Does science make belief in God obsolete?

JOHN TEMPLETON FOUNDATION

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Does science make belief in God obsolete?

Thirteen views on the question

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The John Templeton Foundation serves as a philanthropic catalyst for research on what scientists and philosophers call the Big Questions. We support work at the world's top universities in such fields as theoretical physics, cosmology, evolutionary biology, cognitive science, and social science relating to love, forgiveness, creativity, purpose, and the nature and origin of religious belief. We encourage informed, open-minded dialogue between scientists and theologians as they apply themselves to the most profound issues in their particular disciplines. And, in a more practical vein, we seek to stimulate new thinking about wealth creation in the developing world, character education in schools and universities, and programs for cultivating the talents of the gifted.

This booklet neatly embodies our approach to the Big Questions: the contributors are scholars and thinkers of the first rank, they address a perennial and much-disputed subject, and they bring to bear—in civil, elegant prose—a range of different perspectives. By assembling this "conversation" and inviting the public to join in, we intend to promote a dialogue that transcends familiar rhetoric and stock answers. We aim to turn discourse on the Big Questions in a more thoughtful, considered direction. It is our hope that this booklet will be a lasting resource for students, teachers, parents, scientists, clergy, and anyone else engaged with the great issues of human nature and purpose.

The essays collected here were coordinated and edited by Michael Shermer, who also contributed a piece of his own. The John Templeton Foundation gratefully acknowledges Dr. Shermer's skillful assistance and wise counsel.

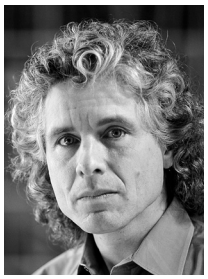
Two previous "conversations" on Big Questions at the core of the Foundation's mandate may also be of interest to readers. They can be found online at the following addresses:

Does the universe have a purpose?
www.templeton.org/questions/purpose

Will money solve Africa's development problems?
www.templeton.org/questions/africa

Steven Pinker

Yes, if by…



Steven Pinker is the Johnstone Family Professor in the department of psychology at Harvard University. He is the author of seven books, including The Language Instinct, How the Mind Works, The Blank Slate, *and most recently,* The Stuff of Thought: Language as a Window into Human Nature.

"science" we mean the entire enterprise of secular reason and knowledge (including history and philosophy), not just people with test tubes and white lab coats.

Traditionally, a belief in God was attractive because it promised to explain the deepest puzzles about origins. Where did the world come from? What is the basis of life? How can the mind arise from the body? Why should anyone be moral?

Yet over the millennia, there has been an inexorable trend: the deeper we probe these questions, and the more we learn about the world in which we live, the less reason there is to believe in God.

Start with the origin of the world. Today no honest and informed person can maintain that the universe came into being a few thousand years ago and assumed its current form in six days (to say nothing of absurdities like day and night existing before the sun was created). Nor is there a more abstract role for God to play as the ultimate first cause. This trick simply replaces the puzzle of "Where did the universe come from?" with the equivalent puzzle "Where did God come from?"

What about the fantastic diversity of life and its ubiquitous signs of design? At one time it was understandable to appeal to a divine designer to explain it all. No longer. Charles Darwin and Alfred Russel Wallace showed how the complexity of life could arise from the physical process of natural selection among replicators, and then Watson and Crick showed how replication itself could be understood in physical terms. Notwithstanding creationist propaganda, the evidence for evolution is overwhelming, including our DNA, the fossil record, the distribution of life on earth, and our own anatomy and physiology (such as the goose bumps that try to fluff up long-vanished fur).

For many people the human soul feels like a divine spark within us. But neuroscience has shown that our intelligence and emotions consist of intricate patterns of activity in the trillions of connections in our brain. True, scholars disagree on how to explain the existence of inner experience—some say it's a pseudo-problem, others believe it's just an open scientific problem, while still others think that it shows a limitation of human cognition (like our inability to visualize four-dimensional space-time). But even here, relabeling the problem with the word "soul" adds nothing to our understanding.

People used to think that biology could not explain why we have a conscience. But the human moral sense can be studied like any other mental faculty, such as thirst, color vision, or fear of heights. Evolutionary psychology and cognitive neuroscience are showing how our moral intuitions work, why they evolved, and how they are implemented within the brain.

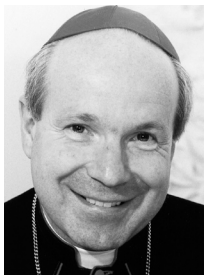
This leaves morality itself—the benchmarks that allow us to criticize and improve our moral intuitions. It is true that science in the narrow sense cannot show what is right or wrong. But neither can appeals to God. It's not just that the traditional Judeo-Christian God endorsed genocide, slavery, rape, and the death penalty for trivial insults. It's that morality cannot be grounded in divine decree, not even in principle. Why did God deem some acts moral and others immoral? If he had no reason but divine whim, why should we take his commandments seriously? If he did have reasons, then why not appeal to those reasons directly?

Those reasons are not to be found in empirical science, but they are to be found in the nature of rationality as it is exercised by any intelligent social species. The essence of morality is the interchangeability of perspectives: the fact that as soon as I appeal to you to treat me in a certain way (to help me when I am in need, or not to hurt me for no reason), I have to be willing to apply the same standards to how I treat you, if I want you to take me seriously. That is the only policy that is logically consistent and leaves both of us better off. And God plays no role in it.

For all these reasons, it's no coincidence that Western democracies have experienced three sweeping trends during the past few centuries: barbaric practices (such as slavery, sadistic criminal punishment, and the mistreatment of children) have decreased significantly; scientific and scholarly understanding has increased exponentially; and belief in God has waned. Science, in the broadest sense, is making belief in God obsolete, and we are the better for it.

Christoph Cardinal Schönborn

No, and yes.



Christoph Cardinal Schönborn, O.P., is a Dominican friar, the Archbishop of Vienna, Austria, a member of the Congregation for the Doctrine of the Faith and the Congregation for Education of the Roman Catholic Church, and was lead editor of the Catechism of the Catholic Church.

No, as a matter of reason and truth. The knowledge we have gained through modern science makes belief in an Intelligence behind the cosmos more reasonable than ever.

Yes, as a matter of mood, sensibility, and sentiment. Not science itself but a reductive "scientific mentality" that often accompanies it, along with the power, control, comfort, and convenience provided by modern technology, has helped to push the concept of God into the hazy twilight of agnosticism.

Superficially it may seem that the advances of science have made God obsolete by providing natural explanations for phenomena that were once thought to be the result of direct divine activity—the so-called "God of the gaps." But this advance has been the completion of a program of purification from superstition begun thousands of years ago by Athens and Jerusalem, by a handful of Greek sages, and by the people of Israel, who "de-divinized" Nature to a degree unparalleled in the ancient world. Summarizing an established tradition 750 years ago, St. Thomas Aquinas taught that the wise governor ordinarily governs by delegation to competent subordinates. In the case of Nature, God's ordinary providence governs by means of the regularities ("laws") built into the natures of created things.

