Faith, Deuteronomy 18:21–22, and the Scientific Method

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Abstract: This article shows that beliefs or convictions permeate the use of the scientific method just as they permeate religion. To that end, it begins by showing how belief is a prerequisite for both religion and for the deployment of the scientific method as a valid tool for empirical science. Then it describes the scientific method, bringing to the fore the extent to which it entails faith or beliefs. It also shows that Deuteronomy 18 and other biblical passages prove critical thinking to be embedded in the faith both in the use of religion and in the scientific method.

Keywords: circular reasoning; conflict narrative; faith; falsification; scientific method

The conflict narrative posits that religion and empirical science are always in conflict—totally incompatible with each other—poles apart. "Religion is founded on faith; but science is founded only on facts!" is the boast of atheists.[1] They also ask how can there be any faith involved in the use of the scientific method, which draws upon tangible evidence, visible facts, hard data, and physical proof. This article attempts to show that faith—or rather belief, conviction—permeates the use of the scientific method just as it permeates all religions. To that end, I shall discuss belief as a prerequisite for both religion and the

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1 Jerry Coyne, "Yes, There Is a War Between Science and Religion" (2018) https://theconversation.com/yes-there-is-a-war-between-science-and-religion-108002 (accessed 16 April 2022).

scientific method, to then show that Deuteronomy 18 and other biblical passages prove critical thinking to be imbedded in the faith. Then I shall describe the scientific method, bringing to the fore the extent to which it entails faith or belief.

Faith

Faith or belief has been defined in many ways, from the New Testament's "faith is the substance of things hoped for, the evidence of things not seen" (Heb 11:1), on the one hand, to Mark Twain's "faith is believing what you know ain't so," on the other.[2] Dictionary definitions refer to "Belief: Acceptance as true of any statement, etc." and "Believe: Trust the word of a person; Put trust in the truth of a statement."[3] The definition adopted here is: "Faith is taking a step beyond what the evidence conclusively proves," which is in line with both *The Concise Oxford Dictionary* and the Bible. There is much more that could be said about faith and, indeed, philosophers have said much, much more. It involves knowledge of, acceptance, or mental assent to something, and acting upon the proposition that is believed. The essential point made here is that faith goes beyond proof.

We can supply reasons, facts, and arguments to support our beliefs, for why we accept certain theories, hypotheses, and statements as true, but the former never prove the latter. Faith always goes beyond evidence. It does so in one of two ways—what will be called here the "step of faith" and the "leap of faith." A "leap of faith" (popularised by existentialism) is to go beyond the evidence in the opposite direction to where the evidence appears to be leading. Existentialists believe that this universe is absurd, that there is no purpose or significance in it because it has no creator. We are merely highly evolved pond scum living amongst other highly evolved pond scum and some not so highly evolved pond scum. Even so, existentialists take a leap of faith to

2 Mark Twain, "Faith" (2015) http://www.twainquotes.com/Faith.html (accessed 20 April 2017).

3 "Belief" and "Believe" in *The Concise Oxford Dictionary*, ed. H. W. Fowler and F. G. Fowler (Clarendon: Oxford University Press, 1964).

believe they are significant and hopefully to create purpose for themselves, even though they know this is absurd. As Francis Schaeffer put it, "Kiekegaard came to the conclusion that … you achieved everything of real importance by a leap of faith. So he separated absolutely the rational and logical from faith. The reasonable and faith bear no relationship to each other."[4] This is what Mark Twain quipped.

On the other hand, a "step of faith" is going beyond the evidence in the direction that the evidence appears to be pointing. Such steps of faith are often made unconsciously because they appear logical and reasonable. The more supporting evidence we have to believe a person or proposition, the smaller the step of faith needed to believe or put our faith in them.

For example, consider reading a crime or "whodunnit" novel. Suppose the author depicts the murder of a rich, married woman. All of the suspects have many motives for wanting her dead. All of the suspects have alibis for the time of her murder. All of the suspects have a web of relationships and intrigue with each other so that any two or more of them could have hatched a conspiracy to murder her and cover each other's tracks. As the story progresses, all the evidence points to the butler. You might conclude: "I believe the butler did it!" That would be a "step of faith" because it was in the direction the evidence appeared to be pointing. Someone else might say: "I know all the evidence points to the butler, but I still believe her husband/widower murdered her." This would be a "leap of faith," since it is in the opposite direction to where the available evidence is pointing. You then have to wait until the end of the novel to find out who the actual culprit/s is/are.

Atheists maintain that all religious faith is a "leap of faith," saying: "Faith means claiming something to be TRUE without any evidence, and despite evidence to the contrary."[5] In the Bible, faith in Jesus Christ is depicted as a "step of faith." Typically, Jesus says to Philip, "Believe Me that I am in the Father and the Father in Me, or else be-

4 Francis August Schaeffer, *The God Who Is There: Speaking Historic Christianity into the Twentieth Century* (London: Hodder and Stoughton, 1968), 20–21.

5 Atheist Max, "Is Atheism a Faith?" (2019) atheistmax.wordpress.com/is-atheism-a-faith/ (accessed 17 October 2019).

lieve Me for the sake of the works [i.e., the evidence] themselves" (John 14:10). Accordingly, Christians suspect that it is atheists who are taking the "leap of faith" because all the evidence in the world around us indicates that there must be a Creator behind it all. Atheists retort that they have explained most things scientifically and will one day explain everything without any need for a mastermind, so it is a "step of faith" to believe that there is no Creator. And the argument goes on. We will have to wait until the end of life to find out the actual truth.

