

## Science and Religion: Drawing the Line

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### Abstract

Areas exist where theistic religion and modern science are clearly not compatible, but demarcation for the defender of the faith may get blurred. In this essay, I provide some overriding reasons why modern science should not be characterized by the religious believer as *a religion, faith, and/or just a theory or belief system*.

### Introduction

The problem of drawing the line between science and religion may be considered a subset of a wider problem in the philosophy of science: the **demarcation** (or boundary) **problem**. This is the general problem of drawing the line between science and non-science (most importantly, pseudoscience). But, can we draw the line between science and religion? For some religious believers, things are not always that clear-cut and it can be difficult to tell the characterizations of science and religion apart. For example, consider popular notions like: *science is a secular or humanistic religion, science is a hostile materialistic or mechanistic faith, and/or science is just a theory or belief system*.

To be sure, areas exist where theistic religion and modern science are clearly not compatible, but demarcation for the defender of the faith may get blurred. This may be especially the case when the religionist dismisses or discredits reasoning and critical thinking, is armed with a characterization that confuses science with scientism, adopts a too narrow vision of what knowledge is, and/or argues that science and religion *must be* compatible because key aspects of modern science are based upon (or have something in common with) religion.

Furthermore, passion (or commitment) born out of doctrinal certainty (or religious imperialistic ideology) may also motivate individual or dominant faith to blur the line between science and religion. In such cases, religious faith may seek to uncompromisingly extend the rule or influence of a body of alleged *spiritual truths* proposed (or dictated) to direct the beliefs, expectations, and actions of others. Yet such individual or dominant faith may be founded on false beliefs based on a misguided identification of causation, beliefs that are not falsifiable, and/or beliefs that are not physically (and logically) possible. Accordingly, in this essay I provide some overriding reasons why modern science is not a religion, faith, and/or just a theory or belief system.

## Like A Dog Chasing Its Own Tail

To be sure, one cannot, on pain of contradiction, *reason* against demarcation, yet appeal to it by *reasoning* that different disciplines require different methods of analysis or evaluation—suggesting that the progress sought in this discussion cannot be achieved by appealing to *reason* because religion governs its own separate domain by *faith* and is, in this sense, immune from rational analysis or evaluation. For, in the sense that religion is an attempt to try to **argue** and/or invoke **method** to determine or make known the truth about *what is* (e.g., via scriptural reference or interpretation, metaphysical claims, metaphor, or analogical *reasoning*), there is the need to analyze or evaluate its arguments by crossing the different domains. Moreover, by refusing to conform to logic one cannot, on pain of contradiction, sidestep the reality that **method** itself implies a **logically** ordered way of accomplishing something—as the detailed procedures and techniques that suggest order characteristic of a particular discipline or field. Religion, then, is also not immune from the logical analysis or evaluation of its procedures and techniques.<sup>1</sup>

It does one no good to dismiss logical analysis or evaluation and/or material evidence (i.e., argument and/or supporting evidence), since to *argue* against the truth or correctness of the logical principles of reasoning amounts to adopting a position that makes reasoning theoretically impossible. For ... *the laws of logic are embedded in our thinking and our language*....<sup>2</sup> So, for instance, the skeptic (or person refusing to conform to logic) cannot, on pain of contradiction, hope to persuade by presenting the argument (possibly critiquing logic as a blatantly *absolutist* enterprise) that *all rules are oppressive, logic is a set of rules, so logic is oppressive*<sup>3</sup>—that is, one cannot use logic to reject (or defeat) logic.

Likewise, the skeptic cannot sidestep all this by *arguing* that *arguments* by themselves do not persuade—suggesting that the progress sought in this discussion by logic cannot be achieved by appealing to *valid* arguments. For, the skeptic cannot, on pain of contradiction, hope to persuade by presenting the argument that arguments do not persuade. Additionally, the skeptic cannot sidestep all this by *stating* here that no one can ever be perfectly sure about any *statement* made—suggesting that the *truth* sought by logic cannot be attained by appealing to *statements* like those found in *sound* arguments. Since, one cannot, on pain of contradiction, be *perfectly* sure that there is no such thing as *perfection*, nor *state* that no one can ever be perfectly sure about any *statement* made. In short, logic would demand, for the sake of consistency, that we not beg the question by relying on the very thing we are disallowing or arguing against.

Further, skeptics may **reason** that the progress sought in this discussion to facilitate open inquiry in science cannot be achieved by appealing to impersonal standards and impartial procedures dictated by **reason**. This is because we cannot get at **knowledge about the natural**

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<sup>1</sup>. Thus, given that both science and religion are not exempt from rational/logical analysis or evaluation, they are in an important sense two domains that **do overlap**—contrary to Stephen Jay Gould’s thesis of **non-overlapping magisteria/NOMA** (1997, 16-22).

<sup>2</sup>. Bassham, Irwin, Nardone, and Wallace, *Critical Thinking: A Student’s Introduction*, 4.

<sup>3</sup>. *Ibid.*

**or physical world**, since we are somehow always filtering what we *know* via theory and evidence so that there simply and literally are no neutral arbiters. But this form of *reasoning* that accepts no independently accessible locus of truth is untenable, since we would be using reason to defeat reason—thus begging the question.

Moreover, we could not establish the truth of the claim that **there simply and literally are no neutral arbiters**. For if the claim is *itself* derived by reason, then we are using the very thing we are arguing against. On the other hand, if the claim is *itself* derived on the basis that there can be an **outside** position from which to arbitrate and adjudicate, then we are engaged in circular reasoning—where **neutral arbitration** (which is itself in question) is assumed to somehow establish the position against neutral arbitration. Since either result is untenable (each **contradicts** itself without any doubt), we can thus reject the claim that the progress sought in this discussion cannot be achieved by appealing to reason.

This form of self-sabotaging epistemology is avowed by Stanley Fish. Accordingly, his arguments are ineffectual, particularly when substituting irony for truth. Such reasoning depends, in a most round-about fashion, on the principle of non-contradiction, for *[t]he essential feature of IRONY is the indirect presentation of a contradiction between an action or expression and the context in which it occurs*.<sup>4</sup> But, the principle of non-contradiction itself relies on the notion of truth to have any force. This, then, begs the question by using the very thing which is at issue—truth. As it relates to theistic religion, Fish's anti-liberalism may be characterized as a *double-edge (Lockean) sword* that indirectly undermines his position.<sup>5</sup> Logically speaking, therefore, the **antifoundationalism** many like Fish appeal to is like *a dog chasing its own foundationalist tail*.

Like a dog running around in circles trying to **bite off** (or undermine) its tail, skeptics may further *reason* that the progress sought in this discussion cannot be achieved by appealing to *reason* because we cannot get at **what is real (or what corresponds with reality—the truth)** on the basis that we are somehow always **filtering** what is *real* (so that there simply and literally *is* no reality (or truth) beyond what our reason **constructs** and **interprets**). But this form of **interpretism** (a form of relativism) is problematic, since we would be using reason to defeat reason—thus begging the question.

Moreover, we could not establish the truth of such claims as **we cannot get at what is real on the basis that we are somehow always filtering what is real via reason**. For if the claim is itself derived by reason, then we are using the very thing we are arguing against. On the other hand, if the claim is itself derived on the basis of what is *real* (or true), then we are engaged in circular reasoning—where reality (which is itself in question) somehow establishes what is real (or true). Since either result is untenable, we can thus reject the claim that the progress sought in this discussion cannot be achieved by appealing to reason.

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<sup>4</sup> *Dictionary.com*, s.v. **Irony**, <http://dictionary.reference.com/browse/irony?s=b> (accessed September 10, 2012).

<sup>5</sup> See Kozinski, *The Things That Are Not Caesar's: How to Catch Fish, Unlock Locke, and Settle the Just Bounds of Church and State*; and, Feser, *Are We All Lockeans Now?*

Unfortunately, armed with such contradictions found in interpretism or antifoundationalism (usually as a **social constructivist** or **postmodernist** response<sup>6</sup>), the religionist (inconsistently appealing to a relativism at odds with his/her religious absolutism) may seek to dismiss the critical thinker here as someone who is no better, since he or she *worships at the altar of reason*. But this only pushes our discussion from the problem of drawing the line between *science* and *religion* to an underlying dispute between *reason* and *faith* (or *belief*). Accordingly, persons refusing to conform to **reason** may *reason* that the progress sought in this discussion cannot be achieved by appealing to *reason* because **reason does not trump faith**. But this is problematic, since we would be using reason to defeat reason—thus begging the question.

