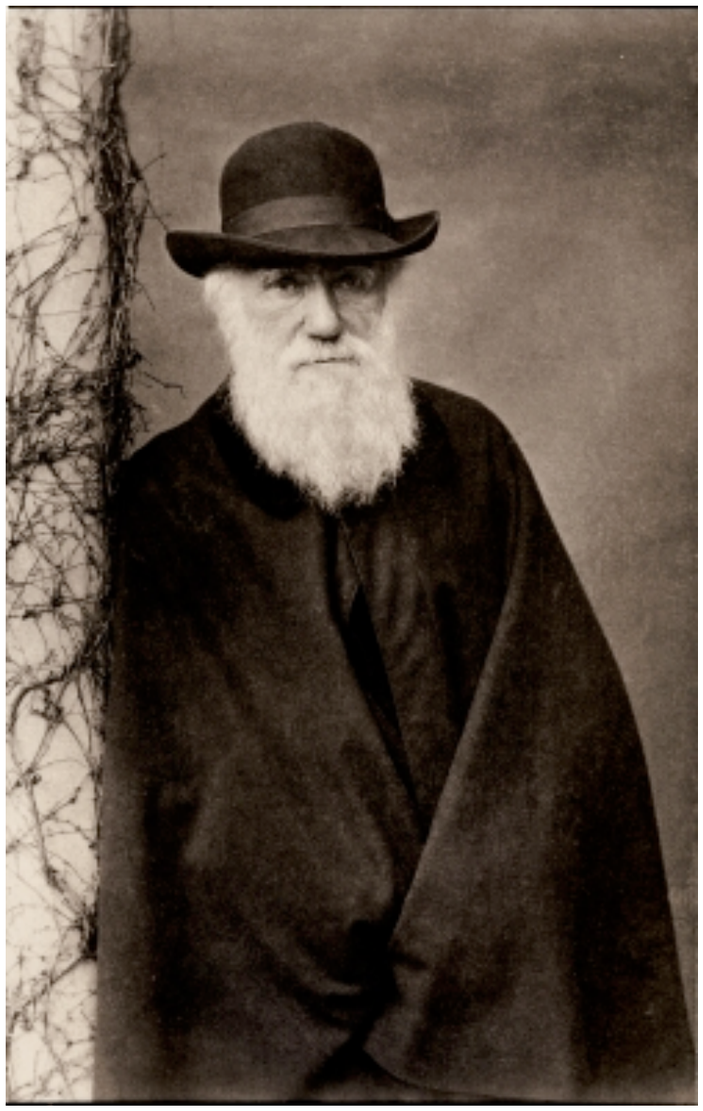
Paley in his book goes on to provide example after example like the case of eyes. Each new natural phenomenon, he thought, provides one more piece of evidence for the existence of God.

Paley wrote his book in 1802. From our perspective in the 21st century, though, it looks like Paley's argument has a fatal flaw.

This problem comes not from a philosopher finding a flaw in Paley's argument, but rather from Charles Darwin's development of the theory of evolution by natural selection.

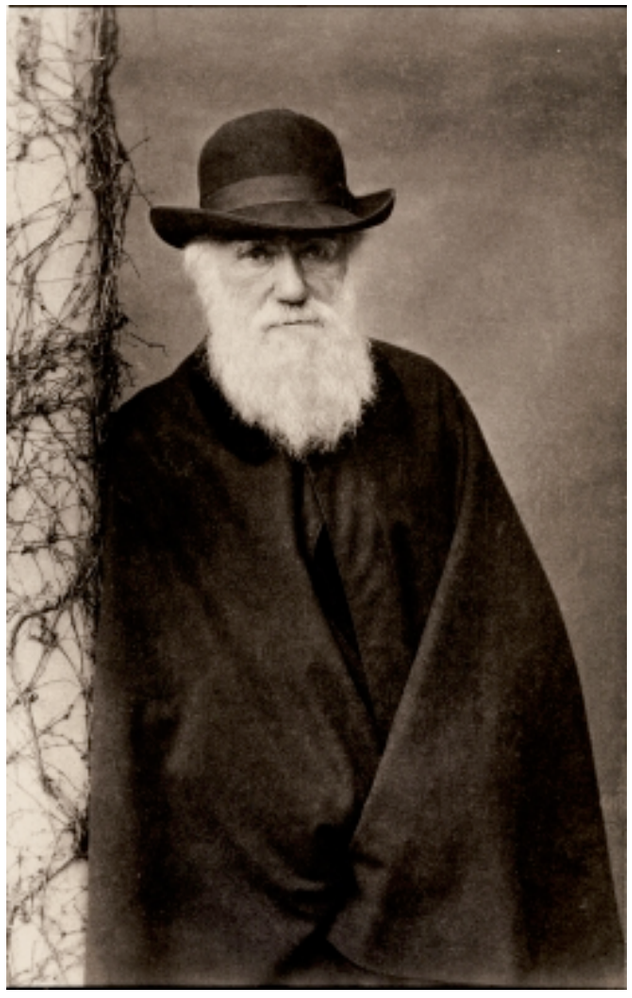
That theory showed how it is possible, through mutation and natural selection, for complex life to evolve in the absence of a designer.

