

KINDS OF GAPS IN KNOWLEDGE: THE CONFLICT OF APPEALS TO GOD AND METHODOLOGICAL NATURALISM IN DEVELOPING EXPLANATIONS OF THE WORLD

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To refer to God in explaining a physical event or process is called using the ‘God of the gaps.’ This is a pejorative phrase in that it is thought to indicate superstition and hinder the understanding of how the physical world actually works. To invoke God as the explanation is said to not further one’s understanding of the physical causes, and indeed to hinder understanding. Conversely, methodological naturalism explains physical events without reference to non-material causes. This does not commit one to metaphysical atheism or naturalism, but is a method/model for interpretation that is believed to be superior because it offers explanations that can be duplicated by others in contrast to explanations that involve ‘an act of God.’ The goal of methodological naturalism is knowledge, and proof that knowledge has been attained is that the results can be duplicated and confirmed by others – the results are universal. The defect of appeals to God is that such appeals cannot be confirmed, are used where ignorance leaves a lacuna and abandoned as soon as that space is filled with a natural explanation, and do not further our understanding of the physical world. And yet, both historically and currently, appeals are made by notable thinkers to a God of the gaps style explanation, in accounting for design or irreducible complexity, beauty, values, and meaning in life. I will endeavor to show that filling gaps with unproven assumptions is much more common and widespread than one might think, and is done by those who speak against the ‘God of the gaps’ approach. Does a truly scientific worldview require rejecting all appeals to God as a source of explanation?

Philip Hefner has noted that science presses religion to adapt to a naturalistic worldview, and that today science is the most fruitful and authoritative worldview.¹ Indeed, using naturalistic methods, science ‘continually brings us to the brink of amazement as it suggests vast blank spaces in our knowledge and hints of realities that beggar the imagination.’² What are these blank spaces, or gaps, in our knowledge, and how can they be filled? What does the answer to this question say about the relationship and roles of science and religion? Keeping in mind the goals of methodological naturalism, this paper will argue that there are different kinds of gaps that can be filled in different ways. The two kinds of gaps are empirical and logical. The former are those that can be filled through greater empirical discovery and research. The latter are those that cannot be filled in through such work, and must be addressed in a different way – namely, logically. After considering the historical setting of the contemporary discussion about the God of the gaps, I will argue that understanding logical gaps can help both in solving skeptical problems that recur in the history of thought, and avoiding problems that arise due to the

¹Some of this research relies on earlier work published in my book *The Natural Moral Law: The Good After Modernity* by Cambridge University Press, 2012.

bifurcation between science and religion. Where some thinkers define science as mechanistic and naturalistic,³ I am arguing that this is precisely what is in question in discussing these kinds of gaps. Understanding the difference between kinds of gaps will provide a methodology for filling gaps in our knowledge in topics within the domains of science and religion by providing a foundation presupposed by both.

ARISTOTLE'S SOLUTION TO BEING AND BECOMING

The influence of Aristotle with respect to science is typically taken to be negative. It will be helpful to consider how Aristotle came to develop his view of the unmoved mover as a response to specific problems that arose in Greek philosophy and that continue to pose problems for making sense of the scientific worldview. In the *Physics*, Aristotle said that in order to have knowledge, one must know the four causes. 'Now, the causes being four, it is the business of the physicist to know about them all, and if he refers his problems back to all of them, he will assign the 'why' in the way proper to his science – the matter, the form, the mover, "that for the sake of which".'⁴ These causes relied on Aristotle's analysis of potentiality and actuality as a solution to the skepticism that arose in earlier Greek philosophy due to the impasse between appearance and reality, change and permanence. How can there be both being and becoming, what is their relation? The difficulties in solving this problem lead to an impasse in Greek philosophy that Plato and Aristotle attempted to solve.

Aristotle's solution involved an analysis of potentiality and actuality. Aristotle defined 'nature' as the 'principle of motion and change.'⁵ It has reality but is also becoming – it is changing from potentiality to actuality. In order to understand motion and change, more than a description is necessary – one must understand what is changing, how the change is affected, the formal essence of the change, and that toward which it is changing (the *telos*). This introduces the idea of a 'primary cause,' which will play an important role in later thinking about the God of the gaps. Aristotle said that 'knowledge is the object of our inquiry, and men do not think they know a thing till they have grasped the 'why' of it (which is to grasp its primary cause). So clearly we too must do this as regards both coming to be and passing away and every kind of physical change, in order that, knowing their principles, we may try to refer to these principles each of our problems.'⁶

The problem of motion is a problem about being and becoming. How can change occur and yet something still be? The acorn changes into an oak tree, but in the process, before it is an oak tree, it no longer *is* an acorn, so what *is* it? Earlier Greek philosophy divided between saying there only *is* being, and there only *is* becoming (both assumed something *is* and so assumed being in some sense). Aristotle's analysis of potentiality and actuality was an attempt to resolve the impasse. Aristotle said that no one doubts that there is motion,⁷ which implies that no one doubts there is being and becoming. Therefore, according to Aristotle, there has always been being and becoming. 'Let this conclude what we have to say in support of our contention that there never was a time when there was not motion, and never will be a time when there will not be motion.'⁸ But Aristotle distinguished between motion that is secondary and derived, and that which is primary. 'We have argued that there always was motion and always will be motion throughout all time, and we have explained what is the first principle of this eternal motion: we have explained further which is the primary motion and which is the only motion that can be eternal: and we have pronounced the first movement to be unmoved.'⁹ Thus, the primary cause of motion and change is itself eternal and unmoved by anything else.