Besides, if the claim that **reason does not trump faith** is itself derived by reason, then we are using the very thing we are arguing against. On the other hand, if the claim is itself derived by faith, then we are engaged in circular reasoning—where faith (which is itself in question) somehow establishes faith. Since either result is untenable, we can thus reject the claim that **reason does not trump faith**. Moreover, **even if** science and religion were to be characterized as **both** relying on reason and/or faith (or belief), the issue remains whether the beliefs appealed to are **true** and/or there are **good** reasons and arguments for believing so.

### Confusing Science with Scientism

Yet, it can be difficult to tell modern science<sup>7</sup> and theistic religion<sup>8</sup> apart because the characterizations of science as *a secular or humanistic religion, a hostile materialistic or mechanistic faith, and/or just a theory or belief system* confuse it with **scientism**. Scientism is a dogmatic creed. It champions a particular secular or humanistic worldview (or theory) that uncompromisingly seeks to extend the rule (or influence) of a belief system proposed (or dictated) by a dominant class of scientists (a *new priesthood*<sup>9</sup>). This is done to direct the scientific *faith* (i.e., the beliefs, expectations, and actions of the community of scientists). Underlying this confusion of science with scientism is the characterization of science<sup>10</sup> as an

<sup>6</sup>. Many critics of science work within a social constructivist or postmodernist distinction that contrasts the *subjectivity* of theory with the *objectivity* of sensory data to establish the dictum that *sensory data are theory laden*. It is claimed that this is problematic because the theory-laden character of data implies *subjectivity, circularity, or rationalization*. This has the goal of minimizing (or denying) the objectivity of science. But such a distinction assumes a naïve understanding of the nature of science and overlooks the possibility that we can overcome this conception of science (Grant 2011, 20-25; Ben-Ari 2005, chapters 6-7; Nagel 1998, 32-38; Rothbart and Slayden 1994, 25-38).

<sup>7</sup>. That is, modern science in the Western tradition.

<sup>8</sup>. Theistic religion may involve many applicable versions of Christianity, Judaism, Hinduism, and Islam.

<sup>9</sup>. See Henry, *The Rise of the New Scientific Priesthood*; and, Feyerabend, *The Tyranny of Science*.

<sup>10</sup>. Other characterizations of science include that it is weak and need not be heeded because it admits uncertainty, it frequently contradicts what people have long thought they knew, it actively rejects any role of God in scientific explanation, it is no truer than religious accounts, it demonstrates little significant difference between the scientist's faith in reason, evidence, and skepticism as the best way to achieve truth about the world and the religious believer's faith in revelation and scripture, it denies both the existence of God and the importance of *human values* (meaning

immense and material machine stripped of free will or emotion. This, allegedly, turns human beings into mere machines stripped of any impulse beyond the material or mechanical—composed of matter stripped of spirit or soul. Accordingly, science is thought to be hostile to human flourishing, dignity, thoughts, feelings, and desires.<sup>11</sup>

Nevertheless, those who claim that humankind apparently is stripped of free will or emotion by science confuse a hostile material or mechanical gloss on science with science itself. To be sure, some take science to be merely a system for applying empirical knowledge. But such *applied* science may be differentiated from *pure* science, emphasizing the application of scientific knowledge (i.e., technologies and inventions) to specific human needs. For, technology is primarily about the application of science to produce something that (supposedly) works for the betterment of humankind.

Of course, technology does not always work for the good of humankind. And, science should not be blamed for this.<sup>12</sup> In this sense, pure science may be compared to a knife that (when applied) can be used for bad (e.g., to fatally wound) and/or good (e.g., to perform a life-saving surgery). Hence, pure science, like the knife, is in itself neither bad nor good. Accordingly, reasoning whether things really do (or do not) converge continuously toward betterment, is more of an argument applicable to technologies and inventions, than science.

So, when the goal is the production of goods or gadgets to apply scientific knowledge to practical problems, we have technology. Nonetheless, the negative impact of some applied technologies and inventions may suggest an underpinning worldview (or theory) with a hostile materialistic or mechanistic inclination or emphasis. However, an understanding of science as fundamentally materialistic is problematic and too narrow, since modern science does not have a single notion of what is the fundamental stuff of reality and modern science no longer attaches itself to the Newtonian mechanistic approach and to deterministic materialism (see **footnote no. 23**).

*Pure* science, on the other hand, is primarily about **knowledge** of the natural or physical world—an *epistemological* endeavor.<sup>13</sup> So, modern science should not be confused with technology. In view of that, it is a mistake to identify *pure* science with the adverse results of the material or machine-like results (or applications) of *applied* science. Thus, to assert that modern science simply strips us of any impulse beyond the material or mechanical and is thus hostile to

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behaviors that are affirmed by traditional religion), it seems to be talking about the same things in scripture but contradicts the teachings of the Church, and its new developments seem *unnatural* (Easton 2009, xvi-xvii, *ad verbum* summary/adaptation).

<sup>11</sup>. Schick and Vaughn, *How to Think About Weird Things: Critical Thinking For a New Age*, 166-167.

<sup>12</sup>. *[T]he past has taught us that technological developments can have unforeseen and terrible consequences. Those consequences do 'not' belong to science, for science is nothing more (or less) than a systematic approach to gaining knowledge about the world. Technology is the application of knowledge (including scientific knowledge) to accomplish things we otherwise could not* (Easton 2009, xv).

<sup>13</sup>. *Ibid.*

human flourishing, dignity, thoughts, feelings, and desires is as uninformed, if not as dishonest, as asserting that theistic religion has brought only pain and suffering to humankind.

In the extreme, then, scientism serves to trivialize the subject of modern science. For if scientism defines science, science just boils down to championing a belief system proposed (or dictated) by a dominant class of scientists. And, the methods and procedures of scientific investigation would make no difference. There would be little point in formulating and testing hypotheses to make comparative scientific judgments to investigate the natural or physical world.

Furthermore, since circumstances raising different hypotheses would make no difference, all that would matter would be prefabricated, all-purpose answers based on scientific authority. And this would actually amount to affirming the dominant scientific view and closing the subject. Accordingly, by itself a dominant scientific view would fail to expose the better hypothesis, since we could not show how we are to choose between competing hypotheses. Also, there would be no way to convince someone who does not share the privileged scientific view that it is the right one. Besides, we would not always be sure of, or in agreement about, the credentials of the prevailing scientific authority, nor on how the authority would rule in ambiguous or new cases.

Finally, even if we grant that at specific moments in the history of science particular worldviews (or theories) held by scientists have been considered to be dominant in the scientific community, modern science should not be said to be dominated by any particular worldview (or theory). This is because worldviews (or theories) in science have changed radically over the years. So, for instance, Newtonian mechanics is presently taken by the scientific community to be, in an important sense, supplanted by (or subsumed into) Einstein's relativity. Furthermore, it may be very difficult to characterize modern science with any one dominant worldview (or theory), since at times incompatible worldviews (or theories) may operate in parallel in science. For example, taken together quantum mechanics and general relativity shape science's present understanding of the physical laws of the universe, but these worldviews (or theories) are *incompatible* with one another<sup>14</sup> (in this sense, theistic religion and modern science conjoined are necessarily incompatible<sup>15</sup>).

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<sup>14</sup>. Penrose, *The Road to Reality: A Complete Guide to the Laws of the Universe*, 816-817.

<sup>15</sup>. Point made by Alvin Plantinga at the American Philosophical Association Central Division Meeting in Chicago for 2009 (Dennett and Plantinga 2011, 2). But it is important to note, in contrast to any inconsistency that may be found in theism (see **footnote no. 40**), *incompatible* theories that operate in parallel in science can be compared and confronted on the plane of observations, measurements, experiments, and conceptual analysis and evaluation. So although we may grant that sometimes science involves crisis and revolution, recalcitrant theories, and paradigm shifts, a state of balance or coherence among competing theories can be arrived at by a process of deliberative mutual adjustment by comparing experimental results to the predictions of each theory.

