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The Smallest Leap of Faith: a New Worldview for a Postmodern World?

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Abstract

It is undeniable that religion provides a sense of purpose, ethical direction, and social belonging that most human beings for most of recorded history have found to be profoundly important. But it is equally undeniable that its supernatural metaphysics and dogmatic conservatism have retarded society's progress in many ways and caused untold human suffering. An obvious question is thus: Is it possible to preserve the beneficial aspects of religion but excise the problematic ones?

Immanuel Kant fathered the postmodern age with his devastating critique of the possibility of human knowledge of the Ultimate. However, Kant himself was far from skeptical about the possibility of objective human knowledge - as long as its claims were carefully qualified. The key to understanding this seeming contradiction is his (often misunderstood) transcendental method. The method offers a way to have our postmodern skepticism concerning traditional religious supernaturalism and still eat our metaphysical cake, as it were.

Combining a transcendental approach with new scientific findings about the nature of the universe may allow us transcend the stalemate between scientific rationalism and faith, constructing a belief system which blends positive elements of each perspective. Scientists in a number of disciplines are beginning to hypothesize that the universe *naturally* creates complexity. On the one hand, this undercuts the most common justification for belief in the supernatural, since there is no need for divine intervention to explain things that occur naturally. On the other hand, it invites those so inclined to view themselves as part of a universal *telos* involving the creation of complexity. Such a move requires only the smallest step of faith to adopt and may provide believers with the sense of purpose, ethical foundation, and social support they long for while sidestepping conflict with the essential claims and methods of science.

Keywords Postmodern, religion, complexity, science, faith, metaphysics, transcendental

1. Introduction

Every mind must make its choice between truth and repose. It cannot have both. – R.W. Emerson

Science and faith have a long and tempestuous relationship. There have been times when they worked harmoniously together, as during the natural theology movement that produced scientists like Newton and Darwin, but also times when they have fought hammer and tong, as when the Catholic Church used its coercive power to repress scientific views that threatened religious dogma. The current situation is complex, with signs of both renewed tension and promising convergence. Unfortunately, it's rare for interlocutors who debate these issues in the fora of public opinion to exhibit much appreciation for the subtleties of the conceptual terrain – a state of affairs that insures such exchanges produce much heat but little light.

As a corrective to this frenetic myopia, I will first place

the relationship between science and faith within a broad historical context by comparing the intellectual origins of science with those of the so called postmodern worldview. Then I will do what philosophers are often uniquely positioned to do: identify the essential contours of the conceptual forest by stepping back from the distracting details of particular trees. This will allow us to see some ways in which both sides have gone beyond their remits to create unnecessary problems. After delineating a possibility space for a "minimal faith" consistent with the essential commitments of both sides, I then discuss the complex universe hypothesis as a concrete example of a scientific hypothesis that suggests a way to fill this space. Of course, as with any compromise, this requires both sides to make concessions, and is thus a position guaranteed to have many detractors. Fortunately, however, my present purpose is not to solve the problem at one fell swoop, but simply to suggest a more fruitful direction for further conversations.

2. Historical Overview

2.1. The Scientific Revolution

The first principle is that you must not fool yourself – and you are the easiest person to fool. – R. Feynman

It is of course impossible to do justice to the complex religious, philosophical and scientific development of the last 300 years in only a few paragraphs. It is with trepidation, therefore, that I attempt to trace a few of the main themes in intellectual history that underlie the genesis and nature of postmodern thought. I beg the reader's indulgence with this preface however, since it is critical for understanding both the current tension between religion and science as well as an avenue for a possible rapprochement.

We are all familiar with the standard account of the scientific revolution as the beginning of a new age of reason and optimism following the long dark night of the Middle Ages. For thousands of years, homage to long dead thinkers, enforced by the church, strangled independent thought. But with the removal of these barriers, science blossomed and, with it, our ability to provide explanations of natural phenomena. Philosophers label this interval, stretching from roughly the beginning of the 17th to the middle of the 19th centuries, the *modern period*.

This was a time characterized by an unbounded optimism concerning our collective capacity to explain the universe and solve our problems thereby. The familiar example of the development of modern astronomy provides a stock illustration of the process: Copernicus' theory of a heliocentric solar system was initially opposed by the church, an opposition that culminated in the infamous trial and condemnation of Galileo. But science had the last laugh, as the heliocentric idea was taken up by new men of science like Brahe and Kepler, then rapidly enshrined within the powerful new paradigm of Newtonian physics. By the end of the modern age, the church was in full retreat and science seemed poised to solve all the mysteries of the heavens.

As science became more professionalized, it began to pull away from natural philosophy, concentrating on empirical investigations. But the theoretical philosophers were still part of the movement, working to provide an explanation for the success of these new methods. Initially, transitional figures like Descartes and Leibniz argued that it was our innate rational gift, bestowed by a benevolent God and exemplified by the elegance of mathematics, that allowed us to uncover the truths of the natural world [1,2]. But it was not long before a new type of empiricist began to argue that we come to know, not through the operations of a mysterious reason, but only by careful induction applied to the data of perception [3,4]. The new scientists quickly adopted this empirical philosophy as the appropriate foundation of their work – a marriage that persists to this day.