Aristotle's form of dualism differs from Plato's, where there is a clear distinction between spirit and matter. For Aristotle, the distinction is between form and matter, and the forms are

known through the material world. Thus, the unmoved mover is in motion, and from this Aristotle constructs his view of the solar system, based on his understanding of this eternal motion rather than observation. Such motion must be 'rotatory,' and must be at the circumference of a circle rather than at the center.

So, too, in order that the motion may continue to be of the same character, the moved must not be subject to change in respect of its relation to the movent. Moreover the movent must occupy either the centre or the circumference, since these are the first principles from which a sphere is derived. But the things nearest the movent are those whose motion is quickest, and in this case it is the motion of the circumference that is the quickest: therefore the movent occupies the circumference.¹⁰

It is simple for the contemporary mind to dismiss this view of the solar system, but what is more difficult is to dismiss it and yet also offer a solution to the problems that Aristotle addressed: change and motion – being and becoming.

NEW SOLUTIONS TO THE SAME PROBLEMS: GALILEO, DESCARTES AND BACON

It was this framework that Galileo challenged, a framework which said that the heavenly bodies were eternal and unchanging, while the earth was undergoing change as it moved from potentiality to actuality and the final cause. By noting change in the sun, Galileo argued that the sun is not eternal and changeless and therefore challenged the foundation of Aristotelianism. He also distinguished between the kinds of questions asked by different fields, between the questions of science and the questions of religion: 'Can an opinion be heretical and yet have no concern with the salvation of souls? Can the Holy Ghost be asserted not to have intended teaching us something that does concern our salvation? I would say here something that was heard from an ecclesiastic of the most eminent degree: "That the intention of the Holy Ghost is to teach us how one goes to heaven, not how heaven goes".'¹¹ Religion has to do with revealed knowledge and redemption, science with the mechanism of the universe – two different spheres that need not compete.

There was still a need to respond to the problems of change and permanence, and this was done by abandoning the Aristotelian model in favor of a mathematical one. Wolfhart Pannenberg argues that Descartes is responsible for the shift to naturalism due to his claim that God's immutability keeps him from acting in the creation.¹² I think Descartes contributed in a different way to the eventual rise of naturalism, in that his solution to the problem of knowledge and sense data, which relied on God's assurance that appearance is reality, but were also used to prove that God exists, was insufficient and gave fuel to the empiricists whose explanation of sense data did not need to refer to God for support. Descartes said 'All science consists in sure and evident knowledge,'¹³ and 'in treating of the objects proposed for investigation what we have to examine is not what others have opined, nor what we ourselves may conjecture, but what we can clearly and evidently intuit, or can deduce with certainty: knowledge is not obtainable in any other way.'¹⁴ Where Aristotle required the four causes to have knowledge, Descartes focuses on intuition and ideas. 'No paths leading to certainty in the knowledge of truth are open to men save self-evidencing intuition and necessary deduction . . . And it is evident that the mind's intuitive power extends to all those simple natures and to the knowing of the necessary connections between them.'¹⁵ Here we have a solution to the problem of change and permanence in a different form: mathematical truths are thought to be eternal and changeless and are applied to explain the changing world. Descartes appealed to God to solve the

problem of appearance and reality.¹⁶ As a theist, Descartes distinguished between God, who is a spirit, and the created, material world – God is unchanging, the material world is changing. He appeals to God to solve the problem of appearance and reality – God assures that there is a relationship between our ideas and the world.

However, Descartes's appeal has been rejected as circular: proof for God's existence is based on clear and distinct ideas,¹⁷ and we can trust these clear and distinct ideas because they are given by God.¹⁸ This God of the gaps approach relied upon an appeal to God to solve the problems that Aristotle's system solved, but without his four causes and the implications about an unmoved mover existing in eternal circular motion. This appeal to God is different than Aristotle's appeal to an unmoved mover in that God is a spirit, and the material world (and therefore physical motion) is created by God and not eternal. Furthermore, Descartes does encourage investigation into how the world works through an experiment method. This was lacking in Aristotle, who, although he gathered data about animals, plants, and stars, was limited by his notion of the formal cause from the kind of experimental investigation that we consider to be 'scientific.'

Descartes' influence affected a change from Aristotelianism to 'modern science' where mathematics plays a central role, and where mechanism (Aristotle's *efficient cause*) is isolated from other types of causes. Francis Bacon also played a central role, and perhaps a more important one because his approach did not rely on an appeal to God in the way that Descartes did. He rejected both rationalists and empiricists: 'Those who have treated of the sciences have been either empirics or dogmatical. The former like ants only heap up and use their store, the latter like spiders spin out of their own webs. The bee, a mean between both, extracts matter from the flowers of the garden and the field, but works and fashions it by its own efforts.'¹⁹ He proposed an investigative method, and a modified form of induction.