## A Broader Vision of Knowledge

The word *science*, understood more broadly, comes from the Latin word *scientia*, which means *knowledge*. This is consistent with the observation that science may be taken as the systematically organized body of knowledge we know about the natural or physical world. So, science may be considered a subfield of epistemology (from the Greek, *episteme*, which means *knowledge*, and *logos*, which means *the study of*). Epistemology, as the study of the nature, limits, and grounds of knowledge, is at the very least concerned with *justified true beliefs*. In view of that, everything that we claim to know about the natural or physical world depends on some epistemological view or position—arrived at by inquiring whether beliefs are true (i.e., the beliefs correspond with reality—enter **empiricism**) *and* justified (i.e., there are **good** reasons and arguments for believing so—enter **rationalism**).<sup>16</sup>

Accordingly, science is not limited to observations, measurements, and experiments, but requires a good deal of reasoning and critical thinking.<sup>17</sup> For instance, although the ancient pre-Socratic Greek philosopher Democritus (with Leucippus, ca. 460 BC - ca. 370 BC) posited atoms without the benefit of experimental investigation, the atomistic theory of the universe got off the ground, in a very important sense, with the wings of conceptual analysis and evaluation. So, reasoning and critical thinking are crucial to the scientific endeavor (see **footnote no. 36**). Consistent with this, modern science, as an *epistemological* endeavor, also draws ultimately on philosophy (Philosophy is composed of the fields of ethics, aesthetics, metaphysics, epistemology, and logic.). So although science (as natural philosophy) was in antiquity fully a part of philosophy, we may argue that today it still shares a strong connection to it besides a concern for those philosophical questions that deal with foundational matters not directly addressed by science itself.

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<sup>16</sup>. Specifically, I mean here the necessary and sufficient conditions for scientific knowledge. Because investigation in science may take the form of an open-ended activity, it will not provide sufficient conditions for knowledge until many experiments are carried out with positive outcomes (**justified** within a period of time). For instance, suppose a person *believes* that a particular propeller airplane is safe to fly across the Atlantic Ocean. Can we say that this person *knows* that the airplane is safe to fly across the Atlantic Ocean? The problem is that although one may *believe* that this particular propeller airplane is safe to fly across the Atlantic Ocean, in a flying attempt (i.e., an experiment) the airplane may, unhappily, break down and crash into the ocean (so belief is necessary, but **not** sufficient for knowledge—science is thus **not** characterized by just belief or faith). However, had the airplane safely flown across the Atlantic Ocean, the belief that the particular propeller airplane is safe to fly would be **true** (so truth is necessary but **not** sufficient for knowledge—science is thus **not** characterized by just [the search for] truth). But belief and truth do not constitute knowledge. The true belief that the particular propeller airplane is safe to fly would also have to be **justified** (i.e., at least for a period of time there exists good reasons that grounded the belief in reality). Accordingly, one could after many experiments (i.e., actual completed flights) claim (factual) **knowledge** that the airplane was (for a period of time) safe to fly across the Atlantic Ocean because one had a **justified true belief** (thus science, at the very least, **is** characterized by the **search** for knowledge). So if we proceed with caution with a stronger sense of justification (taken as **good reasons**, not lucky or educated guesses, which properly ground beliefs in reality so that they are highly probable), we may prevent the problem that belief, truth, and justification may not be sufficient conditions for knowledge (Gettier 1963).

<sup>17</sup>. *The ability to evaluate and to select among alternatives—as well as to know when the data do not permit selection—is called critical thinking. It is essential not only in science and technology but in every other aspect of life as well* (Easton 2009, v).

To be sure, some may challenge such a broad understanding of *science* by bifurcating knowledge so that it is skewed as (or conflated with) either rationalism or empiricism. But this adopts a too narrow vision of what knowledge is. For, the idea that the **physical** universe may well be **rational** in that it may possibly obey the laws of science and these laws can be accessible to human minds, demands that knowledge *not* be bifurcated into the diametrically opposed dimensions of **empiricism** and **rationalism**. Let me explain.

**Empiricism** takes its name from *empeiria*, the Greek word for *experience*. According to empiricism, the true (or only) *source* of knowledge is found in experience where facts are extracted wholly (or mainly) through one or more of the five senses (sight, hearing, touch, smell, and taste). So, in this account experiencing is knowing. But having a correspondence with reality (enter true belief) is not sufficient for knowledge. In contrast, **rationalism** takes its name from *ratio*, the Latin word for *reason*. According to rationalism, the true (or only) *source* of knowledge is found in reason (a faculty or power of the mind commonly referred to as *intellect*). So, in this account reasoning is knowing. But having good reasoning (enter justification) is not sufficient for knowledge.

Furthermore, there is the problem that for such sharply focused accounts of knowledge either may be presumed to work against the other from the start such that any ground gained by one undermines (or supplants) the other. The bifurcation of knowledge may suggest, therefore, that **empiricism** and **rationalism** simply cannot be thought as combinable, for if there were a rational element of knowledge, not only could it not be empirical, it could not be part of a system that involved the empirical. In contrast, if there were an empirical element of knowledge, not only could it not be rational, it could not be part of a system that involved the rational. In which case, any pole of this epistemological dualism may end up downgrading and giving an inferior status to what usually passes for knowledge.

Consider the very claim that **knowledge is bifurcated into the diametrically opposed dimensions of rationalism and empiricism**. How do we know such a claim—empirically or rationally? Given these diametrically opposed epistemological accounts, if the claim is *itself* either rationally or empirically known, then we are engaged in circular reasoning—where **each account** (which is itself in question) is assumed to somehow establish the position against the other. Moreover, given these diametrically opposed epistemological accounts, it seems that **nothing** can be *empirically* (rationally) known while requiring the *rational* (empirical) knowledge that **the physical universe is rational in that it obeys the laws of empirical science and these laws are accessible to human minds**. For this would be like wanting to know what light is without knowing darkness (or *vice versa*). Thus, those who claim that knowledge must be bifurcated into these diametrically opposed dimensions of rationalism and empiricism (to privilege one over the other) are relying on the very thing that is in question—a broader vision of knowledge. Accordingly, we misunderstand knowledge when we adopt a too narrow vision of what knowledge is and then derive false conclusions.

With a broader vision of knowledge, then, **science** may get off the ground to obtain knowledge about the natural or physical world through **observations, measurements, and experiments** (enter **empiricism**) and/or **reason** (enter **rationalism**). And, by also adopting reason as a key source of knowledge, observation (via the senses<sup>18</sup> or calibrated scientific instruments<sup>19</sup>), measurement, and experiment can be kept in check to serve as arbiters between competing hypotheses. Epistemologically, then, whatever light there is, it is revealed in contrast to the darkness. For science need not always be exclusively empirical, or empirically based; science may be subject to, or derived from, reason or the application of logic. Because of this, data acquired by means of observation or experimentation need not *always* be influenced by prior beliefs and experiences—contrary to how some read Thomas Kuhn.<sup>20</sup> This is because scientific knowledge can be separated from the beliefs and experiences of the scientist who produces it. So although scientists may still disagree on the nature of empirical data, they can, through reason or the application of logic, compensate for theory-dependence of observation.

Moreover, this does not require that we be hard pressed to provide good reasons that increase the likelihood to make our scientific propositions absolutely certain, even if possible doubt introduced by the influence of our prior beliefs and experiences cannot always be ruled out. For, the claim to **know** that knowledge requires certainty seems to establish that **nothing** can be *known* (including *knowing* that *observation or experimentation is influenced by prior beliefs and experiences*) while requiring the *certain* knowledge that nothing can be known (i.e., invoking the contradictory notion that **it is known for certain that nothing is known for certain**). Besides, to require that a proposition be certain to be known, would conceivably, in the end, limit the amount of our scientific knowledge to practically nothing. But this is untenable, since it clearly is the case that there is much scientific knowledge.

In short, knowledge bifurcated and skewed as (or conflated with) rationalism or empiricism would adopt a too narrow vision of what knowledge is. This would serve to trivialize the subject of science because true science is a philosophical endeavor. It is *natural* philosophy (whose main focus is to seek knowledge about the composition and order of everything in the physical universe) that depends on critical thinking (i.e., critical analysis and evaluation).<sup>21</sup> As such, it seeks to analyze and assess arguments for competing hypotheses in

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<sup>18</sup>. Philosophers worry that knowledge of the natural or physical world may, in fact, not really be accessible by the senses. That is to say, *sight, hearing, touch, smell, and taste* may be so contaminated by error or distortion (typically introduced or created by the phenomena of perceptual illusion and hallucination) that perception as a source of (factual) knowledge is no longer reliable. This is called *the problem of (sense-) perception*. The *epistemological problem of (sense-) perception*, however, is whether (factual) knowledge generally can be *justified* on the basis of sensory or perceptual experience.