Deuteronomy 18:21–22 and the Criteria of Prophecy

Deuteronomy 18 spells out some of the differences between God's people and the surrounding nations. Having told the Israelites not to be like the pagans who seek soothsayers and the like to determine God's will (Deut 18:9–14), Moses then told them that God would raise up a prophet like himself to guide them (Deut 18:15–20). Furthermore, anticipating the appearance of false prophets who would lead Israel astray, Moses gave the people a way to tell true from false prophets: "And if you say in your heart, 'How may we know the word that the Lord has not spoken?'—when a prophet speaks in the name of the Lord, if the word does not come to pass or come true, that is a word that the Lord has not spoken; the prophet has spoken it presumptuously. You need not be afraid of him" (Deut 18:21–22).

The principle behind testing prophets and their prophecies is captured by the end of the passage. It amounts to considering what the prophets predict, and if that does not happen, then their claims to be prophets of the God of the Bible are illegitimate. They are false prophets and can be safely ignored. In the Bible can be found other tests of prophets, described in Deut 13:1–5, 1 Kgs 18:19, Isa 8:19–20, and Jer 23:14 and 28:7–9. The Bible itself has been proven by this method, as all of its prophets, Jesus Christ included, passed the test described in Deut 18:21–22. They also passed all the other tests.

While Deut 18 is often referred to as a test of true and false prophets, it is, strictly speaking, a test of false prophets. It answers the

question: "How may we know the word that the Lord has *not* spoken?" (Deut 18:21; my emphasis). Paraphrasing Karl Popper, it is about the falsification, not the verification, of someone's claim to be a prophet of YHWH.[6] In short, predictions that do not happen are only made by false prophets. But what if the predictions do happen? Does that prove the prophets to be true? Not necessarily. They may be false prophets with a lucky guess. The Bible acknowledges that a true prediction may be given by a false prophet: "If a prophet or a dreamer of dreams arises among you and gives you a sign or a wonder, and the sign or wonder that he tells you *comes to pass* [i.e., the prediction does happen], and if he says, 'Let us go after other gods' … you shall not listen to the words of that [false] prophet" (Deut 13:1–3a; my emphasis).

The reason why this test can only falsify a prophetic claim, not verify it, is because the test entails circular reasoning: it starts with the prediction and finishes by comparing what happens with that prediction. Circular reasoning can only prove if a proposition is consistent, not whether it is consistently right or consistently wrong. To determine the rightness or wrongness of a statement, another test or more tests are required, including a step of faith. In the case of the Bible, the next step or the next test of prophets and prophecies requires to ask whether the prophets and the prophecies agree with the teaching of the rest of the Bible. In Isaiah's words: "To the law and to the testimony! If they [the prophets, etc.] do not speak according to this word, it is because there is no light in them" (Isa 8:19–20; see also Deut 13:1–16). The step of faith involved here is believing that the Bible is accurate and reliable, and using it to test potential prophets and prophecies.

A step of faith is required even before using this test. Before applying it, one needs to believe it is a valid test to use. The reasons for accepting it as valid are irrelevant. One may accept it because of believing the Bible is inspired and infallible. Or one may believe it because it sounds logical—or for any other reason/s. But believing it is appropriate is a prerequisite for using it.

6 Karl Raimund Popper, *The Logic of Scientific Discoveries* (Mansfield Centre, CT: Martino Publishing, 2014), 32–40.

This test also implies that a prophecy must be falsifiable—that the opposite of the prediction might happen. Some prophecies are so vague or so ambiguous that they will always seem correct. Such predictions are useless, however plausible and religious they sound. Whatever happens, the prophecy makes no difference one way or the other.

Furthermore, prophecies can originate from anywhere. James Crenshaw examined many proposed tests of prophets and prophecies. One such is the "revelatory form" by which the prophet received God's message for the people—whether by dream, by vision, by the word of YHWH, or by the spirit of YHWH, concluding that such "revelatory forms" provide no criterion for distinguishing a true prophet from a false prophet.[7] The most common means of revelation to prophets in the Bible were hearing God's Word (e.g., Jer 1:4, 7; Ezek 3:18; 7:1; Zech 4:8; 8:9) and/or seeing God's message in a vision (e.g., Isa 1:1; 2:1; Ezek 1:3–4; Obad 1). Usually the prophets would then preach it to the people, but occasionally they would act it out (Isa 20:1–6; Ezek 4:1–8). However, God's message sometimes came through other means, such as the "common events" that happened around them. Here is an example: "As [the prophet] Samuel turned around to go away, [King] Saul seized the edge of his robe, and it tore. So Samuel said to him, 'The Lord has torn the kingdom of Israel from you today, and has given it to a neighbour of yours, who is better than you'" (1 Sam 15:27–28).

One of the tests to be used of prophets is that we should expect Godly character from God's prophets, whereas false prophets often live immoral lives (Jer 23:14; 2 Pet 2:1–3). While this is generally true, there were occasional exceptions (e.g., 1 Kgs 13:11–32). In one instance, a true prophecy came, however unwittingly, from an archenemy of Jesus Christ:

> One of them, Caiaphas, being high priest that year, said to them, "You know nothing at all, nor do you consider that it is expedient for us that one man should die for the people, and not that the

7 James L. Crenshaw, *Prophetic Conflict: Its Effect upon Israelite Religion*, ed. Georg Fohrer, Beihefte zur Zeitschrift für die alttestamentliche Wissenschaft 124 (Berlin: de Gruyter, 1971), 49–61.