In forming axioms, we must invent a different form of induction from that hitherto in use; not only for the proof and discovery of principles (as they are called), but also of minor, intermediate, and, in short, every kind of axioms. The induction which proceeds by simple enumeration is puerile, leads to uncertain conclusions, and is exposed to danger from one contradictory instance, deciding generally from too small a number of facts, and those only the most obvious. But a really useful induction for the discovery and demonstration of the arts and sciences, should separate nature by proper rejections and exclusions, after collecting a sufficient number of negatives. Now this has not been done, nor even attempted, except perhaps by Plato, who certainly uses this form of induction in some measure, to sift definitions and ideas. But much of what has never entered the thoughts of man must necessarily be employed, in order to exhibit a good and legitimate mode of induction or demonstration, so as even to render it essential for us to bestow more pains upon it than have hitherto been bestowed on syllogisms. The assistance of inductions is to serve us not only in the discovery of axioms, but also in defining our notions. Much indeed is to be hoped from such an induction as has been described.²⁰

Bacon's system did have reference to God, but I argue that his system is the one that comes down to us in modified form. Descartes' system was influential in its appeal to mathematics, but other systems can also support the need for mathematics. Bacon encouraged an investigation of the world, gave a bifurcation between the world of revealed religion and the natural sciences, and while making mention of God does not do so in a way that is essential to his theory – the investigative method can proceed without mention of God.

For certain it is that God worketh nothing in nature but by second causes: and if they would have it otherwise believed, it is mere imposture, as it were in favour towards God; and nothing

else but to offer to the author of truth the unclean sacrifice of a lie. But further, it is an assured truth, and a conclusion of experience, that a little or superficial knowledge of philosophy may incline the mind of man to atheism, but a further proceeding therein doth bring the mind back again to religion. For in the entrance of philosophy, when the second causes, which are next unto the senses, do offer themselves to the mind of man, if it dwell and stay there it may induce some oblivion of the highest cause; but when a man passeth on further, and seeth the dependence of causes, and the works of Providence, then, according to the allegory of the poets, he will easily believe that the highest link of nature's chain must needs be tied to the foot of Jupiter's chair. To conclude, therefore, let no man upon a weak conceit of sobriety or an ill-applied moderation think or maintain that a man can search too far, or be too well studied in the book of God's word, or in the book of God's works, divinity or philosophy, but rather let men endeavour an endless progress or proficiency in both; only let men beware that they apply both to charity, and not to swelling; to use, and not to ostentation; and again, that they do no unwisely mingle or confound these learnings together.²¹

Here we have mention of secondary causes and their grounding in the highest cause, the primary cause. This solves the problem of change and motion by locating these in the secondary causes of the created order, and permanence in God who is eternal. This is also provides a look at empirical and logical gaps – knowledge of the secondary causes is an empirical matter, whereas their relationship to God is a logical relationship.

NEWTONIAN DESCRIPTION OF PHENOMENA AND LOCKE'S EMPIRICISM

Newton's natural philosophy follows this method. Indeed, Newton's gravitational theory was criticized by Cartesians for not supplying a mechanism, and for involving 'action at a distance.' Newton was aware of this criticism and responded:

Hitherto we have explained the phenomena of the heavens and of our sea by the power of gravity, but have not yet assigned the cause of this power . . . hitherto I have not been able to discover the cause of those properties of gravity from phenomena, and I frame no hypotheses; for whatever is not deduced from the phenomena is to be called an hypothesis; and hypotheses, whether metaphysical or physical, whether of occult qualities or mechanical, have no place in experimental philosophy. In this philosophy particular propositions are inferred from the phenomena, and afterwards rendered general by induction. Thus it was that the impenetrability, the mobility, and the impulsive force of bodies, and the laws of motion and of gravitation, were discovered. And to us it is enough that gravity does really exist, and act according to the laws which we have explained, and abundantly serves to account for all the motions of the celestial bodies, and of our sea.²²

This represents a shift as important as the change from Aristotle to Galileo. Abandoned altogether is the attempt to solve the problem of change and motion, being and becoming, and instead Newton is content with describing the phenomenon of motion. This description relies on mathematics (indeed, Newton invented calculus as an aid in such description) because physical motion can be quantified. But this quantification tells us nothing about being in itself, or motion in itself, nor does it address the problems that occupied Aristotle.

Newton appealed to God in the same way that Bacon did.

This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an intelligent and powerful Being. And if the fixed stars are the centres of other like systems, these, being formed by the like wise counsel, must be all subject

to the dominion of One . . . This Being governs all things, not as the soul of the world, but as Lord over all . . . The Supreme God is a Being eternal, infinite, absolutely perfect.²³

God is the explanation of the design and beauty of the universe, but is not required for a description of the motion of the universe. This is still one of the most popular uses of the God of the gaps: God explains design, or irreducible complexity. Bacon and Newton speak of God as the primary cause, and state that the natural sciences are concerned with the secondary causes created by God.

In order to defend this approach, Locke wrote his *Essay*:

The commonwealth of learning is not at this time without master-builders, whose mighty designs, in advancing the sciences, will leave lasting monuments to the admiration of posterity: but every one must not hope to be a Boyle or a Sydenham; and in an age that produces such masters as the great Huygenius and the incomparable Mr. Newton, with some others of that strain, it is ambition enough to be employed as an underlabourer in clearing the ground a little, and removing some of the rubbish that lies in the way to knowledge . . . Vague and insignificant forms of speech, and abuse of language, have so long passed for mysteries of science; and hard and misapplied words, with little or no meaning, have, by prescription, such a right to be mistaken for deep learning and height of speculation, that it will not be easy to persuade either those who speak or those who hear them, that they are but the covers of ignorance, and hindrance of true knowledge.²⁴