<sup>19</sup>. Scientists can *trust the reliability of modern instruments to expose unobservable physical structures* because *the theory-laden character of data will not imply the inherent failure (subjectivity, circularity, or rationalization) of instruments to expose nature's secrets* (Rothbart and Slayden 1994, 25-38).

<sup>20</sup>. See Ben-Ari, *Just a Theory: Exploring the Nature of Science*, chapters 6-7.

<sup>21</sup>. *More precisely, critical thinking is the general term given to a wide range of cognitive skills and intellectual dispositions needed to effectively identify, analyze, and evaluate arguments and truth claims; to discover and overcome personal prejudices and biases; to formulate and present convincing reasons in support of conclusions; and to make reasonable, intelligent decisions about what to believe and what to do* (Bassham et al. 2008, 1).

order to (hopefully) discover whether our beliefs correspond with the natural world and/or there are good reasons and arguments for believing so. In this sense, the means and methods employed in science are defined and determined by ...*any procedure* [of analysis and evaluation] *that serves systematically to eliminate reasonable grounds for doubt.*<sup>22</sup>

### Must Modern Science and Theistic Religion be Compatible?

When looking back at specific moments in the history of science, some may be tempted to argue on the basis of science's origin rather than its current meaning or context. So, for example, some **reason** that the history of science shows that modern science and theistic religion must be compatible—since many scientists in the past were theists and the origin of science itself is due in large part to religion (i.e., a *theistic* metaphysics).<sup>23</sup> But, this overlooks any difference to be found in modern science. One, therefore, fails to judge modern science on its own merit in the roundabout effort of transferring the alleged compatibility from the earlier context to a modern one.

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<sup>22</sup>. Schick and Vaughn, *How to Think About Weird Things: Critical Thinking For a New Age*, 173, adapted.

<sup>23</sup>. If the religionist avows that the origin of science itself is due in large part to religion (i.e., a *theistic* metaphysics), then an inconsistency may be revealed as the theist turns-around in this discussion to also require the very opposite when arguing that the origin of modern science itself is due in large part to a *materialistic* (or *mechanistic*) metaphysics of earlier periods in the history of science. Unfortunately, this happens often when the debate slips to the one-dimensional battle being fought today in politics—the right versus left, which for the defender of the faith really is the *spiritual* battle (Eph. 6:10-20) of theism versus atheism (and materialism). Nevertheless, this understanding of science as fundamentally materialistic is problematic and too narrow, since modern science does not have a single notion of what is the fundamental stuff of reality. To attack or fend off the atheist, the religionist usually draws upon spiritual claims and implications in contraposition to *deterministic* materialism (or mechanism). To be sure, we are most acquainted with this classical view of matter, since, as characterized by Newtonian physics, it covers the range of that which we are most familiar with in our daily lives. That is, things *much larger than atoms and much slower than the speed of light* (Stedl). However, this view of matter was replaced by quantum mechanics (with its emphasis on chance and indeterminacy), which focuses on the atomic level (and below) and the fundamental stuff of reality is reduced to wave-like or particle-like reality. *An extension of the quantum theory, known as quantum field theory, goes beyond even this; it paints a picture in which solid matter dissolves away, to be replaced by weird excitations and vibrations of invisible field energy....Quantum physics undermines materialism because it reveals that matter has far less 'substance' than we might believe* (Davies and Gribbin 1992, chapter 1: The Death of Materialism). Some atheists, however, have attacked this interpretation of quantum mechanics because it opens the door for religious apologists and quantum spiritualists to make room for their spiritual claims and implications (Stenger 2012, chapter 6). Nevertheless, to bring theistic religion into alignment with quantum mechanics would prove to be a hard pill to swallow for most fundamentalists engaged in a spiritual battle against atheism and deterministic materialism (or mechanism), since quantum mechanics (with its emphasis on chance and indeterminacy) is inconsistent with the traditional view of God's divine sovereignty and providence and God *playing dice* with the universe (Kosso 1998, 114). Moreover, in contrast to quantum mechanics, one may argue that the classical view of matter was also replaced by relativity, which focuses on objects at near the speed of light and the fundamental stuff of reality is reduced to fields in space-time. Accordingly, *[f]rom Newton to Einstein, a single idea dominated: 'The world is made of nothing but matter'.... But this beautiful picture was crushed when special relativity triumphed.... If fields are not made from matter, perhaps 'fields' are the fundamental stuff. 'Matter must then be made from fields'* (Smolin 2006, 38). So, when taken together, quantum mechanics and relativity shape science's present theories of the fundamental stuff of reality. Thus, relying on classical physics' deterministic materialism is problematic and too narrow, since modern science does not have a single notion of what is the fundamental stuff of reality and modern science no longer attaches itself to the Newtonian mechanistic approach and to deterministic materialism.

For instance, some argue that Christianity of the past helped create the framework for (or had something in common with) modern science (a secularized version of Christian thought), so Christianity and modern science are compatible.<sup>24</sup> But this is like arguing that forced slave labor and exploitation of the past helped create the framework for modern democratic society (which is true), so forced slave labor and exploitation and modern democratic society are compatible (which is false). Accordingly, the underlying **form** shared by these two **invalid** arguments reveals fallacious reasoning—the conclusion does not follow from its premise. This fallacy of irrelevance is called the **genetic fallacy**.

But, if the basis of science's origin cannot be appealed to, what about the key aspects of modern science that have had something in common with religion? Unfortunately, compatibility on such a ground would be like arguing that two combatant armies today must be compatible, since they had in common that, for example, they used guns, wore uniforms, defended their respective countries, etc.

What's more, we may argue that the goal of establishing some aspect in common with religion is motivated by the (perceived) need to defend theistic religion from any possible criticism or charge coming from modern science. Accordingly, the religionist attempts to turn any critique back against science by appealing to the hypocrisy of the opponent. That is to say, the characterizations of being *a religion, faith, or just a theory, or belief system* are claimed to apply equally to science. So, by arguing that science is guilty of the same, science is put on the defensive (focusing on the inconsistency of science and not the criticism or charge presented) and the criticism or charge is dismissed or discredited. In a roundabout fashion, therefore, the case is made by the religionist that his/her *religion, faith, and beliefs* are justified by noting that science is in *the same boat*. But this diversionary tactic (or **Red Herring**) is irrelevant to the criticism or charge coming from modern science. And, it relies on drawing a conclusion that is not supported by the premises of the argument. This form of fallacious reasoning is known as the **You Too Fallacy** (*Tu quoque*, Latin).

Overall, the lesson is that *intersecting* aspects do not always secure compatibility. Hence, modern science and theistic religion need not be compatible because key aspects of science are based upon (or have something in common with) religion.

As we have seen, demarcation for the defender of the faith may get blurred. And this may be especially the case when the religionist dismisses or discredits reasoning and critical thinking, is armed with a characterization that confuses science with scientism, adopts a too narrow vision of what knowledge is, and/or argues that science and religion must be compatible because key aspects of modern science are based upon (or have something in common with) religion.

Furthermore, passion (or commitment) born out of religious doctrinal certainty (or imperialistic ideology) may also motivate individual or dominant faith to blur the line between

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<sup>24</sup>. As, for instance, Dinesh D'Souza does in *What's so great about Christianity*.

science and religion. In such cases, when *[w]e walk by faith, not by sight*,<sup>25</sup> the religionist may seek to uncompromisingly extend the rule or influence of a body of alleged *spiritual truths* to direct the beliefs, expectations, and actions of others (e.g., scientists).<sup>26</sup> Yet, as I hope to show in the following sections, such individual or dominant faith may be founded on false beliefs based on a misguided identification of causation, beliefs that are not falsifiable, and/or beliefs that are not physically (and logically) possible. So, in some very overriding ways, modern science is not a religion, faith, and/or just a theory or belief system.

### **Misguided Identification of Causation**

The belief that an action or an event can have an effect on something even though there is no causal relation between the two is called a **superstition**. Accordingly, a superstition is a false belief based on a misguided identification of causation. Given that a correlation is a mutual relationship that is thought to exist between two events or types of events, for a superstition we can only say that the two events are associated or correlated. Consider the following probing illustration.