> whole nation should perish." Now this he did not say on his own authority; but being high priest that year he prophesied that Jesus would die for the nation (John 11:49–51).

This is a true prophecy from the New Testament's perspective. Therefore, following Crenshaw's investigations, wherever a biblical prophecy came from, through whomever it came, in whatever circumstances it was given, it might be a true prophecy if its predictions happened, and if it is in harmony with the rest of the Bible.

Testing biblical prophecy appears to anticipate what is currently known as the scientific method. However, it must be remembered that prophecies are often more nuanced because they involve people. Therefore there can still be "grey areas." For example, was Jonah a false prophet because his prediction of doom for Nineveh did not happen (Jonah 3:4,10) or was he a true prophet because his preaching led to the repentance of the Ninevites (Jonah 3:5–9)? Was Huldah a true or false prophet because one of her predictions was correct (2 Kgs 22:19) and one incorrect (2 Kgs 22:20)? Was her score of 50% a "pass mark" or not? In turn, scientific predictions are more precise, more exact than prophecies, given that they deal with objects and physical forces, not persons.

The Scientific Method

The advent of empirical science—also called modern science or experimental science that uses the scientific method—certainly was one of the greatest leaps forward for the human race. It was a complete change—what Thomas Kuhn called a "revolution" or a "paradigm shift"—from what went before it, Aristotelian science. Modern science or empirical science is based on, concerned with, and verifiable by observation or experience rather than theory or pure logic. It is the practice of basing ideas and theories on testing and experience, capable of being verified or disproved by observation or experiment.[8]

8 Cf. Ian Hacking, "Introductory Essay," in Thomas Samuel Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962), xiii. See

The technique for verifying theories and hypotheses, the scientific method, had been used *ad hoc* for about two hundred years before it was formalised by Francis Bacon in 1620, earning him the title "Father of Experimental Philosophy."[9] Bacon broke with Aristotle's philosophy, theology, and science, and its resurgence in scholasticism and the renaissance. Before attending Cambridge University, Bacon was educated at home by a private tutor, the Puritan John Walsall, who contributed to Bacon's Christian beliefs and "his distaste for what he termed 'unfruitful' Aristotelian philosophy, favouring instead the conviction that the human mind is fitted for knowledge of nature and must derive it from observation, not from abstract reasoning."[10]

In his *Novum Organum* (New or True Directions Concerning the Interpretation of Nature), Bacon detailed a new system of logic that he believed to be superior to Aristotle's old deductive and syllogistic approach. This is known as the Baconian method, precursor to the scientific method based on induction. The title of his dissertation is a reference to Aristotle's work *Organon*, which was the latter's treatise on logic and syllogism, the basis for his science, his natural philosophy. The front cover of *Novum Organum* cited Dan 12:4 which includes the words: "And knowledge shall increase!" In this light, using the scientific method, the early modern scientists went looking for and found God's laws of nature. About this endeavour Johannes Kepler said: "Science is the process of thinking God's thoughts after Him."[11] Auguste Comte called this early era—the fifteenth, sixteenth, and seventeenth centuries—the "theological phase" of modern science.[12]

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also https://www.merriam-webster.com/dictionary/empiricism (accessed 23 November 2020).

9 Peter Urbach, *Francis Bacon's Philosophy of Science: An Account and a Reappraisal* (La Salle: Open Court, 1987), 192.

10 Francis Bacon, *Of the Proficiency and the Advancement of Learning, Divine and Human* (1605) http://www.gutenberg.org/ebooks/5500 (accessed 22 November 2020).