What must be cleared to make way for the work of Newton is not just Aristotle, but the innate ideas of the Cartesians. In contrast to Descartes, Locke argues that there are no innate ideas, and that all knowledge is from the senses. ‘Whence has it [the mind] all the *materials* of reason and knowledge? To this I answer, in one word, from experience.’²⁵ What appear to be innate ideas are really intuitions based on the strength of our perceptions. Understanding comes when we know the meaning of a statement, and while we may quickly assent to the truth of supposed innate ideas, this is really because we have come to understand what they mean through experience. ‘The different clearness of our knowledge seems to me to lie in the different way of perception the mind has of the agreement or disagreement of any of its ideas. For if we reflect on our ways of thinking, we will find that sometimes the mind perceives the agreement or disagreement of two ideas *immediately by themselves*, without the intervention of any other: and this I think we may call *intuitive knowledge*.’²⁶ But much knowledge cannot be attained this way, and instead must be attained through investigation in the world, and demonstration through experiment.²⁷ This demonstration still relies on perception, but connects perceptions that we do not quickly see are connected by relating them to other perceptions.

Like Bacon and Newton, Locke does appeal to God. Indeed, he says we have certain knowledge of God’s existence, and God’s existence is one of the first things we come to know. ‘We have an intuitive knowledge of *our own existence*, and a demonstrative knowledge of the existence of a *God*: of the existence of *anything else*, we have no other but a sensitive knowledge; which extends not beyond the objects present to our senses.’²⁸ Locke distinguishes between reason and faith in a way that reason can operate independently of faith or belief in God (compared to Descartes). Faith is needed, according to Locke, to confirm certain beliefs that are difficult to know through reason – like the immortality of the soul, or moral systems – or to reveal other truths not knowable from reason that God wants us to know.

I argue that this bifurcation between knowledge derived from the senses and knowledge from scriptures, called *faith*, established a line of development that ends in the rejection of *knowledge* of God (although many still *believe* in God) and any need to appeal to God in understanding the

operations of the physical world (no longer understood as *secondary causes* because this implies there is a *primary cause*). Appeal can be made to the senses, to the quantification of motion, without any appeal to God. Indeed, appeals to God can appear superfluous to any explanation of motion.

THE CHALLENGE OF HUME AND SUCCESS OF NATURALISM

In contrast to Pannenberg, I do not think that naturalism is traced directly to Descartes (although perhaps indirectly), who's system relied on God to give assurance of the relationship between appearance and reality; instead, naturalism can be traced to Hume's criticism of the empirical method found in Bacon, Newton, and defended by Locke. This process got underway through the work of David Hume. Hume's criticism is of other empiricists, like Locke, but in his work he challenges the idea of causation which is a central piece of Descartes's philosophy as well. His challenge is essentially to renew the ancient problem of appearance and reality. What is the basis for the appearance of causation? Hume's analysis of causation is important for the discussion about God of the gaps explanations. Hume limits the sources of knowledge to sense data and the relationship between ideas.²⁹ According to Hume, as we experience change we begin to notice patterns and regularities, and we call these causation. But since this is based on our extremely limited experience we cannot say we have knowledge about causation, or that we know what to expect tomorrow.

Hume notes that we never experience causation itself, only two events that we link together as regularities.³⁰ These are not linked by necessity but only in our limited experience. This is by implication a rejection of Descartes' method of knowing, and a reject of the God of the gaps invoked by Descartes. But this also opens up troubling problems about appearance and reality, and about change and permanence for Locke. Indeed, Hume harkens back to one of the views that led to skepticism when he said: when I look inside all I see are mental images – all is change, all is becoming.³¹

What will suffice to prove this hypothesis to the satisfaction of every fair enquirer, is to shew from daily experience and observation, that the objects, which are variable or interrupted, and yet are suppos'd to continue the same, are such only as consist of a succession of parts, connected together by resemblance, contiguity, or causation. For as such a succession answers evidently to our notion of diversity, it can only be by mistake we ascribe to it an identity; and as the relation of parts, which leads us into this mistake, is really nothing but a quality, which produces an association of ideas, and an easy transition of the imagination from one to another, it can only be from the resemblance, which this act of the mind bears to that, by which we contemplate one continu'd object, that the error arises. Our chief business, then, must be to prove, that all objects, to which we ascribe identity, without observing their invariableness and uninterruptedness, are such as consist of a succession of related objects.³²

Hume applies this to the rejection of *miracles* as divine acts, since our knowledge of these is limited to our sense data (we cannot appeal to scripture/testimony to justify calling an event a divine act since these are simply further instances of sense data), and the overwhelming (if not universal) confirmation of sense data is that event are explainable through natural causes. Indeed, this tension between scientific knowledge and revealed knowledge has been summarized in the question 'what has Jerusalem to do with Athens' by Tertullian, and continues to be explored by thinkers like John Caiazza (*The Athens/Jerusalem Temple*).

KANT'S TWO-WORLD SOLUTION TO THE PROBLEM OF APPEARANCE AND REALITY IN CAUSATION

This skepticism about causation troubled Kant and was the impetus for awakening him from his dogmatic slumbers. However, Kant was also troubled by the idea of causation/determination, especially in the area of the will. His resulting system distinguishes between the phenomenal world of experience and change, and the noumenal world of things in themselves.³³ Causation applies to the world of experience, but not to the things in themselves. The problem for this explanation is the following: is there a causal relationship between the things in themselves and the phenomena? If not then the noumenal realm serves no purpose in the system and cannot be intelligibly spoken of. If so, then causation does apply to the noumenal realm. Kant appealed to a God of the gaps to justify morality – this continues to be one of the most popular and most used examples of the God of the gaps. It is said that science tells about how things are, and religion/belief in God gives values and morals (not much different than Galileo's solution, or that explored by Matthew Orr in his article).