If you have ever been to a city park or a college campus, you know that people love to observe and feed squirrels. You have probably also noticed that these curious rodents are very interested in finding out if you are a food source. So squirrels are usually keeping an eye on you, particularly when you are eating. You may have also discovered that people may preferentially throw more food to the entertaining squirrels than to other creatures, which could explain some of their seemingly strange behavior. They practically walk up to you and engage in various behaviors (e.g., flirting with their tails moving up and down) to demand something to eat. It is as if squirrels *believe* that their behavior *causes* the feeding.

Assuming squirrels have beliefs, how do they seem to acquire the superstitious belief that their behavior causes the feeding when, in fact, all that exists is an association or correlation of the behavior with the food? Well, squirrels simply engage in various random (or unplanned) behaviors prior to feeding. Furthermore, if food is provided while performing one of these odd behaviors, the squirrel associates the behavior with the food. And the food, in turn, reinforces the behavior, so it is performed more regularly. Moreover, because the behavior is performed more regularly, it is noticed by humans and rewarded more often. Pretty soon, it becomes too difficult to break with the conditioning.

To be sure, the tendency to acquire superstitious beliefs is not unique to squirrels. It has been clearly demonstrated in experiments with laboratory rats and pigeons, where the ritualistic behavior has been shown to increase long after the positive stimulus is discontinued. Moreover,

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<sup>25</sup>. 2 Cor. 5:7, New King James Version.

<sup>26</sup>. *The history of science is also the history of struggle against those who insist—from religious, political, or other motives—that truth is what they say it is. Scientists insist on evidence and reason rather than creed or ideology, . . . . [In our times this comes to light] . . . notably where the conservative and religious right already 'know' the answers the scientists seek in their research* (Easton 2009, 2-3; contrast with Henry 2007).

this same type of process not only lies behind many of the ritual practices and beliefs of certain primitive societies, but has been found in many of our present-day ritual practices and beliefs of theistic religion. For like squirrels, rats, and pigeons, we also have the tendency to only notice and look for confirming instances of an action or an event so that when performing certain types of behavior, certain predicted forms of effects are expected to follow. This tendency to only notice and look for confirming instances of an action or an event is called **confirmation bias**. And, unfortunately, it may lead us to ignore and misinterpret evidence that conflicts with our own beliefs.

Consider, for instance, the various human behaviors of certain primitive societies like uttering prayers, chanting, dancing, offering an animal (or human) sacrifice, or any other similar ritual performed to ask a *rain god* for rain to end a drought. In any one of these possible scenarios, a superstitious belief was formed that some ritual was causally linked with rain—that prayer, or chanting, or dancing, or offering a sacrifice, or any other similar ritual *caused* rain.

But how did these people acquire the superstitious belief that their behavior caused the rain to end a drought when, in fact, all that existed was an association or correlation of the behavior with rain? Well, people (may have) simply engaged in various random (or unplanned) behaviors prior to rain. And someone simply happened by chance to be uttering a prayer, or chanting, or dancing, or any other similar behavior when rain came pouring down during an opportune moment. So, if by chance it rained while someone was performing one of these behaviors, people associated the behavior with the rain. Furthermore, the reward of the much-needed rain, in turn, reinforced the behavior, so it was performed more regularly (and possibly escalated by offering animal or human sacrifice). And because the behavior was performed more regularly, it was noticed and praised more often by the rest of the community. Pretty soon, it became too difficult to break with the conditioning and so the behavior was thought to be causally linked and passed on as a religious ceremony for future generations to revere and devotedly follow.<sup>27</sup>

Specifically, the underlying problem is that in such arguments about causes a correlation is the evidence supplied in an attempt to support a conclusion about causes. In this context, a correlation is a mutual relationship that is thought to exist between two events or types of events. Symbolically, if we let **E1** signify **Event #1** and **E2** signify **Event #2**, then the basic form of this type of **weak inductive argument** about causes is revealed as follows.

1) **E1 correlates with E2.**

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2) **Thus, E1 causes E2.**

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<sup>27</sup>. None of this is intended as either a defense or a criticism of the *origin* of such ritualistic practices and beliefs, which is not the subject of this essay. The point is rather to underline the extent to which the **thinking** of many contemporary theists may reflect a broad appeal to ritualistic behaviors and beliefs that impact or limit personal experiences.

It is important to note that since *correlation does not imply causation*, the premise of this type of argument may be true but the conclusion false. For instance, if we let **E1** be **squirrel behavior** (e.g., a squirrel flirting with its tail moving up and down) and **E2** be **squirrel feeding**, then we generate the following weak argument about causes.

1) **Squirrel behavior *correlates* with squirrel feeding.**

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2) **Thus, squirrel behavior *causes* squirrel feeding.**

Or, using our religious example, if we let **E1** be **ritual behavior** (e.g., like uttering prayers, chanting, dancing, offering an animal or human sacrifice, or any other similar ritual performed to ask a rain god for much-needed rain to water the crops or end a drought) and **E2** be **rain**, then we generate the following weak argument about causes.

1) **Ritual behavior *correlates* with rain.**

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2) **Thus, ritual behavior *causes* rain.**

Moreover, even if at times the ritual were to have no effect on the rain, the faithful could easily explain away the disconfirming evidence and show that the ritual could, indeed, achieve the desired effect when done *properly*. This is a case of **subjective validation**. Subjective validation is the tendency to ignore and misinterpret evidence that conflicts with our own views by fitting data to our personal practices and beliefs so that we fool ourselves into thinking something is the case when it is not. For example, the faithful could claim that the rain dancer did not do the ritual properly, did not have enough faith, was an evil person or sinner, or did not wait long enough for the desired results to come about. Accordingly, any time there is a drought, the true believer can trump any critical thinking by introducing an **ad hoc hypothesis**—a hypothesis added in order to save the belief from being falsified.

Additionally, in order for the rain dancer to do the ritual properly, it might, for instance, be required that the individual engage in the behavior of scattering or sprinkling water about for the desired rain to be invoked. This belief that **like causes like** is called the **representativeness heuristic**. A heuristic is a rule of thumb that supposedly guides our effort to understand the world. So, a properly performed rain dance might require that the effects should resemble their (alleged) causes. Moreover, when *properly performed* a rain dance produces great joy and celebration, since it brings much-needed water for the crops and a sense of hope for a better future and control over nature. And since the joyous raining episodes that supposedly confirm the effectiveness of the rain dance are more memorable (and hence, more **psychologically**

**available**) than those that do not, rain is believed to be more frequently caused by the ritual behavior than it actually is. This belief is called the **availability error** and is another limitation of personal experience. It is committed when we privilege the psychologically available evidence over the relevant evidence so that we misjudge the frequency of an event and end up ignoring and misinterpreting any evidence that conflicts with our own beliefs.

Not only can we misjudge the frequency of an event, but we can also become victims of **perceptual construction**. This constructive tendency can, at times, impact or limit our personal experiences. So, for example, if a belief is strong enough, a kind of perceptual distortion is introduced that simply changes the way we perceive (so that *believing is seeing*). Consider, for instance, the familiar experience we all have of observing faces or figures in the clouds, which depends on one's strong belief, selective attention, and expectancy, and has nothing to do with reality. When confronted with a vague, formless stimulus of a forming cloud, for example, the rain dancer might nevertheless etch meaning into the meaningless cloud and perceive the image of a rain deity. This is because the rain dancer strongly believes in the deity, is selectively attentive to the features of the deity, and anticipates with confidence that the deity will appear. Of course, the problem here is that the tendency to overlay our own beliefs onto vague stimuli makes it very difficult to perceive anything else, even if we wanted to.

### **Beliefs That Are Not Falsifiable**

When considering religious belief as a factor that shapes religious *knowledge*, we are immediately confronted with limitations concerning what belief involves, what belief is, and what are its sources. Whether based on religious, spiritual, sacred, or mystical experience, faith is sometimes alleged to be a source of knowledge. A standard definition of *faith*,<sup>28</sup> however, notes that it is *[b]elief that does not rest on logical proof or material evidence...*<sup>29</sup> Further, we may add that *[s]ince believing something on faith doesn't help us determine the plausibility of a proposition, faith can't be a source of knowledge.*<sup>30</sup>

Accordingly, many of our beliefs in theistic religion (grounded in divine revelation or authority) are formed by means of our personal experiences (and our judgments about those experiences).<sup>31</sup> Such subjective experiences are unsystematic and uncorroborated; they are not always reliable enough and they often mislead us. On the other hand, [s]cience is a systematic attempt to get around the limitations of personal experience. It is a set of procedures designed to

<sup>28</sup>. Paralleling Heb. 11:1, Rom. 8:24; 2 Cor. 4:18, 5:7.