11 Johannes Kepler Quotes, https://www.pinterest.co.uk/pin/811773901558228997/ (accessed 23 November 2020).

12 Hacking, "Introductory Essay," xxxiv.

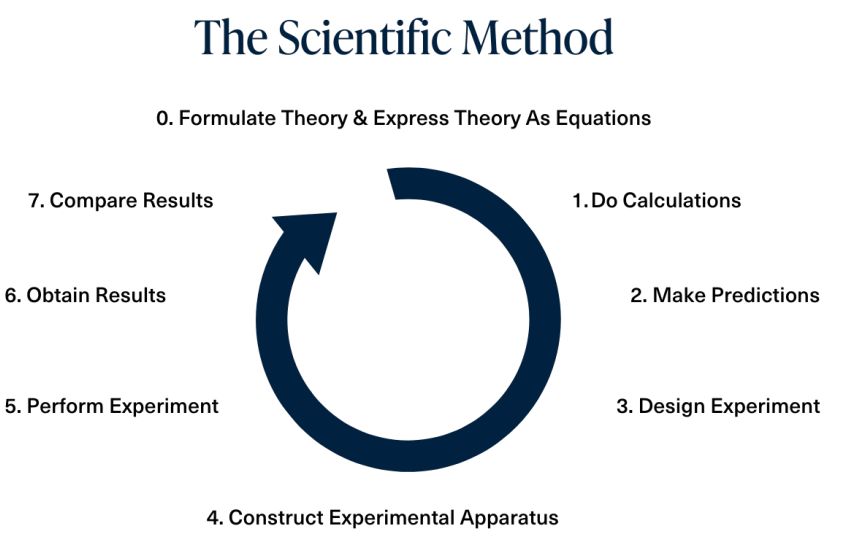

Figure 1

The scientific method may be called a "Reality Test." Figure 1 depicts it in more detail. The essence of the scientific method—what Robert Nola and Howard Sankey call its "meta-method" or its "meta-methodology"—is to find what a scientific theory or hypothesis predicts, and then to perform experiments and observe whether the prediction happens or not, i.e., if the theory's prediction is correct.[13] If it is not, the theory is rejected as wrong. It may be rejected altogether, or it may be modified in one or more ways, yielding a new theory which gives new predictions, which can then be tested against the scientific method, and so on. A scientific hypothesis must be falsifiable, implying that it is possible to identify a potential outcome of an experiment or observation that could conflict with predictions deduced from the hypothesis; otherwise, the hypothesis cannot be meaningfully tested.

Some disciplines require slight modifications of, or additions to, the general scientific method. When testing astronomical phenomena,

13 Robert Nola and Howard Sankey, *Theories of Scientific Method: An Introduction* (Montreal: McGill-Queen's University Press, 2007), 1.

for example, the scientific method relies on observations only, since we cannot perform experiments on stars, galaxies, comets, etc. When used with human subjects, such as in testing psychological theories and the efficacy of newly developed medications, the "double blind" technique is added to the scientific method in order to eliminate human expectations (the "placebo effect") as much as possible.

Testing scientific theories with the scientific method has exactly the same "meta-method" or "meta-methodology" as the test of prophets and prophecies; it is a matter of seeing what they predict and then of checking the prediction in the real world by observations and experiments. Because they both follow the same meta-methodology, testing prophecies and scientific ideas have common grounds. In particular, just as there are four steps of faith in testing prophecies, so there are four steps of faith in using the scientific method. We have noted one common ground already—both prophecies and scientific theories need to be falsifiable in order to be meaningful and able to be tested.

Faith in the Scientific Method

As with the test of prophets and prophecies, we need to have faith in the scientific method before we use it. Most scientists use it simply because it was passed on to them as how to do what they need to do to get their research done and publish their results. For those who have thought more about it:

> Scientists use the scientific method because it is evidence-based, standardized and objective in conducting experiments. The scientific method allows scientists to stick to facts and to avoid the influence of preconceived notions and personal biases in research processes, improving the credibility of research findings … The scientific method involves a rigorous methodology that is aimed at minimizing prejudice.[14]

14 "Why Do Scientists Use the Scientific Method?" https://www.reference.com/science/scientists-use-scientific-method-887b9796714e7261 (accessed 23 November 2020).

These are excellent reasons for adopting and using the scientific method, but they are not proof of its validity. Some scholars such as Paul Feyerabend reject its comprehensiveness.[15] In turn, Nola and Sankey defend "the idea that there is such a thing as scientific method," and seek to justify, warrant, and legitimise it.[16] That it needs to be argued thus shows it is neither a fact nor self-evident but an article of faith. No experiments have been performed to verify the scientific method itself—you cannot use the scientific method to validate the scientific method. You either believe it is valid or you believe it is not valid.

To be an empirical scientist, one must believe the method is legitimate. The reasons for accepting and using it are irrelevant. One may believe it because it is in harmony with the Bible (Deut 18:21–22) as the present writer does. One may believe it because that has been the tradition of the scientific establishment for over five hundred years. One may believe it given that contemporary experts promote it. Moreover, one may believe it for any other reason/s. But, to be an empirical scientist, one must believe that it is valid.

Faith in the Results of the Scientific Method

Popper refined the theory of using the scientific method, showing that its purpose is not to verify hypotheses and theories, but to falsify them.[17] His arguments have won the day, with virtually everyone agreeing with him.[18] In order to verify that any theory or hypothesis actually is a law of nature—i.e., to know it is true and factual everywhere all the time—we would have to articulate it precisely and correctly, test it with infinitely accurate instruments, at every place throughout the universe, and at every time throughout the universe, past, present, and future, which, of course, is impossible on all counts. Therefore, human beings can never verify or determine conclusively whether a scientific

15 Paul Feyerabend, *Against Method*, 3rd edition (London: Verso, 2002), 23.
16 Nola and Sankey, *Theories of Scientific Method*, 1.
17 Popper, *The Logic of Scientific Discoveries*, 32–34, 40.
18 Martyn Shuttleworth and Lyndsay T. Wilson: "Falsifiability: Karl Popper's Basic Scientific Principle" https://explorable.com/falsifiability (accessed 23 November 2020).

hypothesis is correct, even when using the scientific method. Our experiments are always limited, never comprehensive enough, never extensive enough, and our instruments are never precise enough—they are never perfectly or infinitely accurate.

The reason why the scientific method is only capable of the falsification and never the verification of scientific theories is that, like the test of a false prophet, it is circular reasoning, as seen in Figure 1. It starts with the prediction of a scientific theory (or a prophecy) and ends with comparing the results of the experiment with the prediction with which you started. Circular reasoning can only prove whether the original proposition, theory, or hypothesis is consistent or not. If it is inconsistent, i.e., if its prediction does not happen, then it is false, and should be rejected. If the prediction does happen, then the theory, hypothesis, or proposition is consistent, but there is no way to tell by using the scientific method whether it is consistently right or consistently wrong.