The problem of change and permanence, being and becoming, is addressed by the model that being in itself is unchanging, and we attempt to make sense of changing appearances through the use of mathematics which is also eternal and unchanging. Thus, reality is only approximated by scientific models, which are increasingly improved and modified (C.S. Peirce). In this model there is no room for appeals to God as such appeals literally serve no purpose: we do not need God as the eternal, final cause toward which all things are striving; we do not need God to assure us that appearances match reality; and we do not need to appeal to God to explain anomalies in appearances since these will eventually be explained through empirical research. Changes in the world are explained through efficient/natural causes through the use of mathematics.

EMPIRICISM AND PRAGMATISM LEADING TO SKEPTICISM ABOUT ANCIENT PROBLEMS

Empiricism and pragmatism limit explanation to efficient causes and the immediate workings of physical processes ('how' questions, rather than 'why,' 'what is it,' 'where did it ultimately come from' 'where is it going,' or 'for what ultimate purpose' questions). While some speculative or abstract physical sciences address 'larger' questions, they are generally seen to be non-empirical and to not produce the same results as their more empirical cousins. This limits the natural sciences as well as the rest of the academy. Significant energy is put into explaining immediate physical processes, and significant success is attained. 'Success' is defined in terms of accurate prediction, and 'fit' within the rest of the system (does the hypothesis require significant change to what is already assumed, or does it 'fit' nicely in the existing system). This success was, and is, used as further confirmation that the right path has been chosen.

WHY THE 'GOD OF THE GAPS' IS REJECTED

Given this historical context, appeals to God as an explanation for the immediate workings of physical processes are viewed as problematic for a number of reasons:

1. They are non-empirical, non-verifiable, and non-repeatable. This means there is no place for them as an object of sensory investigation, given that knowledge has been limited to the empirical. As explanations they 'don't make sense.'

2. As explanations they are unnecessary. The same physical process can be explained through physical efficient causes without appeals to God. Where this explanation is not yet available, there is trust that greater empirical investigation will eventually yield the explanation. This trust is based on i) success thus far achieved, ii) that it is the only viable option given the nature of knowledge (sense data).
3. As explanations they are unhelpful. They do not add anything to the explanation, and raise greater questions that have not (and perhaps cannot within empiricism) be answered. The appeal to sense data by Bacon, Newton, and Locke can be kept, and their view of, and reliance on, God jettisoned.
4. As explanations they are anachronistic. They come from a time when the systems of Aristotle and Descartes limited science or relied on appeals to God, and are therefore out of place with subsequent development. Their use indicates that the person making the appeal is not 'up to speed' with developments, discoveries, and successes of the past three centuries.
5. As explanations they commit the fallacy of 'appeal to ignorance.' For many God continues to be important. But as an explanation God tends to be left to areas of the 'unknown,' the distant past, distant future, or afterlife. But these areas are simply gaps that can be filled through greater empirical investigation. Design, values, beauty, etc., can be explained as empirical gaps, or as part of the appearance/reality problem.

Thus, methodological naturalism emerges as the only reliable theory of knowledge, and as a solution to the problem of change and permanence. While this makes no comment about being (metaphysical atheism), it does imply that nothing can be known about what is non-material (where the material world is the world of extension that can be measured and quantified) and therefore if God exists God cannot be known (and therefore need not be posited at all).

The result is that 'God of the gaps' is a pejorative term. To claim that someone is using it as an explanation is to dismiss their explanation. To have it said of your explanation is for your explanation to be dismissed. However, I will argue that a proper understanding of logical and empirical gaps can also help in solving problems about being and becoming, change and permanence. This will be helpful in understanding the conflict between science and religion because these often involve conflicts about the domain of knowledge between what are empirical and logical matters. Having given an overview of the problem, I will now argue that an important but little recognized contributor to the problem is a difference in kinds of gaps, and that this difference has hindered the pursuit of explanations. Noting the difference between empirical gaps and logical gaps is therefore important for the discussion about the God of the gaps, and also important for understanding what constitutes a scientific worldview, and how to address ancient problems that continue to affect the search for knowledge.

TWO KINDS OF GAPS

The kinds of gaps considered thus far in this paper have been empirical gaps. For instance, design, change, values, and meaning. Greater empirical investigation can help explain these, or at least explain why they are important to the human (although not part of reality).

Newton and other scientists used God to fill gaps in their scientific accounts – until better data or new theories made divine intervention unnecessary. The 'God of the gaps,' invoked as a hypothesis to account for scientifically unexplained facts, or introduced as a cause producing

effects on the same level as natural causes, retreated further as each of the gaps in human knowledge was closed.³⁴

Is there a role left for God in the halls of academia or the research labs? In his article ‘What is a Scientific Worldview, and How Does it Bear on the Interplay of Science and Religion?’, Matthew Orr discusses the difference between unscientific and non-scientific components of worldviews. Although he dismisses the personal creator of Genesis as facing empirical problems, he states that science is amoral and a full worldview must contain non-scientific components to fill the gaps. This is not unlike my distinction between empirical and logical gaps, although rather than calling them non-scientific, I believe they are meta-scientific (assumed by empirical investigation, transcending – in the Kantian sense – scientific investigation). John Carvalho IV states in his ‘Overview of the Structure of a Scientific Worldview’ that science presupposes an ordered, detectable, and explainable world, faith in sense data, and that the world is contingent.³⁵ But here I am speaking about something more basic than these, about *being* itself, and putting this in the historical context of how thinkers have tried to defend or explain what Carvalho says science must presuppose.