<sup>29</sup>. The American Heritage Dictionary of the English Language, New College ed.

<sup>30</sup>. Schick and Vaughn, *How to Think About Weird Things: Critical Thinking For a New Age*, 80.

<sup>31</sup>. To suggest, as Alvin Plantinga does, that we seem to be *hard-wired* by God to **believe** in God, begs the question by using the very thing that is at issue: **belief** in basic *beliefs*, particularly **belief** in a *God* who makes the capacity for such **beliefs** *part of our native cognitive endowment* (Dennett and Plantinga 2011, 9, 15, 58). Moreover, belief is suspect in the case of the follower who claims that he or she really *chose* to **believe** in God. For, *choosing* to **believe** in God (when *hard-wired* by God to believe in God) would strongly suggest that it is possible to **believe** that one can *choose not to believe* to exercise free-will—relying on the very thing that is in question.

keep us from fooling ourselves. By performing controlled experiments, scientists seek to ensure that what they observe is not affected by these limitations, or at least is affected as little as possible. Thus, scientific work is largely the business of not taking any one person's word for it.<sup>32</sup>

Part of the business of not taking any one person's word for it is realizing that **belief is cheap**. Anyone (whether theist or not) can believe anything, but the question remains whether the belief is **true** and **justified** (i.e., whether we have knowledge). As a result, belief (even very strong belief) by itself does not constitute knowledge. To be sure, natural human biases and limitations of upbringing (or indoctrination) inevitably lead us to hang on to a preferred belief and ignore or resist all other alternatives. Accordingly, there is a gradual hardening of beliefs, some of which may pass for knowledge. But, this may result in seriously impeding critical thinking. Furthermore, by conflicting with what amounts to better established objective beliefs, such hardened beliefs cannot align, nor demonstrate consistency, with reality.

If this is the case, progress sought in this discussion cannot be achieved by appealing to mere *belief* because we cannot get at **knowledge** on the basis that our beliefs are somehow always filtering what is *real*. Not, as some may argue in an epistemically self-sabotaging fashion, that (they *believe* or *know*) there simply and literally *is* no reality (or truth) beyond what our belief constructs and interprets, but that by performing controlled experiments we cannot ensure that what we observe is not affected by the limitations of belief—the natural human biases and limitations of upbringing (or indoctrination). But in this light, arguing that science and religion *must be* compatible because **belief** (or faith) is a key aspect of modern science that is **based upon** (or **has something in common with**) religion, will not pan out.<sup>33</sup> For, to appeal to mere belief and abandon our mental capacity (though at times limited and imperfect) to engage reality critically impedes scientific inquiry and the possible attainment of knowledge. In this sense, we may note the significance and value of modern science as the systematic attempt through reason and experimentation to get around the limitations of personal belief.

To be sure, in the hope of attaining knowledge scientists try to secure justified beliefs that have a high probability of being true. One way to do this is by restricting beliefs to working hypotheses that can be tested for logical consistency and/or make testable predictions. This means that a belief, as a hypothesis provisionally accepted as a basis for further investigation and testing, must take the risk in being found false. So, we examine whether a hypothesis is true or false by checking its claims or deduced implications for consistency and/or whether its claims or deduced implications correspond with reality. But this means, following philosopher Karl Popper on this point, that a hypothesis is falsifiable. That is to say, the hypothesis will *admit* as

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<sup>32</sup>. Schick and Vaughn, *How to Think About Weird Things: Critical Thinking For a New Age*, 154.

<sup>33</sup>. Moreover, we do not get anywhere by limiting the debate to mere **belief** where *seeing is believing* characterizes science and *believing is seeing* characterizes religion. For, **even if** science and religion were to be characterized as **both** relying on belief (or faith), the issue remains whether the beliefs appealed to are **true** and there are **good** reasons and arguments for believing so.

evidence possible reasoning and/or physical or natural circumstances that *could* show it to be false.

Unlike theistic religion, the sciences seek to test hypotheses in bundles to compare one hypothesis with another in the hope that one hypothesis explains the evidence and accounts for it better (i.e., find a best explanation) than any other competing hypothesis.<sup>34</sup> Accordingly, one way we can determine how and where to draw the line between modern science and theistic religion is by establishing whether a corresponding hypothesis is falsifiable. Consider, for example, the hypothesis that **spiritual beings** (e.g., gods, angels, ghosts, disembodied souls or spirits of people who have died) **interact with the physical world**. Given that the *spiritual* is, by definition, *not physical*, the hypothesis would certainly not take a risk in being found false, since it *will not admit* as evidence any possible reasoning and/or physical or natural circumstances that could show it to be false. Specifically, since something that is not physical cannot ever causally interact with the physical objects of the world, physical experimentation and corroboration is not feasible—we cannot investigate causal relationships to test the hypothesis. Furthermore, logically allowing beings that are **not physical** to interact with the **physical** world is logically inconsistent (more about this later). So, the spiritual-being hypothesis is not falsifiable. Accordingly, when it comes to spiritual beings (e.g., gods, angels, ghosts, disembodied souls or spirits of people who have died), we can determine how and where to draw the line between modern science and theistic religion by establishing whether the spiritual being hypothesis is falsifiable.

Some may mistakenly think, however, that the goal here is to **conclusively challenge** an individual scientific hypothesis. But an individual scientific hypothesis may not, and sometimes cannot, confront its refuting evidence. Consider that since a hypothesis is tested in conjunction with a corresponding background theory, we are not logically compelled to select it as the culprit when an experiment goes wrong. That is, we can select the background theory instead as the culprit. Accordingly, we can always *save the hypothesis* from refutation by modifying the background theory. So, negative results (e.g., a false prediction; the experiment fails) do not refute the hypothesis (i.e., establish that the hypothesis is false). Hence, we can never conclusively challenge a scientific hypothesis (though it can be shown to be false beyond reasonable doubt). In contrast, no individual scientific hypothesis can be **conclusively established** because there are no guarantees that the predictions made by the hypothesis will come true. And given that the hypothesis will admit as evidence possible circumstances that could show it to be false, there is always the possibility of someday finding refuting evidence that cannot be ruled out. So, we can never be absolutely certain that a scientific hypothesis is true (though it can be shown to be true beyond reasonable doubt).

Because no group of facts by themselves can conclusively challenge or establish any hypothesis, we must also request the help of good reasons and arguments in order to decide

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<sup>34</sup>. A hypothesis explains the evidence and accounts for it better than a competing hypothesis whenever it has the features of testability, fruitfulness, scope, simplicity, and conservatism (Schick and Vaughn 2008, 233-235).

which hypothesis best explains and accounts for the facts. Accordingly, it is a mistake to hold that experimental experience must just be based on observable phenomena. For example, the abstract nature of advanced scientific hypotheses relies on theoretical constructs or objects that are not accessible to observation. So, observational evidence by itself cannot ever be sufficient to establish a theory. For instance, testing the atomic theory of matter relies on theoretical objects such as electrons and protons, which are not directly accessible to observation. So, all the available observational evidence (or data) for electrons and protons underdetermines the claims of the atomic theory of matter. In general, this is known as **the problem of underdetermination**. Nevertheless, electrons and protons are accessible to reason (e.g., reasoning from indirect evidence provided by scientific instruments or reasoning by means of thought experiments<sup>35</sup>). Accordingly, the evidential role of reasons and arguments to adequately ground our scientific knowledge (and help account for underdetermination) is also crucial to the scientific endeavor.<sup>36</sup> In this sense, scientific theories do not just fit observational evidence (or data) well and turn out to be wrong without having no way of knowing whether they provide us with a reliable picture of reality.

Since the goal is to adequately ground scientific knowledge, characterizing science as a religion, faith, or belief system will not work. That is because in approach and/or application **every (theistic) religion is absolute to itself, but relative to others**. Accordingly, religion is caught between a rock and a hard place: **religious absolutism** (as the *dogmatism* of religious positions: *it is my way or the highway* approach) and **religious relativism** (as the *plurality* of religious positions: *it is relative to the particular religion* approach).<sup>37</sup> Thus, religious

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<sup>35</sup>. On the current state of the debate of thought experiments in science see Frappier, Meynell, and Brown, *Thought Experiments in Science, Philosophy, and the Arts*.

