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Abstract It has been suggested that one similarity between science and religion is that both endeavours pursue truth. Over the last century, however, there has been a significant move in the philosophy of science to suggest that science does not, cannot, or should not pursue truth. There are three possible basic responses to this: that philosophers are wrong, and science does in fact pursue truth; that science and religion are not so similar after all; or that – like science – religion also does not pursue truth. Cutting across all these options is the question: what kind of truth are we talking about? This paper argues that neither science nor religion pursue ultimate logical truths: science seeks to get a grasp on the phenomena, and is broadly unconcerned with ultimate reality; Christianity pursues relational truth, which is broadly unconcerned with logical facticity. This has implications for framing discussions of about science and Christianity, with pertinence for the fledgling discussions of such in an Asian context.

CHAPTER ELEVEN

SCIENCE AND RELIGION: WHAT KINDS OF TRUTH DO THEY SEEK?

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Abstract

It has been suggested that one similarity between science and religion is that both endeavours pursue truth. Over the last century, however, there has been a significant move in the philosophy of science to suggest that science does not, cannot, or should not pursue truth. There are three possible basic responses to this: that philosophers are wrong, and science does in fact pursue truth; that science and religion are not so similar after all; or that – like science – religion also does not pursue truth. Cutting across all these options is the question: what kind of truth are we talking about? This paper argues that neither science nor religion pursue ultimate logical truths: science seeks to get a grasp on the phenomena, and is broadly unconcerned with ultimate reality; Christianity pursues relational truth, which is broadly unconcerned with logical facticity. This has implications for framing discussions of about science and Christianity, with pertinence for the fledgling discussions of such in an Asian context.

Part 1 – Introducing the Options

Science has a long an illustrious history of being seen as seeking truth. René Descartes' seminal *Discourse on method* (1637/1998), written at the cusp of the modern scientific age, was fully titled *Discourse on the method of rightly conducting one's reason and of seeking truth*. The view that science seeks truth survives in a variety of forms to the present, from

popular treatments (such as Dawkins, 2012) through to academic discourse (such as Fuchs, 1992).

Over this time, from the early modern era through to the present day, there has been a carefully choreographed interaction between science and Christian religion.[1] Proponents of science and of religion look at where each area stands with respect to the other, and also where they stand with regard to their prestige in popular understanding. Early in the rise of science to prominence (and as described by Peter Harrison, 2015) many formative decisions about the remit of the subject were consciously taken to either align science with religion (and, by association, gain some of religion's prestige), or to distinguish science from religion (and thus avoid being subsumed by it). More recently, the balance of prestige has rather shifted. Religion now often looks to science when choosing to either align itself to the prevailing zeitgeist, or distinguish itself from such. The question of whether religion should be viewed as truth seeking is a case in point. Under the assumption that science seeks truth, there are three typical responses regarding religion.

One view is that religion is different from science, and that this is a bad thing for religion. Within this view it can be argued that religion simply *doesn't* do what science does. More strongly, it may be argued that religion *cannot* do what science does. Taking this to the most extreme position, scientism claims that anything which is worthwhile can be done by science, and that nothing apart from science can do anything worthwhile (Blackburn, 2005). This latter view holds an obvious attraction for atheist apologists: if science is the measure of all things, and if Christianity does not do what science does, then Christianity is necessarily found wanting. Such an exclusive position can be found, for example, in the words of the Nobel Prize winner Sir Harold Kroto, when he says that "[Frances Bacon's] New Instrument intrinsically undermined the assumptions and claims that had held sway for thousands of years, that fundamental truth was to be found in the holy scriptures. … [Science] is

[1] By 'religion' this paper considers exclusively 'Christian religion.' Such a simplification is necessary because *religion* is applied to such a wide variety of beliefs and practices across the world that it is not possible to do justice to the full range within the constraints of this paper. Of the many possible religions to consider, Christianity is selected here as it is the religion on which the vast majority of science-religion discourse centres.

the only philosophical construct we have to determine truth with any degree of reliability." (Kroto, 2012)

A second view is that religion is different from science, and that this is OK. This is the position taken, for example, by Carl Jung, who differentiated the roles of science and religion as being confined to statements of fact and statements of belief respectively (1973, p. 346):

> "Science seeks the truth because it feels it does not possess it. The church possesses the truth and therefore does not seek it… Confessions of faith are… not the business of science. I would be sinning against the modesty proper to science if I said anything more… than what can be gleaned from the facts."

Jung himself felt there was nothing improper about religion not seeking factual truth. Indeed, his comments above were in the context of objecting to what he saw as the Catholic Church's inappropriate pre-occupation with having people seek (and find) the truth.

A third view is that religion is (in at least certain respects relevant to the topic at hand) similar to science, and that this is a good thing. In the opening sentence of his book, *Science and religion in quest of truth*, John Polkinghorne (2012, p.1) raises exactly a Jungian perspective, before going on to assert the contrary:

> "People sometimes say that science deals with facts but that religion simply trades in opinions. … [However,] both science and religion are part of the great human quest for truthful understanding."

Such facts, once discovered, are held to be pivotal to the practice of religion. As C.S. Lewis states (1952/2015, p. 58),

> "Religion involves a series of statements about facts, which must be either true or false. If they are true, one set of conclusions will follow about the right sailing of the human fleet: if they are false, quite a different set."

Just as the first of the three positions outlined here seems to be a boon for atheist apologists, this third position seems to be a boon for Christian apologists. Science has set the priorities of modern culture: things should be measurable, falsifiable, and oriented about the search for

fact-based truth. If Christian apologetics can be framed within such priorities, so much the better. The alternative – having to convince people that there is more to life than facts, before going on to present the gospel – would seem like unnecessary effort.