2.2. The Problem of Induction

Everything should be made as simple as possible, but not simpler. – A. Einstein

But no marriage is without its difficulties. Though it

does an excellent job of giving voice to the empirical attitudes embraced by science, as a metaphysical doctrine, empiricism leaves much to be desired. This point was made most persuasively in a critique of the powers of empiricism by one of its early adopters, David Hume [5]. He uncovers what he labeled “the problem of induction,” showing that empiricism establishes a standard of knowledge it can not itself meet, thus revealing a fundamental contradiction at its very foundation that has not been satisfactorily resolved to this day. The argument is relatively simple:

1. Empiricists claim we know nothing that we do not derive from experience, a move that prevents the importation of unjustified “knowledge” through intuition, revelation, etc.
2. To discover truth, therefore, we must always begin with the data of experience, and induce the regularities of nature from this. For example, we observe that an object falls to earth whenever released, so we induce that all such objects will always behave this way under similar circumstances. In time, such observations are enshrined as “laws of nature” and are used to make precise predictions that can be tested. Whatever honorific you apply to the resulting regularity, however, the logic remains inductive.
3. But *causal* reasoning like this requires that the universe will continue to behave in a uniform fashion or we would have no grounds to predict the future based on the past. Hume called this assumption of uniformity “the principle of induction” and observed that all causal reasoning, and thus all empirical induction, rests on this principle.
4. But the principle of induction can't be justified, for to attempt an empirical justification of a principle required for empirical justification would be patently circular. And, since the empiricist holds that all knowledge must be generated empirically, there is no other option.
5. The intellectually honest empiricist, therefore, must admit that her entire system of knowledge rests on a principle that is not only unsupported in fact, but *unsupportable in principle*.
6. Since a chain of reasoning is only as strong as its weakest link, all conclusions of empiricism (and thus of science) are rendered highly suspect.

This puts empiricism in the epistemically awkward position of espousing a method that seems to work very well, but in a way they can neither explain nor justify. The best they can do is point to the fact of their success and hope that it continues. Of course, one time-honored option in the face of such a daunting philosophical problem is to simply ignore it – an approach advocated by Hume himself and imitated by the few practicing scientists aware of the dilemma. In one sense, there is nothing wrong with such a pragmatic approach, especially given the enormous success science has achieved using it, but at the very least the existence of this unresolved problem should engender a certain metaphysical modesty on the part of scientists.

2.3. A Cure Worse than the Disease?

*Sapere aude! 'Have courage to use your own reason!'
- that is the motto of enlightenment. – I. Kant*

Immanuel Kant was a philosopher who took Hume's challenge seriously – indeed, more seriously than Hume himself [6]. If science is so critical to our understanding of the universe, he reasoned, it *must* be possible to place it on a firm epistemic foundation, which requires defusing the problem of induction. And so he set out to do just this, though whether and in what sense he succeeded in this project is still a matter of debate.

Kant accepts the empiricist idea that we have no direct access to information about the “real” world (noumena) beyond our mental representations (phenomena). Since metaphysics is about the ultimate nature of reality, any empiricist making metaphysical claims is in the awkward position of using sensation as a guide to the supposedly extra-sensory causes of sensation. To make matters worse, Kant argues persuasively that our sensation is not a passive faculty on which the world impresses itself, but instead involves active (if subconscious) *interpretation* (a claim richly confirmed by modern psychology). This makes it impossible to know the nature of the world beyond our experience with any confidence – we are trapped in our own minds, as it were. To use a simple analogy, it's as if we spend our entire lives locked inside a movie theatre with only the images on the screen as a guide to the outside world. We have no way to tell whether and to what extent the images correspond to what's outside. And since we also know that our expectations and desires influence what we see on the screen, we have strong grounds to be skeptical about any claim concerning the world beyond the theatre.

This is a radically pessimistic conclusion, to be sure, but Kant argues that we must not deceive ourselves about our epistemic situation or pretend it is otherwise. We can never know the true nature of the reality beyond our senses, period. Surprisingly, though, he does not think this implies skepticism. His unique insight is that, while we can never know anything definite about ultimate reality, we can know something about the ways we structure its influence on our experience. In essence, he argues that there are certain structural properties (categories) of the experiential world that are *necessary* for the function of reason. Thus, as rational creatures, we *must* think the way we do.

One of the necessary features of our perceptual world are causal relationships, a fact which allows us to justify the principle of induction, albeit not in the way we might wish. To put it bluntly, although we will never know whether things like causal relationships are real, we can know that, even if they are illusions, they are illusions that will be shared by all other rational creatures. Casual reasoning accurately portrays the mental worlds of all rational creatures - human, animal, alien or even divine - and this inter-subjectivity is as close to metaphysical truth as we will ever get.

Given such an intuitively unsettling conclusion, it should come as no surprise that opinions differ on whether this constitutes a victory for human knowledge. Indeed, the history of philosophy following Kant can plausibly be divided into two general camps based on reaction to his ideas.

Those who take all of Kant's conclusions seriously go on to find what is typically described as “analytic philosophy”, where the goal is seen as precisely delineating what we can and can't know and in what ways. But those who reject his account of our limited objectivity are put on a very pessimistic path indeed. This is the seed of postmodernism.

2.4. Postmodernism is Born

“In the consciousness of the truth he has perceived, man now sees everywhere only the awfulness or the absurdity of existence and loathing seizes him. – F. Nietzsche

Kant's philosophy had an electric effect on philosophy, catalyzing the formation of German idealism in the late 18th century. These philosophers tried in various ways to come to grips with what the devastating swath Kant had cut through traditional epistemology and metaphysics [7,8]. One common approach was to simply accept our inability to find ever find truth – in other words, to adopt a radical form of epistemic pessimism. This sense of pessimism gained strength in the 19th century from a complex series of social and intellectual developments. A time of rapid social change, the dawn of the industrial revolution saw social upheaval that prompted many thinkers (most famously Marx and Engels) to argue for overthrowing the old political systems. Scientific systems were also being challenged in ways that lent momentum to the pessimistic spirit of the age. For example, the publication of Darwin's Origin of Species made it difficult to defend the traditional claim that human reason was anything terribly special, since it evolved from much simpler systems in non-human animals via a process that, if not random, at least showed no evidence of direction or purpose. And the pointless slaughter of the great war at the beginning of the 20th century proved the final nail in the coffin of modern optimism.