This lack of certainty goes by the name of underdetermination:

> In the philosophy of science, underdetermination or "the underdetermination of theory by data" is the idea that evidence available to us at a given time may be insufficient to determine what beliefs we should hold in response to it. Underdetermination says that all evidence necessarily underdetermines any scientific theory.[19]

Said otherwise, in order to verify that a theory is correct, it would need to be tested with infinitely accurate instruments, at every place in the universe, at every time in the universe. Only if that is achieved can a theory claim to be verified. Since this is never the case, there is no proof that any scientific theory or hypothesis is true throughout the universe.

Similarly, giving an accurate prediction does not prove a scientific theory correct; it might still be a wrong theory with a lucky guess. The phlogiston theory of combustion—that flammable materials contain a substance called phlogiston that leaves it during combustion,

19 Kyle Stanford, "Underdetermination of Scientific Theory," in *The Stanford Encyclopedia of of Philosophy*, ed. Edward N. Zalta (Stanford University Press, 2021).

leaving ash of lesser mass—gave many correct predictions, for just over a century, e.g., burning wood, paper, candles, etc. That meant it was consistent. However, it was consistently wrong, as was later demonstrated. It was eventually proved wrong with the example of burning magnesium, whose ash, magnesium oxide, had more mass than the original magnesium. That means a step of faith is required to accept a theory as one of the laws of nature. A scientist could put it as follows: "I know this is only circular reasoning. I know it is only evidence for its correctness, not proof of it. But I have enough evidence, from this and other experiments, and from other considerations as well. Therefore, I am convinced it is right. Consequently, I will believe it is accurate—I will take a step of faith and act on it, basing all my future scientific theories and research on it." Incidentally, Kuhn used the word "conversion" to describe a scientist's changing from one scientific paradigm to a different one.

Unfortunately, what is "enough" evidence to be convincing is different for everyone. It is for this reason that certain scientists are convinced of theories by the available evidence, while others are not. Some scientists are convinced on a small amount of evidence, long before other scientists are convinced. For example, many scientists in the early twentieth century died still believing in classical gravity and classical mechanics. They claimed not having sufficient evidence to abandon classical mechanics and classical gravity and convert to quantum mechanics and Albert Einstein's theories of relativity. They died believing that one day refinements to classical mechanics and classical gravity would be found that explained everything satisfactorily.

In the case of the physical sciences, there is no inspired, infallible, inerrant book (or anything else) to test theories and hypotheses against. They always remain theories, never to be adequately and fully verified. Because there is no proof available, some wrong theories may go for years, even centuries, before being proved wrong, as the phlogiston theory was. As another example, before Einstein, the classical theory of gravity, or Galileo's theory of relativity, was published in 1632

in his *Dialogue Concerning the Two Chief World Systems*. Here is a summary of the Galilean theory:

> Galilean transformations, also called Newtonian transformations, [which are a] set of equations in classical physics that relate the space and time coordinates of two systems moving at a constant velocity relative to each other. Adequate to describe phenomena at speeds much smaller than the speed of light, Galilean transformations formally express the ideas that space and time are absolute; that length, time, and mass are independent of the relative motion of the observer; and that the speed of light depends upon the relative motion of the observer. Compare Lorentz transformations.[20]

Lorentz transformations are used in Einstein's theories of relativity that treats length, time, and mass not as absolute, but as dependent on the motion of the observer.

For over two hundred and fifty years, Galilean theory was considered consistent and made correct predictions. However, it was still wrong, "consistently wrong," and was eventually proved wrong in 1887. Its predictions were only "correct within experimental error" through that quarter of a millennium. In 1887, Albert Michelson and Edward Morley developed an incredibly accurate interferometer that showed a prediction of Galileo's theory of gravity was inaccurate.[21] So far, its replacements—Einstein's Special and General Theories of Relativity—have lasted for over a hundred years without any wrong predictions. Will they ever be proved wrong? We do not know. All we can say is that, so far, they have always given correct predictions within the parameters of our current scientific instruments. We believe Einstein's theories of relativity are correct, and we base the rest of our science on them at present.

20 https://www.britannica.com/science/Galilean-transformations (accessed 16 April 2022). See also https://www.britannica.com/summary/Galileos-Achievements (accessed 16 April 2022).

21 "Michelson-Morley Experiment" in https://www.britannica.com/science/Michelson-Morley-experiment (accessed 3 March 2022).

Incidentally, a negative result (an outcome contrary to the prediction of the theory under investigation) only demonstrates that something in the circle of the scientific method is wrong. It could be in the mathematical computations; it could be in the design, construction, or malfunction of the apparatus; or because of some contamination. However, with due diligence, including peer review, constant checking and rechecking, such errors are usually eliminated, so that it is only the consistency of the theory with reality that determines the results of the experiment.

One corollary of this analysis is that there are no such things as religious facts. The teachings of all the religions and their prophets are accepted on faith. Correct predictions do not prove that prophets are genuine—they could still be false prophets with a lucky guess. Many adherents will have strong faith in their religion's founder/s and their teachings, treat them as facts, and base their lives on them. They will accept the testimony of eye-witnesses as truthful statements of what happened and what was said, such as seeing, hearing, and eating with the risen Christ. However, we live by faith (Hab 2:4; Rom 1:17; Heb 10:38).