The various aspects of the discussion so far can be located on the four-quadrant chart shown in Figure 1. Under the assumption that science seeks truth, the two quadrants on the right are excluded. The discussion concerning religion's aim, and its relationship to science, then revolves around whether the situation is best described by the top left or bottom left quadrant. Polkinghorne and Lewis argue for the top left quadrant. Jung and Kroto both argue that the bottom left quadrant best describes the situation, though they differ over whether or not this positioning should be seen as a problem for religion.

		Science seeks truth	
		Yes	No
Religion seeks truth	Yes		
	No		

Figure 1: Under a simple formulation, there are four possible basic combinations of responses to the question of whether science and / or religion seek truth. Much discourse to date has assumed that science does seek truth. The open question is therefore which of the two quadrants on the left best describes the situation. This paper argues that the right-hand column should not be too quickly rejected. The quadrant one ultimately opts for will depend on exactly which kind of 'truth' one is talking about.

There is, as has been stated, a long history of science being seen as truth seeking. The end of the 19th century, with positivist views of science at their zenith, may have been the high point for this view. However, since

then, a number of views have gained traction within the philosophy of science which means that the right-hand side of Figure 1 cannot be so easily neglected. Importantly, there is also a possible qualification of the two simple extremes of 'yes' and 'no', with more nuanced positions claiming that science seeks some kinds of truth, but not others.

Part 2 of this paper considers what it means for science to not seek truth, or to seek it only in a strongly qualified sense. Despite misgivings from both scientists and theologians that the abandonment of truth as a central aim in science would be a fundamentally anti-scientific and retrograde step, I argue that – properly understood – such a view makes sense of a lot of scientific practice. Moreover, it allows science to flourish in areas would have been highly constrained by a truth-seeking condition. By providing the possibility that science does not need to be truth seeking, and showing that – if it is truth seeking – it does not seek the kind of truth that is often assumed, the apologetic thrust of arguments by atheists such as Kroto, and Christians such as Polkinghorne, is muted. The path to aligning religion with science, or distinguishing it from science, has been changed.

Part 3 of this paper reassess the nature of truth within Christianity, and the nature of truth seeking as an end of Christianity. I argue that, in the sense that truth is usually understood in modern discourse, Christianity may *happen* to find truth, but this is largely incidental to Christian practice.

Finally, Part 4 considers how the reappraised positions of science and religion with respect to truth seeking might impact on discussions of the relationship between science and religion. Such a reappraisal may be particularly timely for the emerging discourse on science-and-Christianity in Asia.

Part 2 – Does Science Seek Truth?

Do Scientists Seek Truth?

Before delving into the thorny issue of whether or not *science* can be said to seek the truth, it is worth considering the rather simpler question of whether or not *scientists* seek truth. This is easier to answer in as much as one can sit down a selection of scientists and ask them what they are seeking. Despite its simplicity, the task is well worth performing as it

highlights a key difficulty that we must address: there is no consensus among scientists on the answer.

Some scientists evidently do seek the truth. Prof John Polkinghorne FRS claims he, and scientists like him, seek the truth. He makes this clear even in the titles of various book-length treatments of the topic, such as *Questions of truth: Fifty-one responses to questions about God, science, and belief* (Polkinghorne & Beale, 2009) or *Science and religion in quest of truth* (Polkinghorne, 2012). However, it is clear that at least some scientists do not believe they are seeking the truth. In response to the question "What scientific concept would improve everybody's cognitive toolkit?" Prof Neil Gershenfeld (2011) replied, "The most common misunderstanding about science is that scientists seek and find truth. They don't – they make and test models." This ambivalence, even among practising scientists, suggests that things are not as simple as Descartes would have had us believe.

Can Science Seek Truth?

Deferring once more the issue of whether or not science *does* seek the truth, it is worth asking whether science *can* seek the truth. That these two questions (*does* verses *can*) are distinct is readily illustrated. One can imagine a cautious tracker who – on account of her training – *can* seek out angry bears, and yet – on account of her wisdom – *does not* seek out angry bears. Illustrating the distinction in the opposite sense, one can imagine an athlete who – on account of an injury the previous season – *cannot* win a marathon, yet who nonetheless – knowing the bar he has set for himself is impossible to clear – *does seek* to do so.

Given this distinction, and assuming that there is such a thing as truth to be found, there are two aspects to the question of whether science can seek truth: Can science demonstrate that something is true? Can science demonstrate that something is false?

With respect to the first question – whether science can demonstrate a particular claim to be true – the answer which people believe to be correct changed over the course of the last century. Whitehead and Russell (1910, 1912, 1913) marked the zenith of the positivist program in their attempt to create a logical framework to rigorously prove all and only true statements. Such demonstrability of factual truth became more than simply

an ideal or a desideratum, but the measure of meaningfulness itself: "If it cannot be stated in any way why a sentence is true, then that sentence has no sense at all; for the meaning of a sentence is the method of its verification." (Waismann, 1930, p. 229.[2])

However, not only did the positivist program fail in its aims, but the mathematician Kurt Gödel (1931) proved the task to be impossible. He showed that, for any logical system powerful enough to be useful, there would always be statements which could be neither proved nor disproved within that system (Theorem VI). Such "undecidable" statements were not confined to minor aspects around the edges of a theory that could be considered irrelevant for all practical purposes. Rather, Gödel demonstrated (Theorem XI) that in a consistent system, one of the statements which is undecidable is that the system is consistent. The possibility of demonstrable truth in mathematics was gone.