Thus grew the movement known popularly as postmodernism. It's important to note immediately that this term conceals more than it reveals, as there is much more diversity and nuance here than most people realize. The term has been used to lump together a variety of distinct philosophical schools and methods (e.g., existentialism, critical theory, deconstructionism, nihilism, etc.) as well as a number of less precise attitudes and dispositions that don't rise to the level of a philosophical system. Since my goal at present is not to attempt a thorough classification of these views, but rather to position the conflict between science and religion within a broad intellectual trend, I will use the term “postmodern” somewhat loosely. However one decides to apply the terminology, it is fair to say that, just as the modern era was characterized by an unbounded optimism concerning the possibility of human knowledge and progress, the postmodern era is marked by an extremely pessimistic attitude towards all claims to truth, purpose and meaning.

This creates an existential problem that is perhaps best illustrated in Camus' *Myth of Sisyphus* [9]. Sisyphus was

the mythological King of Corinth punished by the Gods for an insufficiently reverential attitude (and in particular, an attempt to cheat death). His punishment consisted of being forced to push a huge boulder up a hill, only to watch it roll back down again just as he reached the top. He was consigned to this repetitive, fruitless toil for all eternity, without any hope of relief or illusion of purpose. For Camus, to contemplate Sisyphus' horrific plight is to confront the situation we all are in, even if most of us refuse to accept it for what it is. In pursuing truth without flinching, and in particular by refusing to be lulled into the illusion of purpose and meaning those in authority foist on the unsuspecting, the postmodern thinker dooms herself to a life of pointless suffering and toil. She knows that she is hopelessly adrift in the sea of meaningless chaos that is our universe, and is forced to conclude that life is *absurd*.

This attitude, like the scientific attitude, has seeped into our modern cultural norms in ways that are not always appreciated. Educated westerners are likely to assume, without much critical reflection, a skeptical orientation to claims that used to be widely accepted. Thus, we are more likely now than ever before to reject broad metaphysical claims (e.g., religious, scientific) and remain steadfastly dubious about the possibility of objective standards (e.g., ethical, aesthetic). Certainly, the debate between science and religion in popular culture has been influenced by a postmodern view of intellectual exchange. Because there are no approved standards, the goal of modern "debate" (here and elsewhere) is not a shared, if competitive, search for truth, but rather the utter destruction of one's opponent by any means necessary, including rhetorical dirty tricks.

If the postmodernist is right and there really is no purpose or point to life, we have limited options. We can:

1. Avoid the problem by ignoring it.
2. Avoid the problem by committing suicide.
3. Accept the problem and suffer.
4. Accept the problem and learn to love the absurd.
5. Accept the problem and find a non-objective source of purpose.

The first option, while popular, is either an act of ignorance or a willful rejection of the truth. Either way, it's not something anyone devoted to the truth can endorse and the postmodern philosopher (if not always the postmodernist more generally) is just as devoted to the search for truth as the scientist - she is just extremely skeptical about our ability to find it. Not surprisingly, the temptation to kill oneself and thus end the farce is a very common theme in postmodern discussions. However, postmodernists have the same basic psychological makeup as the rest of us, which includes robust psychological mechanisms to prevent self destruction. They thus often express a longing for suicide as something they should do if they could only overcome their animal natures - a position Nietzsche labels "the most difficult thought" [10].

If we accept the postmodern problem, however, it is not easy to deal with. We can simply suffer, of course, but most people would reject this option out of hand. We could learn to love the absurd - as Camus puts it, "we must imagine Sisyphus happy." But this is a bit like telling someone in great pain: "It's mind over matter - if you don't

mind, it doesn't matter." While undeniably true, very few people find such advice helpful.

Our final option is to discover a source of meaning for ourselves. But this is not easy either. Since postmodernism undermines not only all conventional ideas of meaning and purpose, but their sources as well (e.g., God, the state), we are entirely on our own in the search for meaning. Indeed, it is better to say that we are required to *create* meaning rather than to discover it, since there is no privileged place where it might be found. Some postmodern philosophers believe this can be done - for example, by devoting oneself to living an *authentic* life [11,12]. While this is probably easier to achieve than learning to love absurdity, for our purposes it suffices to note that it is still extremely difficult - to the point where its attainment eluded some of the greatest postmodern thinkers.

What are we to do in the face of this dilemma? There is at least one other option not listed above - the leap to faith. Kierkegaard [13], himself a foundational postmodern philosopher, famously argued that one must simply *choose* to believe in something that provides *objective* meaning, despite the lack of evidence (and perhaps even in the face of countervailing evidence). Such a leap is subjective in the sense that it is a purely personal choice without objective evidence. But it is also objective, at least in the sense that what one subjectively believes in is a source of *objective* truth.

Of course, the most common sort of leap is into some kind of traditional religion, since this provides a complex and ready made system of values. In principle, however, a leap could be toward anything that allows for a sense of objective purpose. Given the commitments underlying postmodernism, it is not surprising that most postmodernists consider leaping into faith to be a perversion of their ideals. And it is certainly at least ironic to use the search for objective truth to justify what is manifestly at least an arational, and perhaps even an irrational, belief system. But more ironic still is the extent to which both sides of the modern discourse between science and religion are caught in the grip of this worldview without realizing it.