In exactly the same way, there are no scientific facts—no scientific theory can ever claim to be proved right, or determined, or established as a fact either. Any theory could be falsified by new experiments and new observations with more accurate instruments at any time. Claims that correct predictions concerning the cosmic microwave background radiation prove that the Big Bang theory is right or factual are mistaken. The correct predictions are evidence for the theory's correctness, but not proof of it. There is always a step of faith made. The more evidence we have, the smaller the step of faith needed—but there is always a step of faith required—it is never completely eliminated. We never know if three or three thousand years later a more accurate experiment will prove it wrong. Scientists, like Christians, live by faith and need to admit it.

To summarise, the second scientific step of faith is believing that a theory which has been tested using the scientific method and given correct predictions is not consistently wrong but consistently right, an

accurate description of reality, and then acting on it. The more evidence we have, the smaller the step of faith made, but faith is always required.

Faith in the Extent of the Scientific Method

Suppose a group of scientists perform an experiment to find how the forces exerted by two electrically charged objects on each other depends on their distance of separation. They perform this experiment in Brisbane, Australia, at 10:00am on Thursday 10 February 2022, and get the result that it is inversely proportional to the square of the distance between them. Strictly speaking, all they have demonstrated is that at their location in Brisbane at 10:00am on Thursday 10 February 2022 the force exerted by charged particles on each other was proportional to the inverse square of the distance between them. Why should anyone believe that it is the same anywhere else in the universe or at any other time throughout the history of the universe?

Someone might object: "We don't just believe it! We know it is true throughout all space—i.e., throughout the whole universe—and throughout all time—past, present, and future—because thousands of scientists and thousands of science students have performed similar experiments right round the world for hundreds of years and all got the same answer! No faith is needed!" We know they did. I have performed some of those experiments myself. Most likely, you have too. But how do we know we did not miss a time or a place or times and places where it was otherwise? How do we know if a law of nature is being broken now near Alpha Centauri, so we will not find out about it for over four years (at the speed of light)? Empirical scientists believe that all the laws of nature are uniform throughout the universe. The limited evidence that we have gives solid pointers in that direction, so it is a step of faith, not a leap of faith. But it is still a step of faith to believe that the universe is entirely regular.

Recently, postmodernists have claimed that there are no such things as "universal truths"—true for everyone, everywhere, and at every time. They are at most only "true for you," but may not be true

for anyone else, let alone for everyone else, everywhere else and "everywhen" else. Empirical scientists disagree with postmodernists on this point. Empirical scientists or modern scientists hold that the laws of nature are universally true—they operate infallibly throughout the whole universe throughout the whole history of the universe, whether people believe they do or not. Again, why one would believe this is true? One might believe it because the universe was created by a God of law and order. One might believe it because that is the tradition of empirical science for the past five hundred years. One, again, might believe it for any number of other reasons. But belief is crucial in order to be an empirical scientist.

The third article of the faith of empirical scientists is believing that the laws of nature hold true everywhere and "everywhen"—past, present, and future. The evidence from observations by human beings over the past five hundred years or so—an extremely tiny proportion of the entire history of the universe—points in that direction, so it is a step of faith, not a leap of faith. But faith it remains; it has not been proved or verified.

Faith in the Scientists Who Use the Scientific Method

We need to have faith in scientists that they will honestly report the results of their experiments and what those experiments indicate. Someone might object that the scientific method involves only facts and therefore we do not need any faith in those performing the experiments. Anyone at any time and in any place can repeat these experiments for themselves to check and see that the results obtained are genuine. Similarly, anyone can check their theory, their equations, their apparatus, and their instruments for themselves as well.

While this sounds good in theory, does it really work out that way in practice? Where would I, or any other scientist for that matter, obtain the multibillion dollars necessary to build and launch a telescope into space for ourselves ($1,000,000,000 to build and launch in 1995, plus $100,000,000 per year to operate) to check the images report-

edly obtained from the Hubble Space Telescope? Failing that, would I be allowed to launch on the next space mission to check if the images that are claimed to have come from the Hubble Space Telescope really did? Finally, who will pay for me or anyone else to spend twenty years or more at a university to learn the theory behind the experiments and the experimental equipment?

The answer is, of course, in the negative to these and similar questions. We need to have faith in the scientists who run the Hubble Space Telescope and all the other pieces of very expensive scientific apparatus and instrumentation. We need to have faith in the scientists that they are competent in the use of the equipment, and that they are honestly reporting their results. Actually, we need to have faith in them at all seven steps in the scientific method, as shown in Figure 1.

Occasionally, scientists will include some kind of certification or perhaps a statutory declaration that they have done all of this. Even if they do not, it is the tacit assumption that they have. Regrettably, this has not always been the case. There have been occasional examples of deception. Piltdown Man was fabricated from a modern human skull, some chimpanzee teeth, and an orangutan jaw, and then "doctored" to appear millions of years old, and thus made to look like a missing link in human evolution. To mark April Fools' Day, National Geographic News summarised some historic scientific hoaxes: Piltdown Man, Cardiff Giant, Archaeoraptor, and Bigfoot. "Not only was the Piltdown skull itself fraudulent but the entire mammalian fauna of the gravels had been planted and the human artefacts manufactured."[22]

In religion, there have been cases of "fake miracles," like instances of bleeding statues being reported to bolster people's faith in the god/s and/or goddess/es of that religion. For example, the *Irish Times* reported on one such hoax in 1920 with the headline: "The 'Templemore Miracles': How a fake bleeding statue led to an IRA truce."[23] The apocryphal additions to the biblical book of Daniel, *Daniel, Bel, and the*

22 L. B. Halstead, "New Light on the Piltdown Hoax?" *Nature* 276:5683 (1978): 11–13.

23 https://www.irishtimes.com/culture/heritage/the-templemore-miracles-how-a-fake-bleeding-statue-led-to-an-ira-truce-1.4328392 (accessed 1 March 2022).