This theistic outlook has been fully vindicated. As the ancient Greek materialists recognized long ago, if we wish to explain the observed world in terms of Matter without reference to Mind, then it must be explained by things material, ultimate, and very simple all at the same time—by indivisible, notional "atoms" and a chance "swerve" that sets them in random motion. If the things of everyday experience are mere aggregates of these "atoms," and if the cosmos is infinitely old and infinitely large, then chance can do the rest. To be the complete explanation of material reality, these "atoms," and whatever natural regularities they exhibit, must be so simple that their existence as inexplicable "brute facts" is plausible.

Fast-forward to the present: modern science has shown that Nature is ordered, complex, mathematically tractable, and intelligible "all the way down," as far as our instruments and techniques can discern. Instead of notional, perfectly simple "atoms," we have discovered the extraordinarily complex, beautiful, and mathematical "particle zoo" of the Standard Model of physics, hovering on the border of existence and intelligibility (as Aristotle predicted long ago with his doctrine of prime matter). And order, complexity, and intelligibility exist "all the way up" as well. We see a teleological hierarchy and chain of emergence from quantized physics, giving rise to stable chemistry, enabling the nearly miraculous

properties of carbon and biochemistry, providing the material basis for the emergence of life with its own ontological hierarchy of metabolic (plant), sensitive (animal), and rational (human) existence. Beyond this astounding and unfailing order and intelligibility, our knowledge of which increases each day as science expands its scope, we now know of the precise fine-tuning of the physical laws and constants that make possible a life-supporting universe.

In short, the Nature we know from modern science embodies and reflects immaterial properties and *a depth of intelligibility* far beyond the wildest imaginings of the Greek philosophers. To view all these extremely complex, elegant, and intelligible laws, entities, properties, and relations in the evolution of the universe as "brute facts" in need of no further explanation is, in the words of the great John Paul II, "an abdication of human intelligence."

But the modern *mood* is an entirely different matter. In terms of modern sensibilities, the intellectual culture of the West is dominated by a scientific mentality that seeks to explain qualitative and holistic realities by quantitative and reductive descriptions of the workings of their parts. Although the scientific program that gives rise to this mentality has been quite successful in explaining the material basis for holistic realities, and in allowing us to manipulate natural things to our advantage by altering the configuration of their parts, it fails to grasp the reality of natural things themselves. The unlimited application of the "scientific mentality" is scientism, the philosophical claim that the scientific method and scientific explanations can grasp all of reality. For many, scientism is accompanied by agnosticism or atheism.

In terms of popular sentiment, however, scientism has not carried the day. Most people still intuitively cling to the notion that at least human nature and human experience are not reducible to what is scientifically knowable. But with no rational alternative to scientism, most people live in a "soft," non-rational, and relativistic world of feelings, opinions, and personal values. The increase in leisure and health brought about by our increasing mastery over Nature has not resulted, as the ancient sages supposed, in an increase in wisdom and the contemplation of the good, the true, and the beautiful. Instead, our technology-based leisure is more likely to result in quiet hedonism, consumerism, and mind-numbing mass entertainment. While many still claim belief in God, the course of their lives reflects *de facto* agnosticism in which the "God hypothesis" is far from everyday experiences and priorities.

In all our scientistic "knowledge" of the inner workings of things, and our technology-based comforts and distractions, there seems to be no place for the still, small voice of God. In that practical and existential sense, science and technology seem to have pushed belief in God toward obsolescence.

Or have they?

In our innermost being, we moderns remain unsatisfied. Sooner or later we face an existential crisis, and recognize in our lives something broken, disordered, in need of redemption. The fact that we can recognize disorder, brokenness, and sin means that they occur within a larger framework of order,

beauty, and goodness, or else in principle we could not recognize them as such. Yet brokenness and disorder are painfully present, and the human soul by its nature seeks something more, a deeper happiness, a lasting good. Consideration of the order and beauty in nature can lead us to a Something, the "god of the philosophers," but consideration of our incompleteness leads us beyond, in search of a Someone who is the Good of us all.

Science will never make that quest obsolete.

William D. Phillips

Absolutely not!

William D. Phillips, a Nobel Laureate in physics, is a fellow of the Joint Quantum Institute of the University of Maryland and the National Institute of Standards and Technology.

Now that we have scientific explanations for the natural phenomena that mystified our ancestors, many scientists and non-scientists believe that we no longer need to appeal to a supernatural God for explanations of anything, thereby making God obsolete. As for people of faith, many of them believe that science, by offering such explanations, opposes their understanding that the universe is the loving and purposeful creation of God. Because science denies this fundamental belief, they conclude that science is mistaken. These very different points of view share a common conviction: that science and religion are irreconcilable enemies. They are not.

I am a physicist. I do mainstream research; I publish in peer-reviewed journals; I present my research at professional meetings; I train students and postdoctoral researchers; I try to learn from nature how nature works. In other words, I am an ordinary scientist. I am also a person of religious faith. I attend church; I sing in the gospel choir; I go to Sunday school; I pray regularly; I try to "do justice, love mercy, and walk humbly with my God." In other words, I am an ordinary person of faith. To many people, this makes me a contradiction—a serious scientist who seriously believes in God. But to many more people, I am someone just like them. While most of the media's attention goes to the strident atheists who claim that religion is foolish superstition, and to the equally clamorous religious creationists who deny the clear evidence for cosmic and biological evolution, a majority of the people I know have no difficulty accepting scientific knowledge and holding to religious faith.

As an experimental physicist, I require hard evidence, reproducible experiments, and rigorous logic to support any scientific hypothesis. How can such a person base belief on faith? In fact there are two questions: "How *can* I believe in God?" and "Why *do* I believe in God?"

On the first question: a scientist can believe in God because such belief is not a scientific matter. Scientific statements must be "falsifiable." That is, there must be some outcome that at least in principle could show that the statement is false. I might say, "Einstein's theory of relativity correctly describes the behavior of visible objects in our solar system." So far, extremely careful measurements have failed to prove that statement false, but they could (and some people have invested careers in trying to see if they will). By contrast, religious statements are not necessarily falsifiable. I might say, "God loves us and wants us to love one another." I cannot think of anything that could prove that statement false. Some might argue that if I were more explicit about what I mean by God and the other concepts in my statement, it would become falsifiable. But such an argument misses the point. It is an attempt to turn a religious statement into a scientific one. There is no requirement that every statement be a scientific statement. Nor are non-scientific statements worthless or irrational simply

because they are not scientific. "She sings beautifully." "He is a good man." "I love you." These are all non-scientific statements that can be of great value. Science is not the only useful way of looking at life.