3. Science vs. Religion

Only the closed mind is certain. - D. Spanley

Of course, no thumbnail history such as this can possibly do justice to all the complex nuances of the ideas at play here. However, the above discussion does trace one very important line of thought that helps explain the origins of some of the tensions between science and religion in the postmodern world. Now I want to put flesh on this abstract discussion by presenting concrete examples of the two opponents in the modern debate between science and religion. I present these as caricatures, so they are by definition exaggerations, yet readers will likely see elements of their own thinking in one or the other position and neither is so extreme that there aren't real examples of each. By examining the extremes, I hope to reveal more clearly where the opportunities for compromise lie.

3.1. The Atheist Scientist

The greatest empiricists among us are only empiricists on reflection: when left to their instincts, they dogmatize like infallible popes. – Wm. James

The atheist scientist is a familiar trope in the modern world and has some influential instantiations, particularly within the recent neo-atheist movement [14,15,16,17,18]. He sees himself as engaged in the search for truth using the only method untainted by suspect metaphysics – science. Like many postmodernists, he is baffled by those with the weakness of mind to embrace comforting illusion rather than face reality without flinching. In an act of intellectual moralizing, he even asserts that no one deserving the label “scientist” could be anything but a confirmed atheist. He is confident that, with the proper education, all humanity will eventually shed their childish need for religious myth and the world will consequently be a much better place.

One basic problem with this attitude, of course, is that science does not, and indeed can not, avoid unsupported assumptions. Most scientists are not aware of this, since they do not study the philosophical foundations of their own discipline, but it is no less true for their lack of insight. Even the extremely brief historical background presented above suffices to illustrate how two assumptions were indispensable during the emergence of science as a discipline:

1. The belief that the universe is a *kosmos* - that is, the kind of place that can be explained by human reason.
2. The belief that the empirical methods of science are adequate for uncovering the truths of this *kosmos*.

The notion that we live in a *kosmos* is so central to the modern, scientific, worldview that people don't often single it out for critical scrutiny. However, it is clear that its adoption was an essential step in the creation of science. And if we are honest, we have to admit that it is not possible to justify this claim. There are always rumblings at the edge of one science or another suggesting that our knowledge of the universe is somehow fundamentally flawed. The recent discovery of dark matter and energy, whose existence was not even suspected 50 years ago, is a case in point: it is becoming increasingly clear that these are actually the *dominant* forces in our universe, yet we have scarcely begun to understand them [19,20]. But debates about the scientific anomaly du jour aside, it's important to realize that we will *never* disprove the possibility that all of our scientific knowledge is actually false in a systematic fashion. For example, some respectable philosophers and scientists have given a modern twist to Kant's conclusion about ultimate reality by suggesting the entire universe may be merely a *simulation* [21,22,23,24]. This implies that anything we discover about what we call “the universe,” no matter how well supported by empirical evidence, may not be about anything *real* at all.

The notion that empiricism suffices to explain natural phenomena is more problematic still. Hume's problem of induction has never been resolved in a way that would make a confirmed empiricist happy. There are thus excellent

theoretical reasons to be suspicious of any empirical system that attempts to bootstrap its own justification. But the dream of a complete empirical system is so seductive that a generation of philosophers of science (the logical positivists) in the first half of the 20th century tried valiantly to delineate precisely how empirical evidence can support scientific claims using elaborate systems of logic [25,26]. Unfortunately, this failed rather spectacularly when these attempts actually established that such an account is not logically possible [27,28].

The atheist scientist also makes problematic assumptions about the nature of religion. Typically, the characteristics of the crudest sorts of religious beliefs – those that tend to conflict directly with science, for example – are taken to be representative of all religions. Thus, the view espoused by young earth creationists that the universe is only a few thousand years old is held up as an example of the evils of religion, despite the fact that there are large segments of traditional religions (including a clear *majority* of Christians) that oppose such silliness [29,30]. More subtly, atheists who wish to attack religion typically assume that to be religious is to believe in a divine being, and in particular one who uses his supernatural powers to intervene in the natural world. While there are many who believe precisely this, not all religions require belief in God(s) at all (e.g., Taoism, Buddhism) and many theologians within monotheistic traditions have proposed interpretations of divinity which avoid supernatural claims [31,32,33]. It has even been proposed that certain types of religious claims may be scientifically testable (if perhaps unlikely to be true) [34,35]. Therefore, the atheist should object, not to religion in general, but to certain (admittedly common) *types* of religious belief.

Certainly the sad state of scientific literacy in countries like the United States is often (rightly) blamed for much of the tension between science and religion [36,37]. However, the assumption that quality science education will naturally convince people to abandon their religious commitments seems at least highly questionable. Increasingly, scientific investigation into how people actually form opinions reveals that the kinds of abstract reasoning scientists and philosophers laud plays a relatively small role [38,39]. This suggests that most people may never be able to participate sufficiently in the scientific enterprise to be able to use it as the sole source of meaning and purpose. If that's the case, presenting the choice as starkly as the atheist scientist does will actually be *counterproductive*, since forces the average believer to choose between the mysterious authority of a religion that plays an important role in their life and the mysterious authority of a science from which they derive no comfort. Given such a choice, should we really be surprised when most prefer religion, in whatever form it is offered?