LOGICAL GAPS – BEING AND NON-BEING

The most basic gap is a logical gap, and it has to do with *being*. Aristotle tried to solve the problem of being and becoming, which is one step removed from the most basic, the problem of being and non-being. This is a logical gap in that it cannot be addressed empirically, indeed *being* is assumed in all sense experiences – there can be no experience of non-being. All scientific investigation relies on sense data, and therefore assumes being – it would beg the question to use sense data to investigate the difference between being and non-being. No laws can be applied to non-being, no tests done, no observations made – it is *nothing*. The most basic question, slightly more basic than being and becoming (although related), is ‘is some (all) being eternal, or was there ever only non-being?’ Empirical scientists do not hesitate to weigh in on this question, and as we’ll see they come down on all three sides (all is eternal, some is eternal, none is eternal).

Carl Sagan began his influential work, *Cosmos*, by saying ‘The Cosmos is all that is or ever was or ever will be.’³⁶ By way of contrast, Alan Guth says that the universe sprang into being from absolutely nothing, nada, zip (on the cover of *Discover* April 2002). The origin of being is not an empirical gap but a logical gap. Once there is being the laws that govern that being can be understood in increasing detail through empirical investigation. But the origin of being itself cannot be empirically investigated since it cannot be experienced. Nor can a greater understanding of the laws of being explain the origin of being in that these laws presuppose being; the existence of these laws must be explained, and cannot be the explanation of their own existence. If the material universe is eternal, then the laws that govern it are also eternal and could be said to be ‘brute facts,’ but in such a case there is no origin that needs explaining.

Alan Guth makes the mistake of using the laws to explain their own existence: ‘If the creation of the universe is to be described by physical laws that embody the conservation of energy, then the universe must have the same energy as whatever it was created from. If the universe was created from nothing, then the total energy must be zero.’³⁷ Apparently these laws are uncreated and govern matter but are not explained by matter (i.e., are not due to the nature of matter which would mean they are co-created with matter). While Guth wants his theory to appear empirical, his claim that these laws are eternal is not an empirical claim. There simply is no way to empirically fill in this gap – it is a logical gap.

However, failure to note this logical gap has led some cosmologists to assert that being came from nothing, or from non-being. Alan Guth has said: 'Conceivably, *everything* can be created from nothing. And 'everything' might include a lot more than what we can see. In the context of inflationary cosmology, it is fair to say that the universe is the ultimate free lunch.'³⁸ Of course, *everything* should mean *everything*, which means *all* being came into being from non-being. Stephen Hawking affirms that 'energy cannot be created out of nothing' (Hawking 1988, 106) and explains what Alan Guth might be speaking of when he uses the term 'nothing':

What we think of as 'empty' space cannot be completely empty because that would mean that all the fields, such as the gravitational and electromagnetic fields, would have to be exactly zero. However, the value of a field and its rate of change with time are like the position and velocity of a particle: the uncertainty principle implies that the more accurately one knows one of these quantities, the less accurately one can know the other. So in empty space it would have both a precise value (zero) and a precise rate of change (also zero). There must be a certain minimum amount of uncertainty, or quantum fluctuations, in the value or the field.³⁹

Some scientists suggest that the universe is without beginning, eternal, and offer an oscillating picture to explain this. Hawking suggested such an oscillating system, but has since come to reject it. The implication is that all that exists has always existed, there was no creation and therefore another gap filled by God is closed. In discussing the possibility that the universe is oscillating between the big bang and a big crunch, Hawking says: 'if the universe is really completely self-contained, having no boundary or edge, it would have neither beginning nor end: it would simply be. What place, then, for a creator?.'⁴⁰

Popular science writer Isaac Asimov rejects the idea of creation and instead seems inclined toward the view that the universe is eternal. Of those who believe in God the Creator he says: 'Until quite recently in time, most people in the West thought the Earth and sky was [sic] formed by supernatural creation about six thousand years ago. (Many people today still earnestly believe this, though their intellectual achievement in doing so is about on a par with those who still believe the Earth is flat).'⁴¹ Asimov also looks to Guth's theory to fill in the gap of God the Creator. Must we assume that if there was a beginning to the universe this was caused by a supernatural being? 'Not necessarily . . . In 1980, an American physicist, Alan Guth, took up the problem of the origin of the big bang . . . The pre-universe had energy, and since all of its other properties resemble those of a vacuum, it is called a *false vacuum*. From this false vacuum, a tiny point of existence appears where the energy just happened, by the blind forces of random changes, to have concentrated itself . . . Of course, even if some version of Guth's theory is right, we might simply take a further step backward and ask where did the energy of the false vacuum come from in the first place.'⁴²

Asimov does note that the existence of quasars might indicate that the universe had a beginning. He appeals to quasars to make the point that the universe cannot have always existed: 'This alone [the nature of quasars] would show that the universe in its youth was quite different from what it is now and that there has been an evolutionary process. This tends to disprove competing theories that would have the universe possess no true beginning and that describe it as having had the same overall appearance at all times in the indefinite past.'⁴³ This empirical consideration does not settle the matter for those who limit knowledge to empirical investigation because some other observation might be made tomorrow. To say that the universe was quite different in its youth does not rule out Guth's theory or the oscillating universe. But being from non-being is a logical gap not an empirical gap. Can the universe, which is changing toward sameness (burning out), but has not yet reached sameness, have always been changing toward sameness?