What about the second question: why *do* I believe in God? As a physicist, I look at nature from a particular perspective. I see an orderly, beautiful universe in which nearly all physical phenomena can be understood from a few simple mathematical equations. I see a universe that, had it been constructed slightly differently, would never have given birth to stars and planets, let alone bacteria and people. And there is no good scientific reason for why the universe should not have been different. Many good scientists have concluded from these observations that an intelligent God must have chosen to create the universe with such beautiful, simple, and life-giving properties. Many other equally good scientists are nevertheless atheists. Both conclusions are positions of faith. Recently, the philosopher and long-time atheist Anthony Flew changed his mind and decided that, based on such evidence, he should believe in God. I find these arguments suggestive and supportive of belief in God, but not conclusive. I believe in God because I can feel God's presence in my life, because I can see the evidence of God's goodness in the world, because I believe in Love and because I believe that God is Love.

Does this belief make me a better person or a better physicist than others? Hardly. I know plenty of atheists who are both better people and better scientists than I. I do think that this belief makes me better than I would be if I did not believe. Am I free of doubts about God? Hardly. Questions about the presence of evil in the world, the suffering of innocent children, the variety of religious thought, and other imponderables often leave me wondering if I have it right, and always leave me conscious of my ignorance. Nevertheless, I do believe, more *because* of science than in spite of it, but ultimately just because I believe. As the author of Hebrews put it: "faith is the substance of things hoped for, the evidence of things not seen."

Pervez Amirali Hoodbhoy

Not necessarily.

Pervez Amirali Hoodbhoy is chairman of the department of physics at Quaid-e-Azam University in Islamabad, Pakistan, and is the author of Islam and Science: Religious Orthodoxy and the Battle for Rationality.

But you must find a science-friendly, science-compatible God. First, try the pantheon of available Creators. Inspect thoroughly. If none fits the bill, invent one.

The God of your choice must be a stickler for divine principles. Science does not take kindly to a deity who, if piqued or euphoric, sets aside seismological or cosmological principles and causes the moon to shiver, the earth to split asunder, or the universe to suddenly reverse its expansion. This God must, among other things, be stoically indifferent to supplications for changing local meteorological conditions, the task having already been assigned to the discipline of fluid dynamics. Therefore, indigenous peoples, even if they dance with great energy around totem poles, shall not cause even a drop of rain to fall on parched soil. Your rule-abiding and science-respecting God equally well dispenses with tearful Christians singing the Book of Job, pious Hindus feverishly reciting the *havan yajna*, or earnest Muslims performing the *salat-i-istisqa* as they face the Holy Ka'aba. The equations of fluid flow, not the number of earnest supplicants or quality of their prayers, determine weather outcomes. This is slightly unfortunate because one could imagine joining the faithful of all religions in a huge simultaneous global prayer that wipes away the pernicious effects of anthropogenic global climate change.

Your chosen God cannot entertain private petitions for good health and longevity, prevent an air crash, or send woe upon demand to the enemy. Mindful of microbiology and physiology, She cannot cure leprosy by dipping the afflicted in rivers or have humans remain in unscathed condition after being devoured by a huge fish. Faster-than-light travel is also out of the question, even for prophets and special messengers. Instead, She must run the world lawfully and unto the letter, closely following the Book of Nature.

A scientific Creator should certainly know an awful lot of science. To differentiate between the countless universes offered by superstring theory is a headache. Fine-tuning chemistry to generate complex proteins, and then initiating a cascade of mutations that turn microbe to man, is also no trivial matter. But bear in mind that there are definite limits to divine knowledge: God can know only the knowable. Omniscience and science do not go well with each other.

The difficulty with omniscience—even with regard to a particle as humble as the electron—has been recognized as an issue since the 1920s. Subatomic particles show a vexing, subtle elusiveness that defeats even the most sophisticated effort to measure certain of their properties. Unpredictability is intrinsic to quantum mechanics, the branch of physics which all particles are empirically seen to obey. This discovery so disturbed Albert Einstein that he rejected quantum mechanics, pronouncing that

God could not "play dice with the universe." But it turned out that Einstein's objections were flawed—uncertainty is deeply fundamental. Thus, any science-abiding deity we choose may be incompletely informed on at least some aspects of nature.

Is one being excessively audacious, perhaps impertinent, in setting down terms of reference for a divine entity? Not really. Humans have always chosen their objects of worship. Smarter humans go for smarter Gods. Anthropomorphic representations—such as a God with octopus arms—are a bit out of fashion today but were enormously popular just a few centuries ago. As well, some people might object to binding God and human to the same rules of logic, or perhaps even sharing the same space-time manifold. But if we drop this essential demand then little shall remain. Reason and evidence would lose meaning and be replaced by tradition, authority, and revelation. It would then be wrong for us to have 2 + 2 = 5, but okay for God. Centuries of human progress would come to naught.

Let's face it: the day of the Sky God is long gone. In the Age of Science, religion has been downsized, and the medieval God of classical religions has lost repute and territory. Today people pay lip service to trusting that God, but they still swallow antibiotics when sick. Muslim-run airlines start a plane journey with prayers but ask passengers to buckle-up anyway, and most suspect that people who appear to rise miraculously from the dead were probably not quite dead to begin with. These days if you hear a voice telling you to sacrifice your only son, you would probably report it to the authorities instead of taking the poor lad up a mountain. The old trust is disappearing.

Nevertheless, there remains the tantalizing prospect of a divine power somewhere "out there" who runs a mysterious, but scrupulously miracle-free, universe. In this universe, God may choose to act in ingenious ways that seem miraculous. Yet these "miracles" need not violate physical laws. Extraordinary, but legitimate, interventions in the physical world permit quantum tunneling through cosmic worm holes or certain symmetries to snap spontaneously. It would be perfectly fair for a science-savvy God to use nonlinear dynamics so that tiny fluctuations quickly build up to earthshaking results—the famous "butterfly effect" of deterministic chaos theory.

Nietzsche and the theothanatologists were plain wrong—God is neither dead nor about to die. Even as the divine habitat shrinks before the aggressive encroachment of science, the quantum foam of space-time creates spare universes aplenty, offering space both for a science-friendly God as well as for self-described "deeply religious non-believers" like Einstein. Many eminent practitioners of science have successfully persuaded themselves that there is no logical contradiction between faith and belief by finding a suitable God, or by clothing a traditional God appropriately. Unsure of why they happen to exist, humans are likely to scour the heavens forever in search of meaning.

Mary Midgley

Of course not.

Mary Midgley is a philosopher with a special interest in ethics, human nature, and science, and is the author of Evolution as a Religion *and* Science as Salvation.

Belief—or disbelief—in God is not a scientific opinion, a judgment about physical facts in the world. It is an element in something larger and more puzzling—our wider worldview, the set of background assumptions by which we make sense of our world as a whole.