Pierre Duhem (1906/2012) set the wheels in motion for similar undermining of the possibility of demonstrable truth in science. He highlighted the fact that we do not – and cannot – test a single hypothesis in isolation; rather we test a set of hypotheses in conjunction. If some aspect of this set of hypotheses is found wanting, we cannot – even in principle – definitively identify which of the hypotheses are sound and which of them is (or are) flawed. There can be no such thing as a crucial experiment, or a definitively falsified theory. W.v.O. Quine (1951) extended the remit of Duhem's reasoning from a limited number of sciences to "the totality of our so-called knowledge or belief." (p. 42.) Science is not capable of demonstrating a particular claim to be true.

Accepting that science cannot definitively demonstrate true statements to be true, one might at least hold out hope that science would not declare any true statement to be false (Popper, 1935/2005, p. 58). Unfortunately, with respect to this second question, the history of science is not encouraging. To take one example (as recounted by Woodcock, 2005), during the 18th century, one of the key theories in chemistry was that of phlogiston. It explained why some materials (such as carbon) are wont to combust, while others (such as mercury) are not. By this theory, combustion involves the release of phlogiston, and so materials which contain more phlogiston burn more readily than those that do not.

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2 English translation of the original German by MB.

Advances in the accuracy of weighing chemical reactants allowed supporters of atomic theory (the major competitor to phlogiston theory) to show that all chemical reactants were accounted for within atomic theory, without appeal to phlogiston, and that – even if it existed – phlogiston would have to be nigh-on massless. Atomic theory, while permitting the identification of the material reactants, could not explain *why* some chemicals combust and others did not. This was something which massless, immaterial phlogiston had been able to explain though, with the rise of atomic theory and the demise of phlogiston theory, the question was dropped as presumably unimportant.

Ninety years after Antoine Lavoisier effectively buried phlogiston theory in 1775, J.W. Gibbs would apply his newly developed thermodynamic concept of Gibbs free energy to explain why some chemicals combust and others do not. Gibbs free energy is immaterial and has essentially no mass. Moreover, the amount of phlogiston a material was previously supposed to have contained is equivalent to minus the Gibbs free energy of the oxygen per unit mass of reactant material.

In summary, having developed a theory in the 18th century which explained differences in materials' combustibility, scientific 'progress' led to it being anathematised, even when the newer theory could find no equivalent explanation for the phenomena of interest. It was only towards the end of the 19th century that the concepts and results (if not the terminology) were revived. This is by no means an isolated example. Numerous others are catalogued by Larry Laudan (1981). In any event, it should be clear that science, even when it has the truth in its hand, is not immune from discarding it in favour of something else.

A Circle to Square

This paper has so far argued that science cannot definitively prove any statement to be true or false. Furthermore, it has argued that even if science finds the truth, it may un-find it in short order. These claims, however, seem to present a puzzle: if science doesn't find truth, why does it work so well? This puzzle must be addressed because science does seem to work! Richard Dawkins (2013), a staunch believer in both the truth-seeking and truth-finding nature of science, puts it this way:

> "How do we justify, as it were, that science would give us the truth? It works! Planes fly. Cars drive. Computers compute. If you base medicine on science, you cure people; if you base the design of planes on science, they fly; if you base the design of rockets on science, they reach the moon. It works […]."

This is a statement of the "no miracles" argument. It follows Hillary Putnam's claim (1975, p. 73) that the only way to construe science "that doesn't make the success of science a miracle" is to say that "the theories accepted in mature science are typically approximately true". This seems to provide us with a paradox: On the one hand, as argued above, we have reason to believe that science does not, and cannot, reliably get us to the truth. On the other hand, science does seem to provide a way of getting planes to fly. And connecting the two is the claim that only the truth of the underlying ideas can account for the success of the applications. Formally stated, we have three contradictory claims:

1) Science does not find the truth.
2) The application of science leads to fruitful technological developments.
3) The fruitful application of science implies the truth of the underlying ideas.

There are three ways out of this paradox:

1') It is not true that *science does not find the truth*. The earlier arguments that science does not find truth are somehow flawed.
2') It is not true that *the application of science leads to fruitful technological developments*. Either planes fly entirely independent of scientific input, or planes do not, in fact, fly.
3') It is not true that *the fruitful application of science implies the truth of the underlying ideas*. The underlying model can be wrong, and still lead to accurate predictions about what we will observe.

While there are few who would argue in favour of 2', there are those who would argue for 1'. Both Dawkins and Putnam present the 'no miracles' argument with the expressed intention of supporting 1'. Laudan (1981) directly rebutted Putnam's position at length. 1' can be indirectly rebutted by arguing in favour of 3', as I shall attempt to do here.

Specifically, I shall take three examples in which science leads to apparently accurate predictions concerning particular phenomena, which in turn lead to fruitful technological applications. I will argue that in each instance the science is demonstrably indifferent to the underlying truth regarding what is actually happening.

Does Science Seek Truth?

In addressing this issue, it is worth explicitly noting a distinction to be drawn between *phenomena* and *noumena* (Kant, 1781/1998, Ch. 3).[3] The appearance of a thing, as it seems to our senses, is termed the *phenomenon*. The thing in itself, as it exists, is termed the *noumenon*. Stepping onto an aeroplane in Hong Kong and stepping off that plane in Munich are phenomena. They constitute the appearances of things to my senses. The details of the mechanism by which the plane gets off the ground – be that fluid flow over the wing, or collisions of billiard-ball-like atoms, or fairy dust and happy thoughts – are noumena. They constitute the thing in itself. When Dawkins lists things that science is good at, he lists phenomena: planes fly, computers compute, medicine cures. It is perhaps telling that he does not list the presumed noumena believed to underlie these phenomena. We *do* care about the truth of phenomenological statements, but we are remarkably indifferent to the underlying noumena. Provided my plane does not crash (phenomenon), I do not care if the plane flies by pixie dust or not (noumenon). Provided an airline company can sell me a ticket and make money (phenomenon), it does not care if the lift is produced by atomic collisions or not (noumenon). Provided engineers can optimise the shape of the wing for maximum lift (phenomenon), they do not care if air is a continuous fluid or not (noumenon). On a Kantian perspective, science can only reliably speak about the truth of phenomenological statements, not noumenological ones. On a pragmatic level, this rarely causes a problem because, provided noumenological statements allow us to get a handle on the phenomena, many scientists are quite happy for noumena to simply be viewed as helpful models, the truth of which is unimportant.