In one sense, the scientist's refusal to countenance any claim that can't be rationally justified is critically important, since it's far too easy to fool oneself. Yet this narrow focus must be focused narrowly – on the explanations one is willing to entertain to explain natural phenomena, not on all explanations that could be put forward, even if they are only tangentially relevant to the practice of science. If a faith

claim neither impinges on the details of natural explanation nor gets in the way of naturalistic methodology in general, science should ignore it. Consider the case of creationism: some creationists believe things that directly conflict with science (e.g., a young Earth). Science is obliged to vigorously oppose such claims, since they directly conflict with extremely well supported science. On the other hand, many people will call themselves creationists yet, when pressed to clarify, simply claim that the universe, with all its natural processes (including evolution), was created by a divine being. There is no scientific need to debate such a claim and the atheist scientist who chooses to do so is therefore not operating as a scientist, but as someone with his own, extra-scientific, worldview. That is certainly his right, but he can't legitimately claim that the authority of science supports such a move.

And it's quite obvious that human needs are richer and more diverse than simply explaining the natural world – the persistence of religion and other extra-scientific means of avoiding postmodern angst establish this beyond much doubt. Creating worldviews that allow people to be happy and fulfilled may not be science's concern, but that makes it no less a fundamental human need. Indeed, science seems to realize this in practice if not explicitly, as it is often thought to be an important part of the mission of science to create a sense of wonder concerning the natural world [40,41,42]. What's more, it seems unlikely this is a need that will ever be adequately met by science alone. That does not mean that everyone needs an extra-scientific belief system, of course – some individuals may be perfectly content with science alone, just as some postmodernists may be able to create their own personal sense of meaning. But this misses the crucial point that many, perhaps most, people will simply not be able to do this. A science that continues to push an all or nothing approach to leaps of faith, is creating its own enemy – and needlessly so.

Thus, the thoughtful scientist must be careful to defend science only where a defense is truly necessary. True, science provides no reason to believe in the existence of divine beings and this is an important point. But this is not the same as providing evidence that such a being does not exist. The scientific method is a heuristic for investigating the natural world, not a complete guide to the nature of reality, at least not in any direct way. The scientist is thus well within her rights to oppose a specific religious claim that conflicts with scientific evidence, or to highlight the lack of evidence for religious claims in general, or to warn about the indirect threat that supernatural beliefs can pose to scientific methods. But true atheism requires one to go beyond the available evidence and make a leap of faith of one's own.

3.2. The Man of Unshakable Faith

Men think epilepsy divine, merely because they do not understand it. But if they called everything which they do not understand divine, why, there would be no end to divine things. - Hippocrates

The man of unshakeable faith is one who believes in a traditional monotheistic religion like Christianity based on a

(relatively) literal reading of ancient texts. He has no patience for fancy modern theology and believes in a personal God who loves him in a direct way and intervenes in the natural world through miracles. He is eager to use his rational powers when they support his faith, but quick to lay them aside when they prove inconvenient – indeed, he immediately rejects any claim inconsistent with his own interpretation of scripture, regardless of the weight of evidence behind it. He believes the world would be a much better place if others felt as he does and is in favor of a public educational system specifically crafted to bring this about. Finally, he believes science is ultimately just another type of faith – on a par, in some ultimate epistemic sense, with religion. Examples of such people are commonplace, but an especially rich vein can be found within the creationist movement [43,44,45].

One obvious problem here is the origins of this sort of belief. It is an inescapable fact that the vast majority of the world's major religions were created by illiterate peasants living in a pre-scientific age. The founders of these religions were profoundly ignorant of the sorts of truths we now expect all children to master at an early age. Therefore, whatever insights religions may contain, they are an exceptionally poor guide to the workings of the natural world. No position we choose to stake out should get in the way of our ability to understand the natural world, since this understanding is critical to solving the world's problems. And since science is clearly the best mechanism anyone has ever devised for this purpose, no religion should set itself against science. In fact, doing so is actually a threat to *religion*, since it picks a fight with science that it will ultimately lose – a point made quite persuasively by the head of the U.S. National Institutes of Health and evangelical Christian, Francis Collins [46].

The problem is not the use of ancient texts per se, it's the way the faith claims they embody are accepted without reflection. This may seem an odd thing to say – isn't the whole nature of a leap of faith to accept a claim without adequate empirical evidence? Yes, but that does not absolve believers of their responsibility to carefully consider the context of each leap of faith before making it. It's one thing to carefully consider one's epistemic situation and reluctantly decide that a leap is the only option, and quite another to use such a leap as a cheap way to "justify" what you want to believe without the hard work of critical reflection. Too many believers today approach faith claims far too casually, which does not do justice to the seriousness of the issues at stake.

And it's not enough to assess the leaps *before* they are made. Since we live in a world that is constantly changing, our leaps must be periodically reassessed in light of new circumstance. Communities of faith thus need to create robust and ongoing internal cultures of critique. Of course, some faiths already do this in limited ways, and whatever internal systems are or are not in place, religious interpretations do evolve in response to changes in the world around them [16,47]. If this didn't happen, religions would die. But many followers of traditional religions are not taught to cherish critique as a healthy part of religion and those so inclined to critique tend to have little access to processes for

impacting official doctrine. Adherence to ancient texts exacerbates the problem, since followers must still regard the texts as sacred and true even as interpretations change, creating ineliminable tensions. All too often, change comes to religions only fitfully and with great confusion and pain.