We seldom notice these assumptions, but we often use them in resolving our inner conflicts. As life goes on, we shape them gradually into patterns by which to relate the things we find most important. And occasionally, when something goes badly wrong, we realize that we must somehow think differently about our whole lives. Doing this is not an irrational substitute for formal proof. It is the groundwork without which new thought is impossible. This is clear if we consider for a moment a few unprovable assumptions we quite rightly use at this level:

• Other people are conscious beings, not mindless robots.

• They have thoughts and feelings more or less like our own.

• Most of what they tell us is true.

• The physical world itself will, on the whole, go on acting pretty much as it has done so far (the "regularity of nature").

We trust the world around us, and its relation to ourselves. That trust—that faith—is not irrational; it is, in fact, the foundation of our rationality. If we really did start to doubt other people's consciousness and truthfulness or the regularity of nature, we would lose not just our science but our sanity. We could not act at all.

Worldviews, then, are foundational for human life and underlie every culture. On the points I just mentioned, they mostly agree. But on other points, they differ because they emphasize different aspects of the human experience. What is now seen as a universal cold war between science and religion is, I think, really a more local clash between a particular scientistic worldview, much favored recently in the West, and most other people's worldviews at most other times.

Of course, those other views differ hugely among themselves. Some center on Godhead; some, such as Buddhism and Taoism, don't use that idea at all. But what they all do is to set human life in a context. They don't see our species as sealed in a private box that contains everything of value, but as playing its part in a much wider theatre of spiritual activity—activity that gives meaning to our own. Scientism by contrast (following suggestions from the Enlightenment), cuts that context off altogether and looks for the meaning of life in Science itself. It is this claim to a monopoly of meaning, rather than any special scientific doctrine, that makes science and religion look like competitors today.

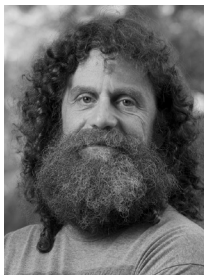
Science does have its own worldview that includes guiding presuppositions about the nature of the world. The founders of modern science expressed these very plainly for their time. Cosmic order (they said) flows wholly from God, so science redounds to his glory. When, however, God went out of fashion, new prophets—Comte, Marx, Freud, and the rest—crafted new and different background pictures, which were all supposed to be scientific. But these eventually became so confusing that Karl Popper exiled them all. Science was then deemed to consist only of falsifiable statements about the physical world. This is extremely neat, but what then happens to psychology? Behaviorism gave this question an answer that was widely accepted for much of the last century, but one so strange that its implications are still not fully understood. Scientific psychology must (they said) deal exclusively with outside behavior. Consciousness, if it exists at all, is something trivial, unintelligible, and ineffective. They thus rejected the first two assumptions that we have identified as being basic for human thought—the consciousness and inner similarity of other people. They did not notice that losing these assumptions would land us in an alien world and that it would actually undermine our other two foundation stones as well. If we really did not believe that others think and feel as we do, we could surely not understand what they said. And if we were thus deprived of all communication, how could we ever form the notion of an objective, reliable world?

In fact, it finally became clear that the behaviorists' starvation diet cannot support intellectual life, so the taboo on mentioning consciousness in scientific circles has been lifted. Unfortunately, however, the visions by which people consoled themselves in their time of starvation—Jacques Monod's dream of a cosmic casino run by natural selection and Richard Dawkins's drama of domination by selfish genes—are still with us, causing confusion. But our main trouble now is perhaps our ambivalent response to the idea of visions as such. We are still inclined to suspect that any talk except literal truths about the physical world is anti-scientific.

Scientism thus emerged not as the conclusion of scientific argument but as a chosen element in a worldview—a vision that attracted people by its contrast with what went before—which is, of course, how people very often do make such decisions, even ones that they afterwards call scientific. We ought, I suggest, to pay a lot more attention to these crises and take more trouble to make sure that our worldviews make sense.

Robert Sapolsky

No.



Robert Sapolsky is John A. and Cynthia Fry Gunn Professor of Biological Sciences and professor of neurology and neurological sciences at Stanford University. He is the author of Why Zebras Don't Get Ulcers, The Trouble with Testosterone, *and* A Primate's Memoir.

Despite the fact that I'm an atheist, I recognize that belief offers something that science does not.

Science isn't remotely about a scientist announcing truths or The Truth. It's about stating things with a certain degree of certainty. A scientist will say, "In this experiment, I observed that A causes B; it didn't happen every single time, and my statistical analyses show that I can be X percent certain that this A/B connection didn't happen by chance." The convention in most scientific papers is that you don't report something until you're more than 95 percent certain. It is impossible with statistics to state something with 100 percent certainty.

Now, I'm not trying to be a postmodernist gibbering about how science is a purely subjective process and there are no objective truths. There are truths, and scientific knowledge produces temporary points of solid ground in pursuit of them. An observation must have predictive power and be capable of independent replication by others. And scientists must be willing to abandon supposed knowledge when a completely different explanation arises—"Hey, this is an orangutan jawbone stained dark, so Piltdown Man really isn't our grandfather." Far more often, scientists are asked to *modify* their knowledge: "Remember when you said that A doesn't cause B every single time? It turns out that A causes B only when C is happening." This increases the subtlety and nuance of science. As a surprising example, it turns out that the most iconic "fact" in the life sciences is only a temporary foothold: DNA doesn't always form a double helix, and those exceptions are mighty interesting.

So it doesn't even make a whole lot of sense to frame a science/religion fight as who has the truthier truth. But you can state it as, "Which approach gives you more predictive power and ability to change an outcome?" When stated this way, science wins hands down. There's no question that when faced with, say, a sick child, it's better to prescribe antibiotics than to invoke some ceremonial goat innards or to employ a fetish gee-gaw. Even in a country as throttled by religion as our own, the courts have consistently ruled that a parent cannot deny medical care to a sick child and instead substitute attempts at religious cures. That's not why belief resists obsolescence.

The next logical arena in the culture wars is the issue of whether religion or science is better for society. On this front, there's no question which approach has produced more historical (and contemporary) harm. Sure, science has come up with Lysenkoism, eugenics, lobotomies, and the people who methodically tested new uses for Zyklon B. But that doesn't even begin to nudge the scale from its one-sided tilt. And the argument that the likes of Torquemada are aberrations of religiosity is nonsense; they

are the only logical consequences of some facets of religiosity. The blood on the hands of religion drips enough to darken the sea.

It might be argued that religious belief remains relevant because of the comfort it can provide. But this one doesn't do much for me. Solace is not benign when reality proves the solace to have been misplaced, nor are beliefs that reduce anxiety when the belief system is so often what generated the anxiety in the first place.