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[3] For those who do not like a Kantian framing, the key point at stake is not exclusive to Kant; I simply borrow his terminology. The ideas presented here are reasonably general, and alternative framings are provided at the end of this section.

Among those who are less happy to accept such a limitation of science, there are a number of ways in which this failure to seek or find noumenological truth might be soft-pedalled. One may say that science simply works with our *best guess at truth*. By this reckoning, a geocentric universe was our *best guess* until we had sufficient evidence to support a heliocentric model. A second option is to say that scientific theories are *approximately true*. By this reckoning, Newtonian mechanics *approximates* relativity in the low-velocity limit. A third possibility is to claim that scientific theories exhibit *verisimilitude*, or truth-likeness. By this account, a corpuscular description of light is not strictly true, but it has a certain *truth-likeness* compared to a wave-particle view. It may be noted that each of the above examples concerns noumena. In the following three examples, I will argue that appeals to best guesses, approximate truth, and truth-likeness all fall short of describing how radically scientists do not care about (noumenological) truth. Nonetheless, in each case we can grasp the phenomena sufficiently well to achieve fruitful technological developments from the application of science.

Example 1: Electron sea – not a best guess.

Within a metal, atoms form a regular crystalline lattice.[4] The mean positon of each nucleus is fixed. Most of the electrons in the metal are bound to a specific nucleus, though one or two electrons per atom (with the exact number depending on the metal) are not bound to a specific nucleus. Paul Drude (1900) treated these free electrons as classical point particles which were free to move within the solid, not interacting with each other, but interacting with nuclei through collisions. For the present discussion, the Drude model has two notable features.

Firstly, it is spectacularly *inaccurate* with respect to what we believe is actually happening within a material (i.e. with respect to what we suppose the noumena to be like): it neglects interactions between electrons (which, being negatively charged, repel each other); it neglects long-range interactions between electrons and nuclei (which, being negatively and positively charged respectively, attract each other); it neglects any aspects of quantum behaviour, including the Pauli exclusion principle, Fermi-Dirac statistics, or the wave-like nature of electrons. Secondly, it is

[4] Further details of the solid-state physics being discussed in this section are given by Kittel (2012, Ch. 3).

surprisingly *accurate* in its predictions of certain macroscopic properties of metals (i.e. the phenomena) such as the conductivity.

There have been subsequent models which improve on each of the above-listed shortcomings of the Drude model. Arnold Sommerfeld (1927), for example, included Fermi-Dirac statistics into the original Drude model which (unsurprisingly in hindsight) predicted the same (correct) conductivity as had been predicted by the basic Drude model.

On a naïve falsificationist view, if we know that the theory is wrong, or has been falsified, we should reject it. Pragmatically viewed, however, a scientist faced with the choice between using a model which is known to be wrong (but which is easy to picture and calculate), and a model which encapsulates our 'best guess at truth' (but which is harder to picture, and computationally challenging) will very reasonably opt for the model that is easier to use, if it provides good enough answers regarding the phenomena about which we care. This example shows that constraining science to only use our best guess at truth does not accord with what is done in practice, and may directly conflict with the application of science leading to fruitful technological developments.

Despite not being the best guess at truth, it may be argued that the Dude model is at least an approximation of the truth. This leads to our next counter example.

Example 2: Holes – not approximately true.

Within a semiconductor there are particular states which electrons can occupy.[5] A situation can be created in which electrons occupy almost all of the states that it is possible for them to occupy. The empty states (i.e. those not occupied by electrons) have 'holes' where an electron could be, but is not. To calculate the electronic properties of such materials, one can either calculate the behaviour of every single electron within the material, or one can treat the hole as an object in its own right, and calculate how the hole behaves.

A macroscopic analogy to this situation is a bubble in a bottle of syrup. As the syrup above the bubble moves downwards to fill in the space where the bubble had been, the bubble moves upwards. It is possible to calculate properties of the bubble, such as its velocity and its effective

[5] Again, the interested reader is refereed to Kittel (2012, Ch. 8) for further details of the physics discussed in this section.

mass, even though these do not correspond to any properties of the syrup itself. The syrup analogy imperfectly parallels the situation with holes, as the bubble contains a gas, so there really is *something* physically moving upwards. However, in the case of semiconductors, the hole genuinely contains nothing. Nonetheless it can be assigned effective properties such as velocity, mass, charge, and spin.

The conception of a hole with a particular mass, charge, and velocity is not a *best guess* at what is happening in the material: scientist know very well that a single hole moving to the left is *really* lots of electrons moving to the right. Significantly, though, consideration of a hole with a particular mass, charge, and velocity is also not an *approximation* of the truth. The truth is that the material contains billions of negatively charged particles jostling each other and overall moving to the right, while the model works on the principle that the material contains a single positively charged particle freely moving left. This simplifies the maths. It gives rise to the same predictions about the macroscopic properties of the material, but it is not an approximation. It wilfully ignores the noumena, because by so-doing we can more easily calculate the phenomena.

The transistors at the heart of the electronics revolution are designed by considering how their holes behave. It is therefore clear that constraining science to only use approximations of the truth – even when deliberate fictionalisation of the system components is more effective – does not accord with what is done in practice, and may directly conflict with the application of science leading to fruitful technological developments.

Scientists know, of course, that the theory is incorrect. They also know what is really happening, and could – in principle, if they wanted to make life difficult – use the theory which they believed to be correct. However, science is not always so clear regarding what is really happening. This leads to our next counter example.