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



Darwin himself thought that his theory showed that Paley's design argument for the existence of God is a failure:

> "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.

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Let's have another look at Paley's argument. Supposing that something like Darwin's theory is true, which premise in Paley's argument does that make trouble for?

Does it give us any reason to doubt premise (1), or any of the other premises?

This suggests a way in which the design argument might be modified.

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Even if Paley could not have seen the alternative explanation provided by Darwin's theory, it does not seem like there is anything wrong with the **form** of Paley's argument.

Indeed, Paley is trying 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 their theories provide the best available explanation of the data. That is kind of like what Paley is doing here.

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 any available alternative explanation?

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One answer to this question is provided by proponents of the **cosmological fine-tuning argument**.

This argument begins with 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." (Hawthorne & Isaacs, "Fine-tuning fine-tuning")

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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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This is the basic physical fact with which the fine-tuning tuning argument gets started. Given the laws of nature, the chance that the values of the fundamental constants would be such as to permit life is extremely low.

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

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> 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 suggests that the fact that the constants are in a range which permits life to exist — i.e., that they are "fine-tuned" — is a fact which stands in need of explanation.

But we have no scientific explanation of the fact that the constants have the values that they have. (They are called "fundamental" constants because their values can't be derived from the laws of nature or the other constants.) That suggests that we can give an argument parallel to the one that we saw from Paley. (This follows the version given in the reading by White.)

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The cosmological fine-tuning argument

1. If E needs an explanation, and H provides a satisfactory explanation of E which is better than any other available explanation, then E provides significant support for H.
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We saw that the weak point of Paley's argument was the 4th premise. Does the 4th premise of the cosmological fine-tuning argument also seem questionable?

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Well, it is true that we have no current explanation of why the values of the constants are the way that they are. But what rules out the idea that in the future physicists might come up with a perfectly reasonable scientific explanation of the values of the constants?

Here the defender of the cosmological fine-tuning argument might point out that it is a little hard to see how physics could provide this kind of explanation. After all, the values of the constants can't be derived from the fundamental laws of nature — but then what could physicists use to explain the values of the fundamental constants?

This is enough to show that the cosmological fine-tuning argument is on stronger ground than the traditional fine-tuning argument. But one might still think that reliance on the absence of a future scientific explanation is a weakness in the argument.

In some cases, it is easy to tell. Suppose I come out of my house in the morning and obtain the following bit of evidence:

E. My sidewalk is wet.

Now suppose that two explanations (hypotheses) occur to me:

H1. It rained.

H2. My neighbor sprayed my sidewalk.

Which one is better? (Suppose that my neighbors are pretty normal people, and have no grudges against me or my sidewalk.) Why?

This suggests that how good an explanation is depends in part on how antecedently likely the hypothesis is to be true.

How consider a third hypothesis.

This also seems not as good as H1. But is this because it is antecedently less likely to be true?

It seems not. Rather, it seems like the problem is that it is not very likely to be true that **if** H3 is true then E is.

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So we've identified two things that make a good explanation. First, it has to be reasonably likely to be antecedently true. Second, it has to make it likely that the observed evidence holds.

The problem is that sometimes these things point in opposite directions. For consider the main piece of evidence that we are looking at:

E. The constants are fine-tuned.

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E. The constants are fine-tuned.

And consider two possible explanations:

H1. God set their values.

H2. The values were set at chance.

Maybe you think that H2 is antecedently more likely, but that H1 makes the observed evidence more likely. In that case, which one is the better explanation? It is hard to say — and nothing in the cosmological fine-tuning argument as laid out so far tells us.

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To make progress here we are going to set aside talk about better and worse explanations, and instead think a bit how to reason more directly about probabilities.

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?

How can we use these notions of probability and conditional probability to tell us what hypothesis to believe, given some evidence?

How can we use these notions of probability and conditional probability to tell us what hypothesis to believe, given some evidence?

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 that the probability of a given b is the chance that a and b are both true divided by the chance 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, Clinton, 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 work through the toy example of the rain and the wet sidewalk. What we want to know is: what is the probability of it having rained, given the evidence that the sidewalk is wet?

Suppose that I think that the probability of rain on any given night is 0.3, and that the probability of my sidewalk being wet on any given morning is 0.2, and that I think that the probability of a wet sidewalk given rain is 0.6 (say that 40% of the time the water dries before morning). Then the probability that it rained, given my evidence of a wet sidewalk, is

$$= \frac{0.3 * 0.6}{0.2} = 0.9$$

So, given your evidence of the wet sidewalk, you think that there is a 90% chance that it rained last night.

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 life-permitting range? Second, what is the probability of the non-design view given the evidence that the constants are in such a 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

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

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It is difficult to think about numbers as large as the denominator of this fraction. 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.

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Of course, this oversimplifies in various ways. For example, there is clearly 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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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 much better objection to the Bayesian fine-tuning argument:

> **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.’

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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.

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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:

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

If not, then it looks like 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.

E1. This universe has life-permitting constants.

E2. Some universe has life-permitting constants.

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.