So why is belief still relevant? To this I'd offer a very a-scientific answer. It is for the ecstasy. I'm not talking about glossolalic frothing in the aisles, nor other excesses that most religions neither generate nor value. I mean those instances where you're suffused with gratitude for life and experience and the chance to do good, where every neuron is flooded with the momentness of feeling the breeze on its cellular cheek. A scientist or a consumer of science may feel ecstatic about a finding—that it will cure a disease, save a species, or is just stunningly beautiful—but science, as an explanatory system, is not very good at producing ecstasy. For starters, there are good arguments to be made for why science shouldn't do ecstasy. One reason is that scientific progress so often constitutes minutiae that lurch you two steps back for every three steps forward. It is also because of the content—the gratitude part of ecstasy is particularly hard if you spend your time studying, say, childhood cancer, or the biology of violence, or causes of extinction. By contrast, the potential for ecstasy is deeply intertwined with religiosity, where the mere possibility of belief and faith in the absence of proof is where it can be an ecstatic, moving truth.

This may seem an unfair tilting of the debate against science. After all, you wouldn't write an essay trashing the profession of commodities broker because it doesn't produce ecstasy. But building your life's explanations around science isn't a profession. It is, at its core, an emotional contract, an agreement to derive comfort only from rationality.

Science is the best explanatory system that we have, and religiosity as an alternative has a spectacular potential for harm that permeates and distorts every domain of decision-making and attribution in our world. But just because science can explain so many unknowns doesn't mean that it can explain everything, or that it can vanquish the unknowable. That is why religious belief is not obsolete. The world would not be a better place without ecstasy, but it would be one if there wasn't religion. But don't expect science to fill the hole that would be left behind, or to convince you that there is none.

Christopher Hitchens

No, but it should.

Christopher Hitchens is the author of God Is Not Great *and the editor of* The Portable Atheist.

Until about 1832, when it first seems to have become established as a noun and a concept, the term "scientist" had no really independent meaning. "Science" meant "knowledge" in much the same way as "physic" meant medicine, and those who conducted experiments or organized field expeditions or managed laboratories were known as "natural philosophers." To these gentlemen (for they were mainly gentlemen) the belief in a divine presence or inspiration was often merely assumed to be a part of the natural order, in rather the same way as it was assumed—or actually insisted upon—that a teacher at Cambridge University swear an oath to be an ordained Christian minister. For Sir Isaac Newton—an enthusiastic alchemist, a despiser of the doctrine of the Trinity, and a fanatical anti-Papist—the main clues to the cosmos were to be found in Scripture. Joseph Priestley, discoverer of oxygen, was a devout Unitarian as well as a believer in the phlogiston theory. Alfred Russel Wallace, to whom we owe much of what we know about evolution and natural selection, delighted in nothing more than a session of ectoplasmic or spiritual communion with the departed.

And thus it could be argued—though if I were a believer in god I would not myself attempt to argue it—that a commitment to science by no means contradicts a belief in the supernatural. The best known statement of this opinion in our own time comes from the late Stephen Jay Gould, who tactfully proposed that the worlds of science and religion commanded "non-overlapping *magisteria*." How true is this on a second look, or even on a first glance? Would we have adopted monotheism in the first place if we had known:

1) That our species is at most 200,000 years old, and very nearly joined the 98.9 percent of all other species on our planet by becoming extinct, in Africa, 60,000 years ago, when our numbers seemingly fell below 2,000 before we embarked on our true "exodus" from the savannah?

2) That the universe, originally discovered by Edwin Hubble to be expanding away from itself in a flash of red light, is now known to be expanding away from itself *even more rapidly*, so that soon even the evidence of the original "big bang" will be unobservable?

3) That the Andromeda galaxy is on a direct collision course with our own, the ominous but beautiful premonition of which can already be seen with a naked eye in the night sky?

These are very recent examples, post-Darwinian and post-Einsteinian, and they make pathetic nonsense of any idea that our presence on this planet, let alone in this of so many billion galaxies, is part of a plan. Which design, or designer, made so sure that absolutely *nothing* (see above) will come out of our fragile current "something"? What plan, or planner, determined that millions of humans would die without even a grave marker, for our first 200,000 years of struggling and desperate

existence, and that there would only then at last be a "revelation" to save us, about 3,000 years ago, but disclosed only to gaping peasants in remote and violent and illiterate areas of the Middle East?

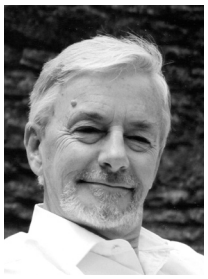
To say that there is little "scientific" evidence for the last proposition is to invite a laugh. There is no evidence for it, period. And if by some strenuous and improbable revelation there *was* to be any evidence, it would only argue that the creator or designer of all things was either (a) very laborious, roundabout, tinkering, and incompetent and/or (b) extremely capricious and callous, and even cruel. It will not do to say, in reply to this, that the lord moves in mysterious ways. Those who dare to claim to be his understudies and votaries and interpreters must either accept the cruelty and the chaos or disown it: they cannot pick and choose between the warmly benign and the frigidly indifferent. Nor can the religious claim to be in possession of secret sources of information that are denied to the rest of us. That claim was, once, the prerogative of the Pope and the witch doctor, but now it's gone. This is as much as to say that reason and logic reject god, which (without being conclusive) would be a fairly close approach to a scientific rebuttal. It would also be quite near to saying something that lies just outside the scope of this essay, which is that morality shudders at the idea of god, as well.

Religion, remember, is *theism* not *deism*. Faith cannot rest itself on the argument that there might or might not be a prime mover. Faith must believe in answered prayers, divinely ordained morality, heavenly warrant for circumcision, the occurrence of miracles or what you will. Physics and chemistry and biology and paleontology and archeology have, at a minimum, given us explanations for what used to be mysterious, and furnished us with hypotheses that are at least as good as, or very much better than, the ones offered by any believers in other and inexplicable dimensions.

Does this mean that the inexplicable or superstitious has become "obsolete"? I myself would wish to say no, if only because I believe that the human capacity for wonder neither will nor should be destroyed or superseded. But the original problem with religion is that it is our first, and our worst, attempt at explanation. It is how we came up with answers before we had any evidence. It belongs to the terrified childhood of our species, before we knew about germs or could account for earthquakes. It belongs to our childhood, too, in the less charming sense of demanding a tyrannical authority: a protective parent who demands compulsory love even as he exacts a tithe of fear. This unalterable and eternal despot is the origin of totalitarianism, and represents the first cringing human attempt to refer all difficult questions to the smoking and forbidding altar of a Big Brother. This of course is why one desires that science and humanism *would* make faith obsolete, even as one sadly realizes that as long as we remain insecure primates we shall remain very fearful of breaking the chain.

Keith Ward

No.



Keith Ward is a Fellow of the British Academy, an ordained priest in the Church of England, a Canon of Christ Church, Oxford, and the author of The Big Questions in Science and Religion, Pascal's Fire: Scientific Faith and Religious Understanding, *and* Is Religion Dangerous?

Far from making belief in God obsolete, some interpretations of modern science provide positive reinforcement for belief in God.

The methodology of the natural sciences requires the formulation of fruitful questions about the nature of the world that can be answered by careful and repeatable observations. The use of controlled experiments aids the construction of illuminating schemes of classification or of causal hypotheses that explain why things are as they are. The development of mathematical techniques for describing and predicting observable regularities is usually an important part of a scientific approach to the world.