<sup>36</sup>. So, for instance, Ben-Ari notes that [*t*]here is no evidence that Galileo ever dropped anything off the Leaning Tower of Pisa [to determine if the time of the fall of an object depends on its weight or not]...More importantly, however, Galileo did not base his claim about falling bodies directly upon experimental evidence. Although he did perform experiments rolling balls down ramps, he only used the results to guide his theoretical thinking and mathematical demonstrations....When Galileo presented his results, he rarely referred to experimental results....Instead, he used thought experiments and mathematical arguments to convince the reader of the correctness of his claims and of their applicability (Ben-Ari 2005, 1-5). Or, for example, Trefil states that *Einstein arrived at the theory* [of general relativity] *without any reference to experiment*, but relied instead on thought experiments so that theory came first and experiments came later (Trefil 1983, 37). In these classic examples, we see the evidential role of reasons and arguments to adequately ground scientific knowledge, which is also crucial to the scientific endeavor. In short, [*t*]he Platonic ideal of knowledge gained through pure reason, so often maligned for its supposed evil effects on science, may bring us closer to the truth than we have imagined (Ibid).

<sup>37</sup>. This may be generalized and squeezed into social or political contexts so that in approach and/or application **every (social or political) belief system is conservative to itself, but liberal to others**. Accordingly, a (social or political) belief system is caught between a rock and a hard place: **conservatism** (interpreted as the *dogmatism* of the particular social or political position so that *it is my way or the highway*) and **liberalism** (interpreted as the *plurality* of social or political positions where the belief systems espouse competing moral codes and/or differ among themselves on what is right and what is the conduct that is required). Unfortunately, this may reduce to the one-dimensional battle being fought today in politics (i.e., the *culture wars*)—the *right* versus *left*, which for the Christian fundamentalist really is the *spiritual* battle (Eph. 6:10-20) of theism versus atheism. Although this black and white thinking has no real connection to science (science is neither conservative nor liberal), science nevertheless is caught-up in this battle (i.e., the *science wars*—see Grant 2011, 20-25) when characterized by the religionist as an *atheistic* religion, faith, and/or just a theory or belief system. In short, this simplistic reduction

absolutism could never hold more than one set of dogmatic beliefs and religious relativism could never find one to take precedence.

But, as we saw in the case made earlier against scientism (i.e., a form of *absolutism*), science characterized as **absolutism** serves to trivialize the subject of science. For if absolutism defines science, science just boils down to championing a set of beliefs and/or body of *truths* proposed (or dictated) by a community of scientists. So, the methods and procedures of scientific investigation would make no difference. There would be little point in formulating and testing hypotheses to make comparative scientific judgments to investigate the natural or physical world. Furthermore, since circumstances invoking different hypotheses would make no difference, all that would matter would be prefabricated, all-purpose answers based on scientific authority (i.e., an absolutist position). And this would actually amount to affirming the absolutist position of the dictated scientific view and closing the subject.

Moreover, by itself the absolutist view would fail to elucidate the *right* view, since we could not show how we are to choose between competing scientific views. Accordingly, for science characterized as absolutism, there would be no way to convince someone who does not share the privileged view that it is the right one. Besides, we would not always be sure of, or in agreement about, the credentials of the prevailing scientific authority, nor on how its scientific absolutism would rule in ambiguous or new cases. In the end, all of this would trivialize the subject of science and serve more to block scientific analysis and evaluation than to promote it.

**Relativism**, on the other hand, is the view that individuals (or groups) differ dramatically in their judgment of what is true (or real), suggesting that reality does not exist independently of our ways of representing it. Specifically, since there are many different religions, faiths, or belief systems in the world, the problem is that what is true (or real) is taken to be relative to the individual (or group). However, this not only undercuts claims that religion is compatible with modern science (and everything else), but strongly suggests that what is true (or real) is personal and subjective. But, does this mean that individuals (and by extension, religions, faiths, or belief systems) create their own reality?

For instance, religious authorities espousing competing moral codes differ among themselves on what is right and what is the conduct that is required by God's will. This not only often leads religious people of good will to opposite positions on moral matters, but undercuts

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clearly makes theistic religion and modern science incompatible. Nevertheless, within the broad spectrum of Christianity, some claim that the atheist's position may still be accommodated, and even validated—avoiding the antagonism between religious meaning/value and scientific progress—when the focus is on the cultural heritage of the faith and not on its metaphysical claims and dogma (Mountford 2011). Moreover, when the focus is on a **cosmic religious feeling**—*which knows no dogma and no God conceived in man's image*—the sphere of religion may give rise to *...the aspiration toward truth and understanding and ...the faith in the possibility that the regulations valid for the world of existence are rational, that is, comprehensible to reason*. In this sense, science without such aspiration and faith is lame, such aspiration and faith without science is blind. However, *...there can be no church whose central teachings are based on this kind of cosmic religious feeling* (Einstein 1954, 36-49).

claims that religion provides a secure, certain, universal, and stable guide to ethics.<sup>38</sup> Accordingly, the problem of relativism is that there can be no objective standards, since different individuals (or groups) have different beliefs. Also, an individual's (or group's) judgment is neither better nor worse than that of any other individual (or group)—it is merely different. And since an individual's (or group's) judgment has no special status, there can be no individual (or group) looking down on others as the objective standard.

In contrast, since modern science must be based on claims or deduced implications that correspond with reality, relativism would not work in science. For if there can be no objective standards, then we would not need scientific hypotheses. This, then, would trivialize the subject of science. For if, as relativists have argued, there can be no objective standards and knowledge just boils down to the personal preference of different individuals with different religions, faiths, or belief systems, then the terms *true* and *real* have little practical application and science is without genuine consequence. Nevertheless, we can avoid this absurdity by rejecting the claim that what is true (or real) is always relative to the individual's religion, faith, or belief system.

### **Beliefs That Are Not Physically (and Logically) Possible**

We may argue that in the construction, examination, and consequences of scientific hypotheses (and the possible experiments that would verify them), science is explicitly or derivatively concerned with the fundamental laws that govern the universe. And these physical principles define reality for us; they define what is possible. But when considering the factors that shape religious belief, we are immediately confronted with the limitations of religious phenomena (grounded in the spiritual).

To be sure, because modern science studies certain aspects of the physical world, it is for the most part concerned with what is **physically possible**. For something to be physically possible, it must be consistent with the laws of nature (laws of Physics, Chemistry, etc.). Something is physically possible if and only if it does not violate any law of nature. For instance, it is physically possible for a spaceship to travel to the planet Mars and back. This does not violate a law of nature (e.g., Newtonian Physics).

However, for something to be physically possible it must also be **logically possible**. That is to say, it must also be consistent with the laws of logic. Something is logically possible if and only if it does not violate a law of logic. If it is not logically possible, it cannot be physically possible. But this does not work the other way around. For, if it is logically possible, it need not be physically possible. For instance, given the laws of nature (e.g., Relativity Theory) it is not physically possible for a spaceship to travel faster than the speed of light, but it is logically possible (Think, for example, how the *Star Trek* shows produce logically possible adventures every time the Enterprise warps faster than the speed of light).

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<sup>38</sup>. Wenz, *Political Philosophies in Moral Conflict*, 41, adapted.

Accordingly, there are two basic forms of **impossibility** that cannot be discounted: the physically impossible and the logically impossible. As the spaceship example shows, a thing is physically impossible if and only if it does violate a law of nature (e.g., laws of Physics, Chemistry, etc.). In contrast, something is logically impossible if and only if it violates a law of logic. According to Aristotle, **the law of noncontradiction** is one of the most fundamental laws of logic. The law of noncontradiction says that contradictions are not logically allowed. So a thing cannot both have a property and lack it at the same time and in the same sense.<sup>39</sup> For example, anyone who is a bachelor (by definition) cannot at the *same time* (and in the *same sense*) be married. One cannot be both a bachelor and not-bachelor; one cannot be both not-married and married. So, a married bachelor is logically impossible.

Furthermore, if it is not logically possible, it cannot be physically possible. And, if it is not physically possible, it cannot be actually the case. The actual is a subset of the physically possible, which in turn is a subset of the logically possible. Note that just because something is possible it does not mean that it is actually the case. For instance, just because it is logically possible for the *Star Trek* Enterprise to warp faster than the speed of light, it does not mean that it is actually the case. Moreover, just because something is logically possible does not mean that we ought to believe it.

