

Scientific Method & the Burden of Proof

Supporters of religion sometimes argue that atheists first need to prove that there is no god. "Look at the complexity of nature and the Universe", they say. "It has to have been designed! Prove that there was no designer for all of this!".

This point of view is actually back-to-front, and comes from ignorance about how we understand objective reality in a coherent way.

Scientific Method

In thinking about nature and our place in it we are sometimes struck by deep questions about how the world and Universe works. Our curious minds have a strong urge for answers to fill that gap of 'not knowing'. Some people are satisfied with traditional answers, or ones handed down from some 'authority'. Scientists, on the other hand, follow a set of guidelines to attempt to discover the best possible explanation.

The actual process is called the 'scientific method', which is a system that is carefully arranged to prevent us from fooling ourselves as we discover how the Universe really works.

Filtering out delusions and wishful thinking

It is easy to deliberately, or through mental illness, imagine things that do not exist. Examples that immediately come to mind are time-machines, leprechauns, hairy blue frogs, elephants that fly. Anyone could make up such things all day with no real effort. And there are an infinite number of these non-existent things that could potentially be imagined.

But it is nearly impossible to **prove** that these things do not actually exist, or have never existed. You would have to show you had looked everywhere the object could be and still not found one. Even then it could be said that the thing was hidden, or moved while you were looking for it, or you looked at the wrong time.

To illustrate the great difficulty of refuting mythical objects, atheists talk of orbiting teapots out past Mars, and of their satirical "religions" of the Flying Spaghetti Monster and the Invisible Pink Unicorn. The point being that there is just as much proof of these satirical entities as for any other gods.

The same principle applies in general science. For this reason the onus is always on the believer to provide convincing evidence that the object believed in is not merely a laughable fantasy but actually exists. This is called the 'Burden of Proof'.

Burden of Proof

There is a really solid reason for placing the burden of proof on the person who is proposing that an object exists, based on the **balance of effort** required to provide evidence for or against something.

As we have seen, the proof on an object's non-existence is actually impossible in practice. On the other hand, it is not necessary to produce the object itself to show that it does exist – all that is required is convincing evidence for it - which in principle is a much simpler task.

So the balance of effort is overwhelmingly weighted **in favour** of the person who is dreaming up these imaginary objects, and **against** the person who seeks to disprove them. That is why we require a higher level of up-front commitment by anyone who proposes that an object exists. They must first provide convincing evidence of a proposed object's existence before any serious discussion about it can begin. Until that happens there is literally nothing to discuss.

This process is necessary to weed out half-baked ideas that would otherwise endlessly waste people's time trying to debunk, or tie them up in fanciful discussions about nonsense. At least in getting the originator to provide evidence, the worst they can do is waste their own time.

Default Axioms

There is an important consequence to this - if an object cannot be shown to exist, the default position is that it does not exist. It is **axiomatic** that something does not exist unless shown otherwise.

In science an axiom is a statement that is taken as true until proven otherwise.

This serves as a rational starting point for any analysis. An axiom could be later falsified by direct evidence or by logical proofs. But until this happens it is taken as being correct.

Other features of the Scientific Method

Hypotheses

Proposing a possible solution to a scientific question is called a 'hypothesis'. We often have several hypotheses for a given question, and the key is how to tell which one fits the evidence the best, and which ones need to be reviewed or discarded because they don't work.

To identify the best hypothesis they should each ideally make clear predictions that are different from all the other hypotheses. We can then test the different predictions to see which still stand, and which can be ruled out.

Occam's Razor

When several hypotheses make the same predictions and we can't find the correct one by its results, other things being equal, we use "Occam's Razor". This principle is named after 14th-century Franciscan friar and logician, William of Ockham.

This states that we should prefer the hypothesis that postulates the fewest entities and makes as few assumptions as possible. Why? Because the extra assumptions and postulates add nothing to the end result.

This principle "shaves away" the hypothetical "foam and stubble", giving the cleanest explanation.

Objective evidence

It is vital that the results of any hypothesis testing must be objective, so that others can detect the evidence too. It is not enough to say the evidence is “internal” to you, you have “faith” or you “feel” it to be true, or the thing has special properties that make it impossible to detect. How else other than by objectivity could you tell reality from a delusion, or sanity from madness?

Falsifiability

Some hypotheses are impossible to test, because they can fully explain every possible result of every possible experiment. They are called ‘unfalsifiable’.

For example, one unfalsifiable hypothesis is *extreme solipsism*, where a person says “I know I exist, but you and everything else I experience are mere figments of my imagination”. There is nothing you can do to prove to this person they are wrong.

Because unfalsifiable hypotheses are untestable, they are also undecidable and hence unscientific.

Peer Review

Before experimental results are published, they undergo “peer review” where several experts in the field check the work for faults in the method or conclusions. The review is impartial, and is often anonymous to prevent undue bias or influence.

Experimental work that has not undergone peer review is generally treated with suspicion as being potentially unreliable.

Theories

A “scientific theory” is a comprehensive, logical, testable model of all available evidence which also allows predictions to be made in order to continue to check it.

A theory must be falsifiable, so it can be tested.

It does **not** mean an unsubstantiated guess or hunch, as it can in everyday speech.

How this applies to religion

The **burden of proof** remains squarely on religious people to provide evidence for the existence of their deity before anything can be claimed or done in the name of this deity – and this includes moral claims!

For those who say that a god started the Universe but has since left it alone, or is otherwise undetectable today, this can be dismissed using the principle of **Occam’s Razor**.

Claims of a ‘personal’ god **lack objectivity and falsifiability**, as do claims that a god is somehow “outside” of time and space.

Intelligent Design, the purportedly scientific face of creationism, has **no impartially peer reviewed scientific papers** to its name. It is also not a scientific theory as it makes no testable predictions.

Consequently, in the absence of any sensible evidence, **by default** we can take it that no gods exist. There is no reason to think otherwise.

In Summary

Science has multiple checks and balances to constantly prevent and correct errors, to get closer to a comprehensive understanding of reality.

Religions have no objective rationality checks, no evidence for a god, and completely fail as realistic explanations of the Universe and our place in it. Consequently, religions have no authority to make any truth claims whatsoever.

Further Information

Reading

- **Richard Dawkins** - The God Delusion
- **Daniel C. Dennett** - Breaking the Spell

Web Sites

- **Richard Dawkins** - RichardDawkins.net
- **PZ Myers** - scienceblogs.com/pharyngula

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