There are many different sorts of natural science, from the patient observations of botany and ethology to the more theory-laden hypotheses of quantum cosmology. What is their relation to belief in God? The answer depends on how one defines God. I shall adopt the rather minimal view that God is a non-physical being of consciousness and intelligence or wisdom, who creates the universe for the sake of distinctive values that the universe generates.

If there is such a God, it follows that a non-physical conscious intelligence is possible—so a materialist view that all existent things must be physical, or must have location in space-time and must be subject to the causal laws of such a space-time, must be false. It follows that the nature of the universe must be compatible with being the product of intelligent creation, and must contain states that are of distinctive value and that could not otherwise exist. And it follows that there is a form of non-physical causality—the whole physical universe only exists because it is the effect of such causality. So some facts about the universe (minimally, the fact that the universe exists as it does) must be such that they cannot be completely explained by physical causal laws alone.

All these claims are subject to dispute. Such disputes are as old as recorded human thought. But has the spectacular advance of the natural sciences added anything significant to them? Some writers have supposed that science rules out any non-physical beings or forms of causality. Auguste Comte propagated the nineteenth century idea of a progress of humanity through three states of thought—religious, metaphysical, and positive or scientific. The final stage supersedes the others. Thus science renders belief in God obsolete.

But quantum physicists have decisively rejected Comte's philosophical proposal that human sense-observations provide the ultimate truth about objective reality. They more nearly vindicate Kant's alternative proposal that our senses only reveal reality as it appears to us. Reality in itself is quite different, and is accessible only through mathematical descriptions that are increasingly removed from observation or pictorial imagination (how do you picture a probability-wave in Hilbert space?).

It is almost commonplace in physics to speak of many space-times, or of this space-time as a 10- or 11-dimensional reality that dissolves into topological foam below the Planck length. This is a long way from the sensationalism of Hume and Comte, and from the older materialism that insists on locating every possible being within this space-time. Some modern physicists routinely speak of realities beyond space-time (e.g., quantum fluctuations in a vacuum from which this space-time originates). And some physicists, such as Henry Stapp, Eugene Wigner, and John von Neumann, speak of consciousness as an ultimate and irreducible element of reality, the basis of the physical as we know it, not its unanticipated by-product.

It is simply untrue that modern physics rules out the possibility of non-physical entities. And it is untrue that science has established a set of inflexible laws so tightly constraining and universally dominating that they exclude the possibility of other forms, including perhaps non-physical forms, of causal influence that we may not be able to measure or predict. It is more accurate to say that fundamental laws of nature areseen by many physicists as approximations to an open, holistic, and flexible reality, as we encounter it in relatively isolated and controlled conditions.

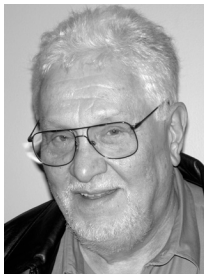
An important fact about God is that if God is a non-physical entity causally influencing the cosmos in non-physical ways, God's mode of causal influence is most unlikely to be law-governed, measurable, predictable, or publicly observable. To the extent that the sciences describe regular, measurable, predictable, controllable, and repeatable behavior, acts of God will be outside the scientific remit. But that does not mean they cannot occur.

Even opponents of intelligent creation (not "intelligent design," which in America has come to designate a view that specific scientific evidences of design can be found) often concede that the amazingly fine-tuned laws and constants of nature that lead to the existence of intelligent life look as if they are designed to do so. The appearance, they say, is deceptive. But it could be true, as Steven Weinberg has suggested, that intelligent life-forms like us could only exist in a cosmos with the fundamental constants this cosmos has, that intelligent life is somehow prefigured in the basic laws of the universe, and that the universe "knew we were coming," as Freeman Dyson has put it. If so, then the hypothesis of intelligent creation is a good one because it makes the existence of intelligent life vastly more probable than the hypothesis that such life is a product of blind processes that may easily have been otherwise.

But this is not a scientific hypothesis. It posits no observationally confirmable entities, and produces no specific predictions. It is a philosophical hypothesis about the most adequate overall interpretation of a very wide set of data, including scientific data, but also including non-scientific data from history, personal experience, and morality. And that is the fundamental point. It is not science that renders belief in God obsolete. It is a strictly materialist interpretation of the world that renders belief in God obsolete, and which science is taken by some people to support. But science is more ambiguous than that, and modern scientific belief in the intelligibility and mathematical beauty of nature, and in the ultimately "veiled" nature of objective reality, can reasonably be taken as suggestive of an underlying cosmic intelligence. To that extent, science may make a certain sort of belief in God highly plausible.

Victor J. Stenger

Yes.



Victor J. Stenger is emeritus professor of physics and astronomy, University of Hawaii, adjunct professor of philosophy, University of Colorado, and the author of seven books including God: The Failed Hypothesis—How Science Shows That God Does Not Exist.

Once upon a time there were a number of strong scientific arguments for the existence of God. One of the oldest and most prevalent is the argument from design. Most people look at the complexity of the world and cannot conceive of how it could have come about except by the action of a being or force of great power and intelligence.

The design argument received perhaps its most brilliant exposition in the work of the Anglican archdeacon William Paley. In his *Natural Theology, or Evidences of the Existence and Attributes of the Deity Collected from the Appearance of Nature*, first published in 1802, Paley wrote about finding both a stone and a watch while crossing a heath. Though the stone would be regarded as a simple part of nature, no one would question that the watch is an artifact, designed for the purpose of telling time. Paley then proposed that objects of nature, such as the human eye, give every indication of being similar contrivances.

When Charles Darwin entered Cambridge in 1827 he was assigned to the same rooms in Christ's College occupied by William Paley seventy years earlier. By that time the syllabus included the study of Paley's works, and Darwin was deeply impressed. He remarked that Paley's work "gave me as much delight as did Euclid."

Yet Darwin ultimately discovered the answer to Paley and showed how complex systems can evolve naturally from simpler ones without design or plan. The mechanism he proposed in 1859 in *The Origin of Species* (inferred independently by Alfred Russel Wallace) was natural selection, by which organisms accumulate changes that enable them to survive and have progeny that maintain those features.

But, as Darwin recognized, a serious objection to evolution existed based on the known physics of the time. Calculations by the great physicist William Thomson (Lord Kelvin) estimated ages for the sun that were far too short for natural selection to operate.

However, at the time, nuclear energy was unknown. When this new form of energy was discovered early in the twentieth century, physicists estimated that the energy released by nuclear reactions would allow the sun and other stars to last billions of years as stable energy sources.

Prior to the twentieth century, the simple fact that the universe contains matter also provided strong evidence for a creation. At the time, it was believed that matter was conserved, and so the matter of the universe had to come from somewhere. In 1905 Einstein showed that matter could be created from energy. But where did that energy come from?