Dragon, tell the story of how Daniel exposed another such fraud (Dan 14). The Bible warns against such tricksters multiple times (e.g., Deut 13:1–5; 18:20–22; Matt 24:24; Mark 13:22; Rev 19:20). Hence the Bible's tests of false prophets to protect believers from them.

Incidentally, I do trust or have faith in the honesty of scientists at the CERN collider, etc., unless the contrary is proved beyond reasonable doubt. In the same way, I trust or have faith in Matthew, Mark, Luke, John, Moses, Isaiah, Jeremiah, Ezekiel, and all the other Bible authors that they have honestly reported what they saw, heard, and experienced. To this end, several biblical authors give a certification—the first century equivalent of a statutory declaration—that they have done this truthfully. For example, the Apostle John wrote:

> This is the disciple who testifies of these things, and wrote these things; and we know that his testimony is true. And there are also many other things that Jesus did, which if they were written one by one, I suppose that even the world itself could not contain the books that would be written. Amen (John 21:24–25).

John is testifying that he is telling the truth and nothing but the truth. However, he tells us that it is not the whole truth because there was simply too much to report. He has given us a "typical sample" of what he saw and heard Jesus do and say. We could see also John 20:30–31, 1 John 1:1–3, and Luke's attestation in Luke 1:1–4. It is the tacit assumption that all other biblical authors are doing likewise. The Bible then offers for everyone to "repeat the experiment"—to believe in or accept Jesus Christ, and experience this for themselves, to "taste and see that the Lord is good; blessed is the man who trusts in Him!" (Ps 34:8).

With all of that being said, the truth or otherwise of a scientific theory does not depend on the honesty or anything else about the scientists who propose and/or promote it. In the case of Gregor Mendel who discovered and enunciated the laws of heredity (about dominant and recessive genes, etc.), he dishonestly reported the findings of his observations and experiments to help convince his peers of the accu-

racy of his theory. The combination of parents' genes in each of their offspring at reproduction is a random process, having an average or mean, and a spread measured by its standard deviation. Recent observations and more accurate measurements of experiments on pea plant reproduction indicate that Mendel "fiddled" or "cooked" his results to make his predictions look more obvious and more accurate. As Michael Starboard notes, "the number of experiments in which Mendel's data were very close to expectation was too great to be believed."[24] This also demonstrates the importance of truthfully calculating, including, and reporting the experimental error and standard deviation in the results of experiments. However, despite his dishonesty, Mendel's theory of dominant and recessive genes has so far stood the test of time and further, more accurate experimentation.

Induction

Finally, a word needs to be said on where scientists get the ideas upon which, and from which, they develop their scientific hypotheses and theories. Following Bacon, the belief was once held that scientific hypotheses must be generated via induction—by performing many experiments, usually drawing graphs of the measurements taken, looking for patterns in the data, and then, from all that data, inducing the relationship/s between the variables. However, Popper showed that one can get a scientific hypothesis from anywhere, not just via induction.[25] Popper called this initial conceiving of a theory its "psychological" stage—it originated in the *psyche* or mind of the scientists.[26] What makes it scientific is not its origin, but the criterion for its acceptance or rejection—the tests and observations made using the scientific method. Feyerabend also rebelled, this time correctly, against the forbidding of what he called "ad hoc hypotheses."[27] Much of Feyerabend's observed

24 Michael Starboard, "Did Famous Genetic Scientist Gregor Mendel Fake His Data?" https://www.thegreatcoursesdaily.com/gregor-mendel-fake-data/ (accessed 1 March 2022).
25 Popper, *The Logic of Scientific Discoveries*, 27–32.
26 Popper, *The Logic of Scientific Discoveries*, 30–31.
27 Paul Feyerabend, *Against Method*, 4th edition (London: Verso, 2010), 8.

"scientific anarchy" is in the multiplicity of ways scientists have conceived of, derived, and developed hypotheses, some very creative and some very unconventional. One of his examples was showing that Galileo did not, and indeed could not obtain the heliocentric model of our solar system by induction, but by what he calls "counterinduction," which denotes "thinking outside the box."[28] Like prophecies, scientific hypotheses may be drawn from anywhere.

The observation of the present writer is that induction played a much more significant role earlier on in the scientific investigation of all the different phenomena. Hacking and Kuhn observed that, before one single paradigm emerges as supreme in any branch of the physical sciences, "we have a pre-paradigm period of speculation … there was simply no way to sort things out, no set of agreed problems to work on, precisely because there was no paradigm."[29] In that atmosphere, scientists did a lot of experimentation, analysing results, plotting graphs, and trying to recognise any patterns upon which to induce a theory or hypothesis. Any hypotheses generated would then be tested using the scientific method.