We should not think that claims concerning being from non-being are outdated in the world of physics or philosophical materialism. These same assertions continue to appear in the latest publications. For instance, Stephan Hawking says that the universe came from nothing in his latest book, *The Grand Design* (2010). A similar claim is made by Lawrence Krauss in his 2012 book *A Universe From Nothing*. Readers will discover that in neither case does ‘nothing’ really mean ‘nothing,’ or ‘non-being.’ For instance, Hawking says that gravity is responsible for the universe, and yet insists this is something from nothing. David Albert, in his 2012 review of Krauss’s book appearing in the *New York Times*, points out that Krauss assumes the existence of things like the laws of quantum mechanics and therefore cannot coherently claim to have shown that the universe came from nothing.

The fundamental mistake in this area would be to assert that being (what exists, including energy or matter) came from non-being. This is not the same as the problem of being and becoming in that this problem assumes existence, whereas non-being is neither being nor becoming. Being from non-being is a contradiction because it fails to uphold the distinction between being and non-being and therefore reduces one to the other. If being can come from either being or non-being, then there is no distinction (in this sense) between them and being is non-being (eggs are non-tables, but both are material objects). Instead, non-being is that which can do and is nothing; non-being cannot produce being, and nothing can come from non-being. Remember that Aristotle was concerned about this problem of being and becoming, but knew that if there is now being then there must have always been being since being cannot arise from non-being. This observation does not of necessity lead to Aristotle’s physics since Galileo, Bacon, Descartes, and Newton also believed that there was an eternal being (God), although not an eternal material being.

This is an important implication of the insight that there is no being from non-being. If there can be no being from non-being then if something now exists something has always existed. What it is that has always existed is not a gap that can be filled through empirical investigation. This involves two parts: i) it cannot be empirically determined if all being is eternal, or only some is eternal; ii) it cannot be empirically determined what kind of being exists and is eternal, matter or spirit (matter is that which has extension, spirit that which is conscious). The latter is an issue of the problem of appearance and reality – does the material world exist apart from ideas, or is it only an appearance? Conversely, does the mind exist or is there only the appearance of the mind while the reality is the material brain?

TWO PARTS OF THE MOST BASIC LOGICAL GAP

The first part involves the distinction between unchanging being (and therefore eternal-without beginning), and changing/temporal being. Was some being created by another being, or has all being (in one form or another) existed from eternity? This is not something that can be empirically investigated because it involves the origin and nature of the being that can be empirically investigated, and the being doing the investigating. It involves the difference in kind between changeable being and unchangeable being. It requires answering the question: is there unchangeable being, or is all being changeable. That there is or is not unchangeable being cannot be empirically confirmed because all empirical investigation is temporally situation. Alan Guth notes that the possibilities are: i) unchangeable being (and therefore eternal-without beginning) brought into existence changeable being (temporal); ii) all being is unchangeable and no being was brought into existence; iii) all being is changeable and all being is brought into existence.⁴⁴ Which of these is the case cannot be determined through greater empirical infor-

mation. These involve logical differences. For contemporary cosmologists, working empirically, to affirm one or the other is to go beyond empiricism, and encounter the problems of change and motion, being and becoming, and appearance and reality.

The second part of this logical gap involves the question of the nature of being; this is the difference between material and spiritual being. Material beings have extension while spirits and ideas have no extension but are conscious or objects of consciousness. Empirical investigation can get no further than perception and appearance. Is this perception of an extended being or of an idea? What is appearance, what is reality? Is change/becoming real, or does it only appear to be real? And if material being exists, has it existed from eternity or was it brought into being? If it was brought into being, was it brought into being by another material being, or by a spirit? On the other hand, if spirit exists has it existed from eternity, and is all spirit one or are there separate consciousnesses/selves? These are not questions that will be answered through further empirical investigation because they involve issue that go beyond empirical perception and encounter the problem of appearance/reality. A quick response might be to say that on these matters empirical science is silent, but that would not be correct. The contemporary materialist cosmology assumes that matter exists, and includes schools of thought that affirm either that matter has always existed or that it came into being from non-being. The failure to notice the difference between empirical gaps and logical gaps leads to the appearance of empirical knowledge in an area of study that cannot yield empirical knowledge. When this is pointed out the response is often skepticism, the claim that we cannot have knowledge of these matters. Historically, the result of this kind of uncritically held assumption has been widespread skepticism with damaging affects on human advancement.

SKEPTICISM AND THE OVEREXTENSION OF NATURALISM

Two issues should be addressed. The first is that empirical investigation, science, never claimed to give this kind of knowledge and therefore citing it for failing to do so is unfair. It is true that many scientists do not make such claims, but it is also true that many do (think of the claims of scientists like Alan Guth or Richard Dawkins), and that many non-professionals look to science as the body of all knowledge. This leads to the second problem, which is that what I have described is not a problem for science but a problem for human limitations. This is skepticism. It is the claim that we cannot know the answers to these kinds of questions. A skeptic might affirm that we can know some things, and these things are what can be known empirically, but we cannot know the answers to questions that are outside of the empirical domain. This is not simply a discussion of the 'limits of science,' where science is said to study the material world and religion provides values, morals, meaning, and hope in a next life. Instead, what is being asked are the traditional questions about motion and change, being and becoming, and appearance and reality. The skeptic is asserting that there is no solution to these problems. The implication is that while we may have some current success in quantifying motion and predicting future motion, we have no certainty that this will last or that it actually tells us anything about what is real. We may have the appearance of success without real success, the appearance of correct quantification and prediction without the reality of such. The mechanism of change and motion is still a mystery, and we are no closer than before to explaining the process of being and becoming.