This remained unanswered for almost another century until accurate observations with telescopes determined that an exact balance exists between the positive energy of matter and the negative energy of gravity. So, no energy was required to produce the universe. The universe could have come from nothing.

Independent scientific support for a creation was also provided by a basic principle of physics called the *second law of thermodynamics,* which asserts that the total disorder or entropy of the universe must increase with time. The universe is growing more disorderly with time. Since it now has order, it would seem to follow that at some point in the past, even greater order must have been imparted from the outside.

But in 1929, astronomer Edwin Hubble reported that the galaxies were moving away from one another at speeds approximately proportional to their distance, indicating that the universe was expanding. This provided the earliest evidence for the Big Bang. An expanding universe could have started with low entropy and still have formed localized order consistent with the second law.

Extrapolating what we know from modern cosmology back to the earliest definable moment, we find that the universe began in a state of maximum disorder. It contained the maximum entropy for the tiny region of space, equivalent to zero information. Thus, even if the universe were created, it retains no memory of that creation or of the intentions of any possible creator. The only creator that seems possible is the one Einstein abhorred—the God who plays dice with the universe.

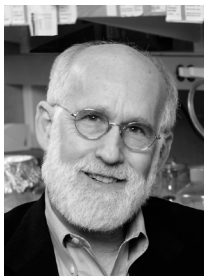
Now, such a God could still exist and play a role in the universe once the universe exploded out of chaos. We no longer have total disorder; but disorder still dominates the universe. Most of the matter of the universe moves around randomly. Only 0.1 percent, the part contained in visible parts of galaxies, has any significant structure.

If he is to have any control over events so that some ultimate plan is realized, God has to poke his finger into the works amidst all this chaos. Yet there is no evidence that God pokes his finger in anyplace. The universe and life look to science just as they should look if they were not created or designed. And humanity, occupying a tiny speck of dust in a vast cosmos for a tiny fraction of the life of that cosmos, hardly looks special.

The universe visible to us contains a hundred billion galaxies, each with a hundred billion stars. But by far the greatest portion of the universe that expanded exponentially from the original chaos, at least fifty orders of magnitude more, lies far beyond our horizon. The universe we see with our most powerful telescopes is but a grain of sand in the Sahara. Yet we are supposed to think that a supreme being exists who follows the path of every particle, while listening to every human thought and guiding his favorite football teams to victory. Science has not only made belief in God obsolete. It has made it incoherent.

Jerome Groopman

No, not at all.



Jerome Groopman is the Recanati Professor of Medicine at Harvard and author of How Doctors Think.

As a physician and researcher, I employ science to decipher human biology and treat disease. As a person of faith, I look to my religious tradition for the touchstones of a moral life. Neither science nor faith need contradict the other; in fact, if one appreciates the essence of each, they can enrich each other in a person's life.

So, the question of obsolescence is miscast, because science and faith should exist in separate realms. Science uses logic and experimental methods to measure and describe the material world. It yields knowledge about the workings of molecules and machines, mitosis and momentum. Science has no moral valence. It is neutral. DNA technology can craft a cure for a cancer or produce a weapon of bioterrorism. It is only a person's application of science that takes on a moral dimension.

In that light, an atheist creates his or her own moral precepts in the absence of God. A believer looks to religious texts for guidance in what is right and what is wrong. Right and wrong, for both, do not come from physics or chemistry or biology. Science does not instruct how to treat one's neighbor as oneself, how to clothe the naked and feed the hungry, why it is wrong to murder, steal, bear false witness, honor one's father and mother, and perhaps most difficult of all, subsume envy and covetousness. There are no Ten Commandments in thermodynamics or molecular biology, no path to righteousness and charity and love in Euclidean geometry or atomic physics. The truths of mathematics, biology, chemistry, and physics are different from the truths we seek in human behavior and human choices. The truths of science can be measured and experimentally verified; the truths of a moral life are matters of belief—whether you are an atheist or a religious person. Religion should view science as a way to improve the world; science should see religion not as a threat but as a deeply felt path taken by some.

So why are we bombarded with polemics from extremists on both sides of this issue? Why is the question of obsolescence asked about God, who is not material and therefore doesn't "age"?

The clash comes from the two extremes. Fundamentalist religious believers in the United States want to change the Constitution so that it includes injunctions about sex and prayer from the Bible. In the Middle East and in parts of Asia, their counterparts, the Wahhabis, press for *sharia,* Islamic law, to prevail over a liberal society. Atheists have their own fundamentalists who characterize people of faith as naïve, infantile, and neurotic in their rituals, too irrational to live by the light of pure logic. The polemics of believers show an ignorance of science, what it offers to improve life, and the polemics of fundamentalist atheists ignore the wisdom found in religious texts. Both seem threatened by diversity and wish to erase any doubt under a blanket of blind belief.

There is another way, a "third way" of articulating the benefits of science and faith. On this middle ground, a person can hold two different sensibilities, two different types of thought, feeling, and

action. Yes, there are times when a scientist like myself who believes in God is filled with doubt. But that should be expected. As the esteemed Protestant theologian Paul Tillich once observed, the basis of true faith is such doubt. Similarly, atheists should sometimes doubt their negation of God, because it is not a matter of proof but of subjective belief on their part.

In my own tradition, the rabbi, philosopher, and physician Maimonides, also known as the Rambam, embodied an apparent cognitive dissonance. He was a scholar of the Bible and Talmud while, at the same time, a scholar of scientific medical practice. He was a person of faith who rejected magic and sorcery as nonsense. He viewed the natural world as governed by laws familiar to us through physics and chemistry. But he also contended that each of us makes a personal decision about whether or not to believe in God. There is no need for mental gymnastics to generate a proof of God's existence; it is a futile exercise. God is axio-matic or not. Faith is not deduced but felt. Religion, at its best, becomes a vehicle to arrive at the good—the good for oneself, the good for others and for the world.

Tolerance is actually a tenet of my tradition. The Hebrew Bible asserts more than thirty times that we should respect the stranger and treat him with dignity, because we were strangers in the land of Egypt. The stranger represents "the Other"—what is foreign and different and at times threatening to our beliefs. There is no need to conquer or erase differences in culture or perspective. The same tolerance should be found among atheists. They should not belittle or ridicule as fools those who struggle to find meaning in life, to confront mystery, based on a belief in the Divine. Science does not threaten faith, and faith need not reject science. Neither will ever be obsolete.

Michael Shermer

It depends.

Michael Shermer is the publisher of Skeptic *magazine (www.skeptic.com), a monthly columnist for* Scientific American *(www.michaelshermer.com), a professor at Claremont Graduate University, and the author of* How We Believe, Why Darwin Matters, *and* The Mind of the Market.

The answer turns on whether one emphasizes *belief* or *God*. Science does not make belief in God obsolete, but it may make obsolete the reality of God, depending on how far we are able to push the science.