The lack of a systematic critical culture within religion is a large part of the reason science is opposed to faith. The fact that some believers have a sensible approach to scientific truths does not mean that most do. And even the sensible believers don't always feel a strong responsibility to chastise others who take their faith claims too far. But they must, since adopting a belief of any kind is an exercise with moral implications [48] and leaps of faith, being divorced from the need for evidence, are fertile grounds for dangerous abuse. Religions should therefore explicitly recognize this fact and adopt a *collective* duty on the part of believers to limit the scope of faith claims. To give just one of many possible examples, if moderate Islamic voices do not take an explicit stance against Islamic radicalism, they are to some extent tacitly endorsing jihad as a legitimate expression of faith. This is fundamentally different from the culture of science, where constant critique is an integral part of the process. Scientists would thus have a much easier time accepting leaps of faith if religions were more active in policing their ranks for overzealous applications of faith.

People, particularly those influenced by intelligent design creationism, often point out that science involves unsupported metaphysical claims such as ontological naturalism. I will not respond to that claim specifically, except to note that it has been decisively refuted elsewhere [49]. Whatever the merits of the claim, it illustrates that there is a sense among many believers that science is "just another faith tradition." There is some truth here, of course, since as we discussed previously, science does make leaps of faith. However, not all leaps of faith are created equal. The assumptions science makes are the minimal ones that must be made in order to pursue rational investigation of the world. We can reject them if we wish, but the result will be a mysterious universe we can not, in principle, explain. Religions, on the other hand, do not typically adopt a minimalist approach to leaps of faith. Indeed, they often embrace, not just arational, but *irrational* revelation, and this is a very different matter.

In particular, most traditional religions embrace supernaturalism - where one believes in forces and entities that, by definition, flout our scientific understanding of the natural world. This is not something science can countenance. It's not that science can establish such claims are false - it can't - but rather that any methodology which accepts supernatural claims is antithetical to the scientific process. To accept the existence of something that can not, in principle, be explained thru human reason, is to open Pandora's box. We lose all control over what emerges, since believing in supernatural entities is like embracing a contradiction in logic - once you make this move, you can use it to "establish" anything at all, no matter how contrary to reason. The real tension between science and religion lies here, since no one committed to the concept of a kosmos can ac-

cept such a move. Of course, in principle, it is possible to endorse a certain kind of supernatural claim without hindering science - for example, that God works his will only indirectly, with the natural universe as his instrument. But history seems to show that, once such a power is asserted, metaphysical claims multiply in a way that will eventually pose problems for the rational investigation of the natural order.

Thus, to the extent that supernaturalism is an ineliminable aspect of religion, science is justified in rejecting a broad compromise. However, as we've discussed, supernaturalism is not a necessary part of religion, even of traditional monotheistic religions. When the atheist scientist fails to appreciate the diversity of religion on this point, his ignorance is revealed. On the other hand, the fact that so few religious believers appreciate this point themselves makes the scientist's mistake more understandable.

3.3. A Metaphysical Opportunity

One should keep an open mind - but not so open that one's brains fall out. - Bertrand Russell

I present the two sides of the science v. religion debate as caricatures so that we may more easily see some of the essential differences. Science is by far the best method humans beings have ever discovered for understanding the natural world, with a track record far superior (to put it mildly) to revelation in this regard. It is thus entirely appropriate that scientists refuse to adopt any belief which weakens science, either by directly refuting specific scientific claims or by putting forward a way of thinking antithetical to scientific methods. But in their zeal to defend science, they sometimes lose sight of the fact that science is simply a heuristic based on its own unsupportable assumptions. This need not be a problem - indeed, the tentative nature of scientific claims is one of science's great strengths, since it facilitates a strong culture of critique. It only becomes a problem if scientists are incautious about the scope of the metaphysical claims they make, as in the case of the atheist scientist.

Religion is a social phenomenon that constituted a critical aspect of the lives of most humans beings since before the beginning of recorded history. It stretches credibility beyond the breaking point to suggest either that this is not an essential aspect of human nature or that nothing of value can be found within the rich creations humans have wrought in its name. But to avoid essential conflict with science, religion must also moderate its metaphysical claims. At the very least, it must openly embrace a more open and critical internal culture as well as eschew supernaturalism in any form that would undermine the scientific investigation of the natural world.

Wouldn't it be nice if we could have our metaphysical cake and eat it too? If we could, on the one hand, retain the scientific worldview with its unprecedented ability to explain the nature world, while on the other hand adopt a wider perspective which allows us to believe our lives have purpose and meaning of the sort religions historically have provided. Perhaps this is something we should actively seek.

4. The Complex Universe

And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection. – C. Darwin

There is a growing movement within science that may offer a possible compromise along these lines. It spans a number of disciplines, from physics to chemistry to information science, and there is not yet even a shared vocabulary, so it goes by various names (e.g., the epic of evolution, big history, cosmic evolution). The basic idea, however, is that the universe has a structure which *naturally* manifests increasing levels of complexity over time through an evolutionary process. It's beyond the scope of this paper to argue for this position in detail, so below I will only trace the general outlines.

Of course, the idea that the universe is progressive is nothing new. But previous discussions have been hobbled by non-natural metaphysical commitments and anthropocentrism, among other things. Yet increasingly, scientists are using rigorous scientific techniques to model the universe in general, and life in particular, as a *system* that spontaneously produces complexity [50,51,52,53,54]. A proposed candidate for the first biological law ever discovered has even arisen that predicts increasing complexity as a fundamental property of all evolving organisms [55]. Together, these suggest that it may be possible to view the universe as exhibiting a purpose, in some sense of that term, without the baggage that has been associated with this idea in the past.