It is here that methodological naturalism overextends itself. While it maintains that explanations can only be given if they limit their appeals to what is available to sense data, it is a theory that is not itself limited to sense data. This is the well known criticism of logical

positivism, and it applies to methodological naturalism as well. The alternative it does not consider, and which has been relied upon by many throughout the history of thought without falling into superstition, is that there is a difference between primary causes and secondary causes, the latter being material the former being non-material and intelligent. To avoid this discussion by only studying secondary causes is a metaphysical viewpoint, not a conclusion of empirical research. While the problems of superstition have been discussed above, the problem noted here with methodological naturalism is sufficient to rule it out and make it worthwhile to explore a method that relies on primary and secondary causes.

PRIMARY AND SECONDARY CAUSES IN HISTORIC CHRISTIANITY

Because methodological naturalism is most often leveled against Christians, and explanations involving the theistic God (it is not so often used to root out Aristotelians anymore), it is worthwhile to note that the distinction between primary and secondary causes is made in Historic Christianity, in the Westminster Confession. Consider the following: ‘God, from all eternity, did, by the most wise and holy counsel of his own will, freely, and unchangeably ordain whatsoever comes to pass: yet so, as thereby neither is God the author of sin, nor is violence offered to the will of the creatures; nor is the liberty or contingency of second causes taken away, but rather established.’⁴⁵ Similarly: ‘Although, in relation to the foreknowledge and decree of God, the first Cause, all things come to pass immutably, and infallibly; yet, by the same providence, he ordereth them to fall out, according to the nature of second causes, either necessarily, freely, or contingently’ (5.2).

Here, Historic Christianity has not made appeals to God where empirical research could fill the gap. Physical events are explained by secondary causes, as are human actions. Research in physics explains how contingent events come to pass, and research in psychology explains human actions. But the Confession also avoids the mistake of philosophical naturalism in limiting all knowledge to the empirical and material and reducing all to secondary causes, and allows that God as the primary cause can work through, against, or without secondary causes. There is a logical gap between the primary and secondary causes. This distinction between primary and secondary causes has much promise in solving ancient skeptical problems, explaining the relationship between science and religion, and protecting both.

SKEPTICISM AS THE PROBLEM

Skepticism is the true problem. If the skeptic is correct and we cannot know, we cannot have certainty about the kinds of questions discussed above, nor can we do more than describe what we experience, without knowing if this applies to our future experiences. This does not help in knowing the primary cause (in developing a full worldview), or in solving the appearance/reality or being/becoming problems. However, progress can be made in logical gaps, and it is made, well, logically. The progress must be made logically, not empirically, and it must be made presuppositionally, not intuitively. To say that it must be made logically and presuppositionally is to say that the most basic (logically basic) aspect of reality must be understood before other aspects of reality can be understood. This is in contrast to proceeding empirically and intuitively, which means seeking to fill empirical gaps to problems that strike us as personally important. We can get some insight about how this can work from Hume.

MAKING PROGRESS WITH LOGICAL GAPS

Hume pointed out that logic cannot tell us about existence, and I think he was partially correct in this. Logic can only give hypotheticals about existence, such as ‘for all ‘a’ (without saying there are any), if ‘a = b’ and ‘b = c,’ then ‘a = c.’ But Hume also pointed out, I think correctly, that what is self-contradictory is meaningless and cannot be. This means that if we have but two options, *a* and *non-a*, and one is self-contradictory, then the other must *be*. Earlier I quoted Guth, who points out that there are only three options: all *being* has always existed, only some *being* has always existed, and created what else exists, or *being* came from *non-being*. If the last is logically impossible, then we are left with only two options. If one of these proves to be logically impossible, then we are left with one – we have filled a gap in knowledge about *being* and *becoming* through logic. This is progress, and it is progress that meets the desired requirements of science mentioned at the beginning of this article – it is able to be duplicated and confirmed by others (it is universal).

CONCLUSION

The desire to make progress in knowledge and avoid false explanations is noble and should be encouraged. Limiting all explanation to empirical explanation ignores logical gaps that cannot be filled through greater empirical research. This kind of limitation is as much a hindrance to gaining knowledge as is ignoring efficient or secondary causes in favor of final or primary causes. Noting these distinctions in kinds of gaps can be helpful in making progress in subjects that have been a source of tension between science and religion. Methodological naturalism makes the same mistake as superstition – both fail to give an adequate explanation of reality. Limiting explanations to efficient causes is not an advancement and is not helpful in the pursuit of knowledge – it is a kind of skepticism about ultimate questions, questions that must be answered in order to understand all the implications of empirical research. Proofs that involve showing the logical impossibility of a conclusion (and therefore the necessity of its opposite) are equally universal and are able to be duplicated by all who think. Such work involves filling logical gaps in knowledge that goes beyond efficient causes. It is my hope that sufficient foundation has been given for increased work in this area.

Notes

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