Nowadays, new phenomena are rarely examined from scratch. There are well established theories with all their equations and past experiments in all branches of the physical sciences. What are currently tested in experiments are new implications drawn from what those theories predict under different conditions. The Higgs Boson, for example, was discovered because theory predicted it, experiments were designed and performed accordingly, and it was eventually identified. No one did multiple high energy experiments in the Large Hadron Collider, examining particles that were produced, and then using induction on the results.[30] Many other techniques have been employed to generate theories, such as purely theoretical considerations, dimen-

28 Feyerabend, *Against Method* (3rd edition), 116.

29 Hacking, "Introductory Essay," xxv.

30 "New Results Indicate that New Particle Is a Higgs Boson" (2013) https://home.web.cern.ch/news/news/physics/new-results-indicate-new-particle-higgs-boson (accessed 3 March 2022). See also "The Search for and Discovery of the Higgs Boson" https://en.wikipedia.org/wiki/Higgs_boson (accessed 23 November 2020).

sional analysis, and from parallels drawn with theories from other fields of science.

Therefore, scientific hypotheses can be drawn from anywhere—from induction, by modifying a previously falsified theory, from dimensional analysis, from a séance, from the Bible, or from "sudden flashes of inspiration," as Popper has shown. The most bizarre example I know is the determination of the chemical structure of the benzene molecule [C_6H_6]. Friedrich Kekule and Johann Loschmidt received the idea of the benzene molecule being a flat ring, not a chain, in a dream (of a snake biting its tail) or a nightmare (where carbon atoms danced around poking fun in "A Ring A Ring A Rosy").[31] Nevertheless, such theories and hypotheses can qualify as scientific if they are then tested by the scientific method and are shown to give correct predictions continuously, as the structure of the benzene molecule has.[32] That is why, in Figure 1, above, the origin of a theory or hypothesis, Point #0, is outside the actual circle of the scientific method.

The most that can be said is that the origin of the idea for a theory might make one suspicious of it, but it does not prove the theory wrong or unscientific. Neither does the dishonesty of the scientist/s reporting on experiments to check a theory's predictions prove that theory wrong or unscientific. At most, it might make one suspicious of them. Therefore, the fact that a theory is derived from the Judeo-Christian Bible, the Qu'ran, a séance, the Bhagavad Gita, a nightmare, etc., does not preclude it from scientific consideration. It might make some scientists suspicious of them, but that is all. In the same way, the dishonesty of some evolutionists does not prove the theory of evolution wrong. At most, it might make scientists suspicious of it, but that is all. The only thing that can prove theories and hypotheses wrong is observations and/or experiments proving their predictions to be wrong.

31 https://www.britannica.com/science/benzene (accessed 23 November 2020).
32 Popper, *The Logic of Scientific Discoveries*, 32–34.

Conclusion

This article has argued against the claim of atheists that "science is founded on facts, religion is founded on faith," and that they are in irreconcilable conflict with each other. It sought to show that the empirical sciences involve faith, particularly faith in and around the scientific method.

This article showed that the scientific method is not antagonistic to the Christian Bible, but in harmony with it. The agreement or harmony was established by drawing a parallel with Deuteronomy 18:21–22, where the test of false prophets and false prophecies depicted there has the same meta-method, the same meta-methodology as the test of false scientists and false scientific theories, what we call the scientific method.

It proceeded to show that the scientific method itself is an article of faith—its validity cannot be proved logically or scientifically, especially not by the scientific method itself. We can amass evidence and arguments for its adoption, but, in the end, we either believe it is legitimate or we believe it is not.

It demonstrated that the scientific method is circular reasoning, and, being circular reasoning, can only prove a theory or hypothesis consistent or inconsistent. If it is proved inconsistent—i.e., its prediction does not happen—then that theory is discarded as false. If its prediction happens—i.e., the theory is consistent—the scientific method cannot tell if it is consistently right or consistently wrong. In Popper's words, the scientific method is only a means of falsification. A step of faith is then needed to believe that the theory is true. The more evidence we have, the smaller the step of faith required, but this step of faith is never eliminated.

The scientific method itself cannot predict if the same experiment done in a different location or at a different time will always yield the same result/s for entities deemed to be "universal constants," such as G, the gravitational constant, c the speed of light, ε_0 the permittivity of free space, μ_0 the permeability of free space, etc. So far experiments

always have assumed universal validity. But, to generalise further, we need to believe that the laws of the universe are the same at all places throughout the universe, and at all times throughout its history—past, present, and future.

While in theory anyone should be able to repeat any scientific experiment and confirm its results for themselves, in practice this is not always feasible, mainly due to the complexity in the design and manufacture of the necessary equipment, and its prohibitively high cost. Therefore, we also need to trust or have faith in the scientists who perform and report any experiments, that they have honestly recounted their findings, experimental error, etc.

The theory to be tested by the scientific method can originate from anyone, anyhow, in any way, in any circumstances, at any time. It may be derived from induction. It may be derived from dimensional analysis. It may be drawn from the Bible. It may be totally concocted by the scientist/s. What makes it scientific is whether it can be and has been tested using the scientific method, not its origin.

Just as there are no religious facts, there are no such things as scientific facts either. Any scientific theory, no matter how confidently it is believed, by no matter how many prominent scientists, for no matter how long, with no matter how many correct predictions made so far, may be proved wrong at any time by a future, more accurate experiment, just as classical gravity was proved wrong after some two hundred and fifty years of making correct predictions.

Therefore, it is not the case that: "Religion is founded on faith and science is founded on facts." Instead, both religion and empirical science are founded on both facts and faith. Scientists, just like Christians, live by faith in the ways enumerated and discussed above.

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