Example 3: Dirac sea vs. antimatter – not truth-like.

Unless there is some reason to do otherwise, particles usually tend to occupy the lowest energy state available. A ball, for example, will roll off a table and land on the floor; it does not usually jump from the floor on to a table. When the ball lands on the floor the (potential) energy it had on the table is emitted as sound and heat. If the table is higher, the ball can fall further, and emit more sound and heat before coming to rest. This is relatively unspectacular, unless the table is positioned next to an infinitely

deep hole. In such a case, the ball would, in the process of falling from one metre above the floor to an infinite distance below the floor, emit an infinite amount of energy.

While this thought experiment sounds improbable, the equations of relativity do allow for states of infinite negative energy.[6] Paul Dirac (1930) noticed that, unless there were some reason for it to do otherwise, an electron with a finite positive energy could 'fall' to the lowest available energy state (which has infinite negative energy) and emit an infinite amount of energy on the way. The simple observation that matter does not spontaneously emit infinite amounts of energy led Dirac to seek some mechanism by which this is prevented. His solution was that all possible negative-energy states (of which there are an infinite number) are already occupied by electrons, and so no more electrons can fall in.[7] These negative-energy electrons, forming a so-called Dirac sea, would have an infinite (negative) charge density, which would have to be cancelled out by assuming that the bare vacuum has an infinite positive charge density. Improbable as this may sound, the model leads to a concrete prediction: a photon (particle of light) could excite an electron from the Dirac sea up to a positive energy level. This would mean that a photon in a vacuum could vanish and – in its place – would be an electron, and a hole in the Dirac sea. The hole would (effectively) have the same mass as the electron, but opposite charge.

One disadvantage of this theory is that it posits as noumena an infinitely deep sea of infinitely many particles with infinite charge density, cancelled out by the opposite infinite charge density of the vacuum. This, by many accounts, is inelegant. One advantage of the theory is that it predicted a phenomenon that was experimentally observed two years later, in 1932 (Anderson, 1933): tracks of something that looks like a positively-charged electron. By the time of his Nobel Prize acceptance speech, Dirac (1933/1965) had recast the noumena to be an empty vacuum from which a particle and an anti-particle had been created. Nonetheless, for those who were uncomfortable with these newly posited anti-particles, Dirac reverted to the Dirac sea picture to aid explanation.

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6 The famous equation $E = mc^2$ is more properly written $E = \pm mc^2$, but the negative root is usually ignored.

7 From the earlier analogy, this is like saying that there is an infinitely deep hole next to the table, but nothing can fall into it because as it is already full of (an infinite number of) balls.

The noumena posited by the two views are starkly at odds. Either the vacuum is electrically neutral, or it has an infinite charge density; either the process we now call 'pair production' involves the creation of two new particles, or it involves moving one particle from a negative energy state to a positive one. This situation is radically different from the previous two examples. Previously, we knew what the right answer was, but we chose to ignore it on pragmatic grounds, because we were happy with accounting for the phenomena. In the current situation, however, we do not know what the right answer is. Maybe anti-matter is real or maybe it is no more real than the 'holes' in a semiconductor. To use one theory when the other has every chance of being correct would seem to stretch verisimilitude to breaking point. Nonetheless, fully aware of the stark differences in reality invoked by the two models, Dirac viewed the choice of using one model rather than the other as nothing more consequential than a mathematical convenience: "A hole [in the Dirac sea] is, in fact, just like an ordinary particle, and its identification with the positron [i.e. the anti-particle partner of the electron] seems the most reasonable way of getting over the difficulty of the appearance of negative energies in our equations." (Dirac, 1933/1965, p. 324.)

Very few scientists are bothered by such a situation. Many have never even heard of the Dirac sea. Physics textbooks never point out that, for all we know, anti-matter is not real. They certainly never moot the possibility that *matter* is not real, and we are merely holes in an anti-Dirac sea. Pragmatically, considering the day-to-day practice of science, this makes complete sense: given the theory can account for the phenomena, it changes little if the noumena which we assume to be correct are, potentially, almost entirely wrong in almost every possible respect.

The basic principle in this section has been framed using the phenomena/noumena distinction of Kantian transcendental idealism. However, the central claim of this section – that science can successfully produce theories which are empirically adequate, while at the same time being either impotent to find underlying truth, or broadly indifferent to its discovery – is not unique to Kant's position. It is consistent with structural realism (Ladyman, 2016) and some forms of critical realism (Brownnutt, 2012, pp. 14-15). It is also entailed by anti-realist positions such as constructive empiricism (van Fraassen, 1980, pp. 11-13), and social constructivism (Pinch & Bijker, 1984, p. 407), to name but a few. As a consequence, it is possible to object to Kant, and still accept the core

arguments of this section. Equally, a defeater for structural realism or constructive empiricism is not necessarily a defeater for the ideas put forward here.

Part 3 – Does Religion Seek Truth?

In introducing the discussion (Part 1) it was noted that much of the contemporary discourse regarding whether religion seeks truth is coloured by how people think religion should be positioned relative to science. Given science's cultural cachet, some atheist apologists see a clear advantage in demonstrating that religion *is not* like science. For exactly the same reason, some Christian apologists see a clear advantage in demonstrating that religion *is* like science. In considering whether or not science seeks truth (Part 2) it was argued that – if one is interested in noumenological truth, or the truth about the thing in itself – science is both impotent to find it, and indifferent to this limitation.