It's not just that the universe gets more complex, it's that it manifests a series of processes that are increasingly adept at *creating* complexity, generating powerful feedback. Thus, the rate at which complexity is generated seems to be increasing as well, particularly once the ability to produce cultural information comes on the scene [56,57,58,59]. The universe has evolved from a smear of energy and simple matter only a cosmologist could find interesting to a place populated by at least one species capable of contemplating its place in the universe. Stars formed in a universe of hydrogen and began manufacturing heavier elements. Over time, these elements formed planets where ever more complex chemical interactions became possible. Eventually, a complexity threshold was passed and living systems arose, enabling the new dynamic of evolution by natural selection, increasing the rate of complexification exponentially. These life forms passed through a series of major transitions (e.g., eukaryotes, multicellularity), with more capacity to generate novelty at each level, until some organisms develop the mental capacity to make sociality, reason and culture possible [60,61]. The resulting cultural evolution creates science and other rational disciplines, within which the evolution of ideas increases the rate of complexification even further.

The complex universe hypothesis holds that someone with sufficient knowledge of the scientific principles and the initial conditions could have predicted, moments after the big bang, that a universe populated by stars, planets, and complex chemistry would come into being. He could also

predict the evolution of living organisms, the emergence of intelligence, and the rise of cultural systems. If this hypothesis is correct, it means that the universe produces the kinds of complexity we see all around us, including our scientific culture, in a perfectly natural fashion. Intuitively, we feel that complexity requires some kind of directive plan, implying a rational *designer* – a point the proponents of intelligent design creationism make much of [62,63]. But if the complex universe hypothesis is correct, there is no more need to postulate supernatural forces to explain our existence than to explain the formation of crystals forming in a supersaturated solution – under the right conditions, these things happen spontaneously.

We do need to be clear about what this hypothesis is *not* saying. The claim is not that the universe is deterministic, just that it is sufficiently predictable that some major trends can be predicted with confidence. This is similar to the way in which, although quantum phenomena are thought to be intrinsically random at the level of individual events, it is nevertheless possible to predict the behavior of large aggregates of such events with enormous (indeed, unprecedented) precision. Biological evolution is actually a process *fueled* by random variation, so it is only possible to predict events that are probable in the aggregate, despite random variation in particular cases. It would therefore be absurd to claim that the universe was destined to produce humans if by “human” we mean something with all the peculiarities of biology and culture that we possess. The patterns of evolution are predictable only in their broadest strokes – given the right conditions, we can predict that life will probably evolve, become multicellular, develop sociality and reason, etc. But we can't typically predict which species will develop which type of trait in which form at which point in time. And we certainly could not predict, 10 seconds after the big bang, that a species of hairy, intelligent ape with arms and legs would arise on the third planet orbiting Sol, much less that one of them would one day write a paper for the *American Journal of Sociological Research* discussing the predictive limits of the complex universe hypothesis.

We do not yet know whether this hypothesis is true. What we can say right now is that it is broadly consistent with what our best science tells us about the universe. It also seems an empirically tractable question we will one day resolve – for example, when we have much better data about the distribution of life in the universe and the systematic principles governing its evolution. In other words, it's a legitimate scientific hypothesis on which we do not yet have definitive data. I will thus leave the empirical debate to future scientists.

But what would the extra scientific implications be should this trend be confirmed? We could, as the atheist scientist will urge, view it as a brute fact that is not in need of further explanation. But doing this creates two sorts of problems, one scientific and one extra scientific. First, when science adopts the notion of a kosmos, it accepts the mission of *explaining* the universe. Generally speaking, we think that to explain something is to show how it is at least more likely than not to occur [64]. A view of the essential nature of the universe as either mysterious or the result of

pure happenstance is thus at the very least less than ideal. It's not that there is anything *inconsistent* about this idea – there isn't – it's just that this undermines the concept of a kosmos on which science is built, suggesting that at some level the universe is simply not explicable via human reason. Second, it is difficult to see how we could derive any sense of meaning or purpose from an accident of history. Indeed, this difficulty may go a long way towards explaining why humans beings created theistic religions in the first place, since these allow us to believe that the universe has a structure in which we have a meaningful place, despite our profound ignorance of its details. We have seen how a sense of meaning and purpose is something humans need deeply and will pursue vigorously regardless of what science says. Thus, in the same way it's a mistake for religions to hinder the investigation of the natural world when they can avoid it, it's also a mistake for science to create needless conflict between that investigation and the search for meaning.

What is the alternative to traditional accounts of religion then? One possibility is to imbue the complexity trend with *value*, which is not so much a fact about the universe as a choice about how we wish to view ourselves in relation to the facts we have. Just as science is careful to make only the *minimal* assumptions necessary to allow for the possibility of rational inquiry, here we need to adopt a minimal set of attitudes necessary to derive meaning from the universe science reveals to us. This seems to require two fundamental elements:

1. A deep *appreciation*, perhaps even a reverence, for the universal nature of this trend (in space, in time, in the levels of reality it encompasses, etc.). Some view this kind of association with a reality that transcends our own personal (and even humanity's collective) interests as the very essence of religion [65,66].
2. The notion that complexity is a *good* in the sense that it is something we should both value and foster. It is difficult to see how we could derive a robust sense of meaning and purpose from the mere universality of a natural property. For example, we are all massive objects subject to gravity. One can certainly appreciate the universality of this claim, but by itself this does little to assuage a postmodern sense of purposelessness.

To some extent, these ideas take us into the realms of religion and ethics where many a scientist fears to tread. Certainly these are not areas amenable to empirical investigation in the same way scientific questions are, and when scientists do venture into this territory they sometime do so in an unfortunately naïve fashion. But it's also important to realize that scientists already make this sort of move routinely, whether they realize it or not as it's (fortunately) a rare scientist who would argue that there are no moral goods, even if they may see these most clearly in the epistemic virtues of their discipline.