Returning to the problem we saw earlier of logically allowing beings that are not physical to interact with the physical world, we can see how the foregoing discussion plays out in regard to beliefs that are not physically (and logically) possible. For a spiritual being (which, by definition, is not physical) to interact with the physical world, it must be **physical and not physical** at the same time (and in the same sense). However, this amounts to violating the law of noncontradiction. So, the religious claim itself is inconsistent, in which case it will be incompatible with science (and everything else).<sup>40</sup> But, the problem of claiming contradictory things is not just the problem of uttering a special class of false statements. The law of noncontradiction is in place not just to help us avoid false statements with a particular type of inconsistency. The law of noncontradiction is also a central principle of thought and communication without which we could not distinguish one thought or statement from another. Since, we could not think or communicate because our thoughts and statements would not be consistently about one thing rather than the other.

Moreover, without the law of noncontradiction every claim would be equally true (false), since the specific content of each statement would not be consistently true (false) about one thing rather than the other. Accordingly, logically allowing a spiritual being to be **physical and not**

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<sup>39</sup>. Aristotle, *Metaphysics*: 1005b 19-20.

<sup>40</sup>. This, then, suggests why [*some claim that theism is itself inconsistent...*]. Point made by Alvin Plantinga at the American Philosophical Association Central Division Meeting in Chicago for 2009 (Dennett and Plantinga 2011, 1-2). Put together with the text related to **footnote no. 15**, I have argued for the **mutual incompatibility** of theistic religion and modern science appealing to inconsistencies found in **both** religion and science. Thus, in an important sense science is, contrary to Stephen Jay Gould's thesis of **non-overlapping magisteria**/NOMA (1997, 16-22), **opposed** to religion.

**physical** at the same time and in the same way would amount to claiming that there is no difference between being physical and being not physical. So, our thoughts and statements about being physical *would not* be consistently about one thing rather than the other. And such claims would be equally true (false), since the specific content of each statement would not have to be consistently true (false) about one thing rather than the other. Thus, without the law of noncontradiction, thinking or communicating would be impossible. And if thinking or communicating were impossible, we could not reason. All this begs the question, since it not only makes reasoning theoretically impossible, but on the most basic level, appeals to reason while disowning it.

Hence, logically allowing a spiritual being to interact with the physical world inescapably leads to an absurdity (i.e., a contradiction). And the only way to avoid the absurdity (here I rely on a *reductio ad absurdum*) is to reject the spiritual-being hypothesis that leads to it. So, it is not the case that spiritual beings interact with the physical world. Accordingly, gods, angels, ghosts, disembodied souls or spirits of people who have died cannot interact with the physical world. In short, because spiritual-being interaction with the physical world is not **logically** possible, it cannot be **physically** possible. In this sense, we can determine how and where to draw the line between modern science and theistic religion.

## Conclusion

In this essay, I have shown that areas exist where theistic religion and modern science are clearly not compatible. Yet for the religionist, it is by no means clear that there is a real distinction between modern science and theistic religion, especially when promoting widely held notions like *science is a secular or humanistic religion*, *science is a hostile materialistic or mechanistic faith*, and/or *science is just a theory or belief system*. So, demarcation for the defender of the faith may get blurred. This may be especially the case when the religionist dismisses or discredits reasoning and critical thinking, is armed with a characterization that confuses science with scientism, adopts a too narrow vision of what knowledge is, and/or argues that science and religion *must be* compatible because key aspects of modern science are based upon (or have something in common with) religion.

Furthermore, passion (or commitment) born out of doctrinal certainty (or religious imperialistic ideology) may also motivate individual or dominant faith to blur the line between science and religion. In such cases, the faith may seek to uncompromisingly extend the rule or influence of a body of alleged spiritual truths to direct the beliefs, expectations, and actions of others. However, because individual or dominant faith may be founded on false beliefs based on a misguided identification of causation, beliefs that are not falsifiable, and/or beliefs that are not physically (and logically) possible, there exist overriding reasons why modern science is not a religion, faith, and/or just a theory or belief system.

To be sure, everything we claim to know about the natural or physical world depends on some epistemological view or position. And, one cannot have knowledge without belief. But when considering religious belief as a factor that shapes religious knowledge, we are immediately confronted with limitations concerning what belief involves, what belief is, and what are its sources. Whether based on religious, spiritual, sacred, or mystical experience, belief is sometimes alleged to be a source of knowledge. But, such belief (no matter how strong or widespread) may be neither true nor justified. This is because *[t]o believe something on faith is to believe it in spite of, or even because of, the fact that we have insufficient evidence for it.*<sup>41</sup>

Accordingly, there is a pressing need to challenge the beliefs formed by means of our personal experiences (and our judgments about those experiences). There is also a pressing need for a systematic effort to obtain justified true beliefs about the natural or physical world. So, rather than appeal to our unsystematic and uncorroborated experiences (and our judgments about those experiences), productive scientific investigation must take place on the common ground of reason, observation, objective measurements, and/or controlled experiments.

What is difficult for some to grasp, however, is the relevance of drawing the line between modern science and theistic religion (or anything else) to the conduct and survival of everyday life—so the foregoing discussion does not seem to be of purely academic interest.

To be sure, as a form of **critical thinking**, science is required to help us think our way through our personal beliefs to increase our chances of getting at the truth of the matter.<sup>42</sup> And, as the biologist Thomas H. Huxley once noted, *[s]cience [must be] ... rigidly accurate in observation, and merciless to fallacy in logic.*<sup>43</sup> This is so that the beliefs that should come out on top are the ones that have the best reasons or evidence on their sides. Accordingly, to keep us from fooling ourselves and help us to curtail the tendency to ignore and misinterpret evidence that conflicts with our own beliefs, science seeks analysis and evaluation, rather than personal experience, to justify our beliefs. This makes it less likely for us to be misled by all the unjustified and/or false beliefs we incessantly are exposed to in various parts of the world today.<sup>44</sup>

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<sup>41</sup>. Schick and Vaughn, *How to Think About Weird Things: Critical Thinking For a New Age*, 78.

<sup>42</sup>. Unfortunately, because an appeal to critical thinking itself may be considered subversive to religiously socialized (or indoctrinated) followers, it is an important underlying reason why modern science may be taken as a threat by some religionists (See Heitin, Colbert, and Talavera). Nevertheless, a religion can encourage critical thinking and because of this not be hostile to science. An example of this is Buddhism (See Jayatunge).

<sup>43</sup>. Huxley, *The Crayfish: An Introduction to the Study of Zoology*, 1.

<sup>44</sup>. To avoid fooling ourselves and/or being fooled by others, we must set the goal that allows us ... *to deal sensibly with problems that often involve evidence, quantitative consideration, logical arguments, and uncertainty; [this is because] without the ability to think critically and independently, citizens are easy prey to dogmatists, flimflam artists, and purveyors of simple solutions to complex problems* (Rutherford and Ahlgren 1990). *For logic, by perfecting and by sharpening the tools of thought, makes men and women more critical—and thus makes less likely their being misled by all the pseudo-reasonings to which they are incessantly exposed in various parts of the world today* (Tarski 1994, xiii-xiv).

What is more, [t]he search for and the application of knowledge is perhaps the human species' single most defining characteristic.<sup>45</sup> This makes modern science, as the systematically organized body of knowledge we know about the natural or physical world, extremely relevant to the human species. So, it is not surprising that science directly impacts a vast majority of practical issues like maintaining health and combating infectious diseases, obtaining sufficient, nutritionally adequate and safe food as well as safe and affordable water, enhancing the ability of future generations to meet their sustainable energy needs and improve energy efficiency, and stimulating emerging technologies and ideas that can increase the number of businesses and grow the economy.

Therefore, the issue discussed in this essay of drawing the line between modern science and theistic religion can go beyond one of purely academic interest because key aspects of philosophy (e.g., critical thinking and epistemology) characterize science as a philosophical endeavor—a natural philosophy relevant to the conduct and survival of everyday life. And, in the sense that science helps us examine the world around us to make it worth living and meaningful, it is certainly not hostile to human flourishing, dignity, thoughts, feelings, and desires.

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<sup>45</sup>. Easton, *Taking Sides: Clashing Views in Science, Technology, and Society*, xvii.

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