Returning now to the question of whether or not religion seeks truth, we find that the surrounding terrain has changed from that assumed in Part 1. Previous biases (recognised or unrecognised) to align religion with – or distinguish religion from – science now tilt a different way. It may be that, despite the shift in science's position, all previous conclusions regarding the centrality of truth-seeking to religion stand. Alternatively, viewing the situation anew, it may be that we once again find religion to be like science, in as much as it does *not* seek truth, or at least not in the way we are used to understanding it. In such a case, it may be that the manner in which religion does not seek truth is similar to the way in which science does not seek it: interested in phenomena, and indifferent to underlying reality. It may, however, be the case that religion's path to not seeking truth is different from science's. In this part of the paper, I argue for this latter option: Like science, religion is not primarily truth-seeking, in the sense that truth is usually understood. However the manner in which it differs from the common view of truth seeking is not the same as the manner in which science differs from that view.

Biblical Perspectives on Truth

There are *prima facie* good reasons for supposing that Christianity considers both truth and seeking the truth to be important. John the

evangelist, for example, writes, “Then you will know the truth, and the truth will set you free.” (Jn. 8:32.) To understand whether the bible is interested in truth seeking in the way that it is usually meant in modern discourse, however, requires a more careful consideration than a simple proof text.

In logic, truth is a property of statements. A *statement* is defined as something that can be either true or false (Hamilton, 1988, p. 1). A statement, *X*, can be used to create a meaningful (though possibly untrue) sentence of the form “It is true that *X*.” For example, “Squares have four sides” is a statement. The sentence “It is true that *squares have four sides*” is meaningful. It is also true; indeed, it is necessarily true. “My name is Peter” is a statement: is true if the speaker’s name is Peter, and it is false if the speaker’s name is not Peter. “Triangles have four sides” is also a statement. The sentence “It is true that *triangles have four sides*” is meaningful, albeit necessarily false.

There are numerous kinds of things which are not statements. They do not, in a logical sense, have the property of being true or false. For example, “Peter!” is an exclamation, not a statement, and is neither true nor false. A person whose name is Peter is a person, not a statement, and is nether true nor false. “Stand up!” is an instruction, not a statement, and is neither true nor false. The sentence “It is true that *stand up!*” is not meaningful, and therefore cannot be true or false. Nonetheless, the fact that “stand up!” is neither true nor false does not prevent it from being meaningful. If someone says to you “stand up!” and you stand up, they have effectively conveyed meaning to you.

Viewed from this perspective, it becomes clear that biblical writers often conceived of truth in a way distinct from the strictly logical sense that is often considered today. Consider the question, “Who cut in on you to keep you from obeying the truth?” (Gal. 5:7.) It is possible to obey instructions (“Stand up!”). It is possible to obey people (Peter). But it is not possible to obey a logical truth (“My name is Peter”). The question, “Who kept you from obeying *Peter*?” is meaningful, while the question, “Who kept you from obeying *my name is Peter*?” is not. This indicates that, if Christianity is to be viewed as seeking the truth, it may be necessary to adopt a conception of truth which is different from logical facticity. In what follows, I shall highlight a number of instances in the bible in which truth is understood to mean something other than logical truth.

Truth is sometimes portrayed in the bible as the opposite of evil. John the evangelist makes this clear using a parallelism when he writes,

> "Everyone who does evil hates the light, …
> But whoever lives by the truth comes into the light." (Jn. 3:20-22.)

Paul makes a similar parallelism when he writes,

> "Love does not delight in evil
> but rejoices with the truth." (1 Cor. 13:6.)

It is obvious that truth here has a moral component, in a way that a simple logical statement of the facts generally does not have. In neither of these passages would the substitution "squares have four sides," make any sense: there is nothing within Christian thinking to suggest that the fact squares have four sides would cause a person to come into the light.[8]

Even in the situation where *truth* is used in the bible to refer to factual statements, this is often in the context of factual statements with moral consequences. Zechariah's exhortation, "Speak the truth to each other, and render true and sound judgment in your courts," (Zech. 8:16) refers to situations in which, were the truth not spoken, a person may be treated unjustly. The statements imagined are of the kind, "This man stole my cow." By contrast, during a discussion in which you correct someone's factual inaccuracy with the admonition, "When you leave the freezer door open you do not let the cold out, but rather you let the heat in," it is not appropriate to justify such pedantry with the claim that we are biblically instructed to speak the truth to each other.

Truth in these situations is not cerebral but moral and relational. Indeed, a key aspect of truth is the speaker's relationship to God. For this reason, John can write,

> "Whoever speaks on their own does so to gain personal glory,
> but he who seeks the glory of the one who sent him is a man of truth."
> (Jn. 7:18.)

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8 There are other religious traditions, such as Platonism, which might suggest that the four-sidedness of a square did draw a person to the light. This is achieved by imbuing such mathematical facts with moral qualities (Harrison, 2008, pp. 21-22).

Such thinking also makes it clear why the injunction "Give Glory to God!" (e.g. Jn. 9:24, Josh. 7:19) meant "Tell the truth!" (Watkins, 2015, Jn. 9:24.)

If truth is understood to be the opposite of evil, and also moral, oriented to justice, relational, and glorifying to God, it should not be surprising that Jesus would say, "I am … the truth." (Jn. 14:6.) Again, it may be noted: in the logical sense of truth, Jesus' statement is not even false; it is meaningless. He is a person, not a statement: "It is true that *Jesus*," is not a meaningful sentence. However, recognising that the biblical conception of truth is to be understood on its own terms, rather than shoe-horning it into a modern view of facticity, makes sense of this passage, along with others that would otherwise be broadly meaningless. Returning to Paul's question to the Galatians, it is entirely meaningful to ask, "Who cut in on you to keep you from obeying *Jesus*?" (Gal. 5:7.) It also fits well with the context, in which Paul refers to Jesus five other times in the first eight verses of that chapter.