But neither claim is entirely divorced from science and its empirical techniques either. We should not build a sense of meaning on something that does not actually exist, and the existence of a complexity trend in an open empirical question (if a difficult one to resolve at present). And if a

trend does exist, the details of its structure and function may help us specify precisely what it is we should be reverent of. Similarly, if we are going to be thoroughly naturalistic in our approach, refusing to engage in supernaturalism, then we need to think carefully about whether and to what extent we can enrich the traditional discussion of moral values with empirical knowledge. Ethical theorists tend to want to draw a line in the sand between ethics and the empirical world, but if we view ethics as another aspect of a purely natural complexity trend, then there is surely much that fields like psychology, sociology, evolution and even economics can contribute to our moral understanding – as recent explorations have suggested [67,68,69].

This kind of approach is certainly not new, even if explicit discussion of its dynamics are rare. It may be that that the complex universe hypothesis is just one of a family of attempts to derive meaning from a purely natural universe that are gaining ground in the popular imagination. For example, deep ecology attempts to combine an appreciation for the universality of complex ecological relationships with the view that this complex ecological system has value (and even rights) we are obligated to respect [70,71,72,73]. There thus may be any number of ways to realize this kind of minimal leap of faith other than the complexity trend hypothesis.

Such pluralism might seem to undercut any claim to objective truth, but this conclusion would be hasty. Just as we can predict the broad contours of an evolutionary trajectory but not its details, the fact that variants of the same basic approach are emerging could indicate an important convergence. It may thus be a common feature of the evolution of social/cultural/rational beings that they begin with a supernatural conception of the universe and their place in it, only to abandon this in favor of more minimal leaps of faith under the influence of scientific culture. It could even be that some specific features of the ethical orientation of all rational creatures, wherever they emerge in the universe, are shared [59]. There is thus the possibility that these beliefs, even if they are subjective and contingent in some ways, are also objective (or at least inter-subjective) in others. If so, this would allow us to offer a response to the postmodern dilemma similar to what Kant offered in response to the problem of induction: if such beliefs are universal features of all beings with the rational capacity to contemplate such matters, then we will at least never lose a debate concerning their truth, since all creatures capable of joining the conversation will agree.

5. Conclusion

*Before I came here I was confused about this subject.
Having listened to your lecture I am still confused,
but on a higher level. – E. Fermi*

The current standoff between science and religion owes much to the history of ideas, and in particular the postmodern movement, though in ways few of the interlocutors are consciously aware of. Modern science tends to borrow from postmodernism a deep skepticism about the possibility

of any ultimate truths, especially as put forward by traditional authority structures like the church. Like Hume before them, scientists don't worry too much about their own metaphysical assumptions. This would be less of a problem if they were at least aware of the difficulties, however, as it might make them more cautious in their opposition to leaps of faith in general. By way of contrast, post-modern philosophers are at least keenly aware of the psychological dilemma created by rejecting all sources of meaning as well as the extreme difficulty of filling this void without the traditional guarantors of objectivity. For their part, religions tend to embrace the postmodern leap of faith too fully, using the fact that something is a faith claim to insulate all aspects of faith from critical scrutiny, opening Pandora's box to release a bewildering, and sometimes dangerous, array of beliefs. It seems as if all parties to the debate are talking past each other in important ways, preventing what most might view as a desirable compromise. How can we break this stalemate?

Those with a scientific worldview must begin to seriously consider the possibility that a minimal *step* of faith (as opposed to a leap) can be taken in ways that enrich rather than hinder the efforts of science to make sense of the universe. Stepping into the a minimalist kind of faith may actually help preserve our dedication to rational inquiry while allowing us to reap the psychological benefits of meaning and purpose science alone can not provide.

But the fact that there is a place for faith does not mean that all faiths are beyond critique. Those coming from traditional faith perspectives must embrace a far more critical attitude towards faith claims and, in particular, strive to purge themselves of the sort of supernaturalism that no one dedicated to rational explanation can countenance. And it is critical that this go beyond paying mere lip service to an abstract ideal – religions need to actively encourage their followers to critique elements of faith as circumstances change, providing concrete structures and processes to allow faith traditions to evolve more rapidly.

I put forward the complex universe hypothesis as an example of a scientific hypothesis capable of supporting a minimal step of faith that could help bridge the gap between the faith and science communities. While it is not science's job to develop extra scientific claims that would allow us to find meaning and purpose, there's also nothing about such a move that science need oppose. This approach simply adds a psychological dimension to our existing scientific understanding of the universe. It explains why we exist in a big sense – we are neither accidents of an uncaring universe nor products of an intelligent designer, but instead integral parts of a universal process that transcends our own existence. Viewing the creation of complexity in a purposeful way doesn't so much change the facts we believe in as change our attitude towards them.

Of course, even if we enthusiastically embrace meaningful universal complexity, it will not answer all questions. People will continue to wonder why the universe has this character of complexification, and one possible answer is to insert the will of a supernatural creator. But this is not a problem unique to this worldview, since it's a move that can be made in response to *any* worldview, even that of the

“hardest” science [74,75,76]. The important point is that there is nothing intrinsic to the complex universe system that *requires* a supernatural explanation.

To inject a pessimistic note, it must be allowed that this proposal may ultimately be unworkable. Traditional religions may be too wed to supernaturalism to change their ways fundamentally. What's much worse is the possibility that most people may continue to prefer the simple answers to complex questions such systems provide, in which case any alternative along the lines I propose here will have a very limited following. I can only hope that I have identified a logical space in which a compromise *could* occur – it remains to be seen whether anyone will actually occupy it and how comfortable its accommodations will prove to be.

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