In light of this discussion, we can revisit the verse with which we started this section: "Then you will know the truth, and the truth will set you free." (Jn. 8:32.) This verse is certainly meaningful if *truth* is understood in its logical sense. The foregoing discussion, however, should alert us the fact that there are other interpretations of *truth*, and that one of them is *Jesus*: "You will know *Jesus*, and *Jesus* will set you free." John himself lends support to this interpretation when, four verses later, he writes, "If the Son sets you free, you will be free indeed." (Jn. 8:36.)

From this brief survey, a Christian search for truth should not be understood in terms of establishing the facticity of particular statements. Rather a search for truth is to be understood in moral, just terms as a pursuit of Jesus; calling us to obey and have relationship with God.

Subsequent Christian Views on Relational and Propositional Truth

This interpretation of how the bible conceives truth is not new. The thrust of the idea has fingerprints throughout church history. The following examples are far from exhaustive, but give an indication of how the term has been used through church history.

Augustine (397/1996, Book I, §1) opens his *Confessions* with the relational statement,

> "You have made us for Yourself."

His subsequent expression of a desire to "know and understand" did not concern knowledge of facts, but knowledge of how to relate to God:

> "Lord, teach me to know and understand which of these should be first: to call on You, or to praise You; and likewise to know You, or to call on You."

In his *Retractions* (426/1953, p. 218), Augustine summarises his writing *Of true religion* by saying "true religion means the worship of the one true God." Religion, in this view, is not true by nature of the factual accuracy of the propositional statements it makes, but by nature of the devotees' relationship of worship to the true God. Note also in this sense that "true God" does not (and cannot meaningfully) refer to a 'factually accurate God'. Rather it is taken in contrast to "false Gods and wicked demons" (Augustine, Letters, quoted by Harrison, 2015, p. 9). Again, the moral character of truth and falsity can be noted by the way in which Augustine parallels "false" with "wicked" rather than with "inaccurate".

Moving on from the Church Fathers, one might imagine that creeds, of all things, would first and foremost lay down the propositional truths that all Christians believe. It is therefore telling how prominently Christian creeds position relational truth, with any assent to propositional statements taking secondary place. Taking the *Apostles' Creed* by way of an example, one could easily rewrite it to highlight propositional truths that many Christians believe. Nonetheless, the Church did not formulate it this way, choosing to emphasise the beings in whom, and the things in which, they believed (Church of England, 2000):

Propositional formulation	Original formulation
I believe that God is	I believe in God,
the Father Almighty,	the Father Almighty,
maker of heaven and earth.	maker of heaven and earth.
And that Jesus Christ is	And in Jesus Christ,
His only Son, our Lord;	His only Son, our Lord;
that he was conceived by	who was conceived by
the holy Ghost…	the holy Ghost…
I believe that	I believe in
the Holy Spirit exists,	the Holy Spirit,
that the holy catholic Church...[?]	the holy catholic Church,
that saints should commune,	the communion of saints,
that sins are forgiven,	the forgiveness of sins,
that the body will be resurrected…	the resurrection of the body…

There are, certainly, aspects to the creed which could appeal to the facticity of particular events: creation, the virgin birth, the crucifixion, and so forth. But these remain essentially descriptors of those *in whom* Christians believe, rather than a list of things *that* Christians believe.

During the Enlightenment, the relational nature of truth was de-emphasised, and the logical, factual nature of truth as it concerns religion came to the fore. The reasons for this shift, the way in which it took place, and the connections to the belief that science should be truth seeking, are thoroughly presented and analysed by Harrison (2015). While this change in perspective towards factual truth has been influential in Western theological thought, it is arguably a departure from, rather than a realisation of, a traditional Christian perspective.

More recently, an emphasis on the relational nature of Christianity can be seen to re-emerge. This is illustrated by Alister McGrath's claim (2011, p. 112) that,

> "The heart of this life of faith lies not primarily in a set of propositions about reality (although these play an important role), but rather in a trusting orientation and attitude towards God… The arrival of God thus brings transformation of our situation, not simply illumination of it."

Part 4 – Implications for Relating Science and Religion

There is a view that one way in which science and religion can be compared – and be shown to be either similar or dissimilar – is with respect to their stance on seeking the truth. If they are both, at heart, truth-seeking endeavours then there is the possibility to claim that they can, and maybe even should, engage with one another concerning matters of truth (Polkinghorne, 2012, pp. 12-13). Such engagement may show science and religion to be in harmony with one another, or it may show them to be in conflict with one another. Alternatively, should one of them be found to not seek the truth (and the default assumption is that if either is so found, it will be religion) then this will certainly exclude large tracts of discourse from any possibility of meaningful engagement between science and religion at all, and may disqualify religion from having a rightful seat at the table (Dawkins, 2012, pp. 19-26). Clearly, where one positions science and religion with respect to their stance on seeking the truth has a major impact on how one approaches any relationship between the two.

I have argued in this paper that science, if it does pursue truth, does so only in a qualified manner. Specifically, it is effective at getting a handle on phenomena: it does whatever needs to be done to ensure that an aeroplane gets in the air long enough and fast enough and reliably enough that someone can make a profit from selling tickets. However, it is remarkably ineffective – both in principle and practice – at reliably shedding light on the underlying truths of what the universe is doing behind the curtain.

Furthermore, I have argued that religion, if it does pursue truth, does so in a qualified manner. Specifically, Christianity views truth as being moral, just, relational, imperative, glorifying to God, and oriented toward relationship with Him. While this may include discovering factually true statements, such statements are not pursued as ends in themselves, but found as a by-product of pursuing relational truth.

These perspectives allow us to recast a number of perennially thorny issues in discussions about science and religion. In addition to being of interest to Western discourse on science and religion, the possibility of such recasting is apropos to the current situation in Asia. Discussions about science and religion in the West have a long history (John Hedley Brooke, 2014). The framing is largely fixed (Barbour, 1997) and

entrenched positions have been established. The agenda for issues about which the discussions revolve has been set by the contingencies of Western history.

By comparison, discussions concerning science and religion in an Asian context are much sparser and less well established. The appropriate framing is much less clear, and attempts to carry Western framings and priorities over to Asian discussions often do abuse to the natural categories of the discussion. David Palmer (2007) illustrates this well by his consideration of qigong, which has been variously categorised as religion, science, anti-science, irreligion, sport, medicine, and political uprising. Moreover, if science and religion is discussed within an Asian context, or from an Asian perspective, it is often restricted to 'Asian' religions such as Confucianism, Daoism, and Buddhism. (See, for example, Csikszentmihalyi, 2011; Kim, 2014; Lopez, 2011.) Consequently, there is a need for a discussion of science and Christianity in Asia which is contextualised to be relevant to Asian discourse and modes of thought. Importing a European Enlightenment pre-occupation with demonstration of logical truths may be wholly inappropriate to this endeavour. By contrast, introducing the topic in the terms outlined in this paper may provide a more fitting frame.

To be clear, the central claims of this paper hold true within a Western context, and I believe that discussions within a Western context would benefit from taking them on board. Nonetheless, to adopt them in a Western context is to face an uphill battle against the legacy of positivism, in which the demonstrability of factual truth is the measure of all things. By contrast, with discussions concerning the relationship between science and Christianity being new to Asia, now is the time to frame them well, before bad habits of elsewhere are adopted for lack of an alternative being discussed. In this context, the ideas outlined above may be particularly apposite.

The impact that a more nuanced conception of truth-seeking might have on topics that have beset Western discourse may be illustrated with the example of cosmogeny. The literature on this topic is vast (see Rau, 2013, for an overview) and I do not pretend here to do justice to the complexity of the issues, let alone resolve anything. Nonetheless, I hope to show that – by viewing a scientific search for truth as relating only to phenomena, rather than noumena; and by viewing a religious search for truth as concerning primarily relational, rather than logical truth – many of

the apparent difficulties evaporate as irrelevancies. This may help diffuse some of the difficulties perennial to Western discussions, and avoid ever establishing such difficulties in fledgling discussions in Asia.

Science claims that the universe began around 13.8 billion years ago (Planck Collaboration, 2015). Christianity claims that "In the beginning, God created the heavens and the earth." (Gen. 1:1.) These are both ostensibly truth claims, and much has been written regarding whether or not the truth claims of science are in agreement with the truth claims of scripture, and what the implications of any agreement or disagreement might be for science or religion. I contend that the character of much of this discussion would change radically in light of the claims of this paper, as both the scientific relationship to truth and the religious relationship to truth would be reconstrued.

A scientific statement about the age of the universe is a statement about noumena. There are related phenomena, which at the most basic level consist of readouts on a measurement device. Science is very good at readouts. When a scientist says "the meter reading is 7 V" then it is highly likely that the meter reading really is 7 V. Going up several levels of abstraction, there is the detection of near-uniform microwave background radiation corresponding to a black-body temperature of around 2.7 K. One must go through several further layers of abstraction before concluding that the universe began 13.8 billion years ago, by which time we are firmly in noumenon territory. Scientists can believe passionately in the models they build (or the noumena they posit) to account for the phenomena they observe. Such passionate belief is arguably a necessary part of the practice of science (Polanyi, 1974, pp. 66-68). Nonetheless, it is still not necessary to the scientific enterprise that such models accurately reflect reality. In the event that a different model is found which is more helpful, or more (subjectively) elegant, or which makes the mathematics more tractable, scientists can entirely abandon a model of the underlying noumena while still saving the phenomena. In summary of the scientific situation: the scientific claims concerning the beginning of the universe *happen* to be truth claims (in the noumenological sense) but that is largely incidental to the project.

The biblical statement about the creation of the heavens and the earth is a statement about God and our relationship to him. David Wilkinson (2002, p. 18), acknowledging that there are propositional

statements made in Genesis 1, highlights that fixation on how to interpret the factual truth of these is to miss the point:

> "In the disagreement over the details we lose the very thing that the writer inspired by the Holy Spirit wants to communicate. … Whether the universe was made in seven days…, or whether it was created over billions of years is… not central to the message of Genesis 1. … It is an overture about the central character. … This is not a passage about the 'how' of creation, or even primarily about the 'why' of creation. Rather it is a passage about the 'who' of creation."

In summary of the religious situation: some of the biblical claims concerning the beginning of the universe *happen* to be truth claims (in the logical sense) but that is largely incidental to the project.

To be clear, although the example here is a negative one, in which science and religion *do not* connect, this should be in no way interpreted as a general situation. I do not argue that science and religion occupy non-overlapping magisteria (contra Gould, 1997). I argue only that they do not, in this instance, prominently overlap in the way usually assumed. The ideas put forward in this paper might, however, suggest – and can certainly accommodate – a good many areas of fruitful engagement between science and religion, which are often overlooked due to a preoccupation with comparing the facticity of different truth claims. To provide one example of such engagement, having highlighted (in Part 3) the prominence in the creeds of 'belief *in* something' rather than 'belief *that* something', one may explore how this relates to the role played by a scientist's "commitment" to a theory in scientific practice (van Fraassen, 1980, p. 13; Polanyi, 1974, pp. 29, 67).

In conclusion, then, science and religion both make truth claims. Practitioners of science and practitioners of religion may hold passionately to the facticity of those truth claims. This paper hopes to go some way to showing that – while factual statements play an important role in both science and religion – collecting and checking the veracity of factual statements is not what either science or religion are really about. Moving away from such preoccupations in the discourse may allow space for new and fruitful areas of engagement to be considered.

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