On the question of belief in God, the answer is clearly *no*. Surveys conducted in 1916 and again in 1997 found that 40 percent of American scientists said they believe in God, so obviously the practice of science does not make belief in God obsolete for this sizable group. Neither does it for the hundreds of millions of practicing Protestants, Catholics, Jews, and members of other faiths who both believe in God and fully embrace science. Even on one of the most contentious issues in all of science— evolution—a 2005 Pew Research Center poll found that 68 percent of Protestants and 69 percent of Catholics accept the theory.

Of course, reality does not bend to the psychology of belief. Millions of people believe in astrology, ghosts, angels, ESP, and all manner of paranormal phenomena, but that does not make them real. Mormons believe that their sacred text was dictated in an ancient language onto gold plates by the angel Moroni, buried and subsequently dug up near Palmyra, New York by Joseph Smith, who then translated them by burying his face in a hat containing magic stones. Scientologists believe that eons ago a galactic warlord named Xenu brought alien beings from another solar system to Earth, placed them in select volcanoes around the world, and then vaporized them with hydrogen bombs, scattering to the winds their souls (called thetans, in the jargon of Scientology), which attach themselves to people today, leading to drug and alcohol abuse, addiction, depression, and other psychological and social ailments that only Scientology can cure. Clearly the veracity of a proposition is independent of the number of people who believe it.

On the matter of God's existence, the answer to the question slides toward a *yes*, depending on how far we extend the sphere of science into the space of theology. If we apply the methods of science to understanding all of nature, where would God be and how would we detect Him or His actions? That's the rub. God is described by most Western religions as omniscient and omnipotent, the creator of all things visible and invisible, an Intelligent Designer capable of constructing the universe, Earth, life, and us. If scientists go in search of such a being—as intelligent design (ID) creationists claim to be doing—how could we possibly distinguish an omnipotent and omniscient God from an extremely powerful and really smart extra-terrestrial intelligence (ETI)? I call this problem Shermer's Last Law (pace Arthur C. Clarke): *any sufficiently advanced extraterrestrial intelligence would be indistinguishable from God*.

Here is how the problem breaks down. Biological evolution is glacially slow compared to cultural evolution. Because of this, and the fact that the cosmos is very big and the space between the stars is vast, the probability of making contact with an ETI that is technologically equal to or only slightly more advanced than us is virtually nil. If we ever do encounter the representatives of an ETI, they will be so far ahead of us technologically that they will appear as gods to us. Consider something as relatively simple as DNA. We can already engineer genes after only 50 years of genetic science. An ETI that was, say, only 50,000 years ahead of us would surely be able to construct entire genomes, cells, multicellular life, and complex ecosystems. The design of life is, after all, just a technical problem in molecular manipulation. To our bronze-age ancestors who created the great monotheistic religions, the ability to create life was God-like. To our not-so-distant descendents, or to an ETI we might encounter, the ability to create life will be simply a matter of technological skill.

By pursuing a course of scientific inquiry to its natural extension of examining the nature of God, what we will find, if we find anything, is an alien being capable of engineering cells, complex organisms, planets, stars, galaxies, and perhaps even universes. If today we can engineer genes, clone mammals, and manipulate stem cells with science and technologies developed in only the last half century, think of what an ETI could do with 100,000 years of equivalent powers of progress in science and technology. For an ETI who is a million years more advanced than we are, engineering the creation of planets and stars may be entirely possible. And if universes are created out of collapsing black holes—which some cosmologists think is probable—it is not inconceivable that a sufficiently advanced ETI could even create a universe.

What would we call an intelligent being capable of engineering a universe, stars, planets, and life? If we knew the underlying science and technology used to do the engineering, we would call it extraterrestrial intelligence; if we did not know the underlying science and technology, we would call it God.

Science traffics in the natural, not the supernatural. The only God that science could discover would be a natural being, an entity that exists in space and time and is constrained by the laws of nature. A supernatural God would be so wholly Other that no science could know Him.

Does science make belief in God obsolete? Belief, no. God, yes.

Kenneth Miller

Of course not.

Kenneth R. Miller is a professor of biology at Brown University and the author of Finding Darwin's God: A Scientist's Search for Common Ground between God and Evolution *and of* Only a Theory: Evolution and the Battle for America's Soul.

Science itself does not contradict the hypothesis of God. Rather, it gives us a window on a dynamic and creative universe that expands our appreciation of the Divine in ways that could not have been imagined in ages past.

As an outspoken defender of evolution, I am often challenged by those who assume that if science can demonstrate the natural origins of our species, which it surely has, then God should be abandoned. But the Deity they reject so easily is not the one I know. To be threatened by science, God would have to be nothing more than a placeholder for human ignorance. This is the God of the creationists, of the "intelligent design" movement, of those who seek their God in darkness. What we have not found and do not yet understand becomes their best—indeed their only—evidence for faith. As a Christian, I find the flow of this logic particularly depressing. Not only does it teach us to fear the acquisition of knowledge (which might at any time disprove belief), but it also suggests that God dwells only in the shadows of our understanding. I suggest that if God is real, we should be able to find him somewhere else—in the bright light of human knowledge, spiritual and scientific.

And what a light that is. Science places us in an extraordinary universe, a place where stars and even galaxies continue to be born, where matter itself comes alive, evolves, and rises to each new challenge of its richly changing environment. We live in a world literally bursting with creative evolutionary potential, and it is quite reasonable to ask why that is so. To a person of faith, the answer to that question is God.

The English poet Matthew Arnold, at the dawn of the modern era, once lamented that all he could hear of the "Sea of Faith" was its "melancholy, long, withdrawing roar." To some, that melancholy roar is a sound to be savored because faith is a delusion, an obstacle, a stumbling block on the road to progress and enlightenment. It is the antithesis of science.

In this view, God is an explanation for the weak, a way out for those who cannot face the terrible realities revealed by science. The courageous, the bold, the "brights" are those who face that reality and accept it without the comforting crutch of faith by declaring God to be obsolete.

But science itself employs a kind of faith, a faith all scientists share, whether they are religious in the conventional sense or not. Science is built upon a faith that the world is understandable, and that there is a logic to reality that the human mind can explore and comprehend. It also holds, as an article of scientific faith, that such exploration is worth the trouble, because knowledge is always to be preferred to ignorance.

The categorical mistake of the atheist is to assume that God is natural, and therefore within the realm of science to investigate and test. By making God an ordinary part of the natural world, and failing to find Him there, they conclude that He does not exist. But God is not and cannot be part of nature. God is the reason for nature, the explanation of why things are. He is the answer to existence, not part of existence itself.

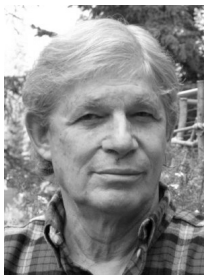
There is great naiveté in the assumption that our presence in the universe is self-explanatory, and does not require an answer. Many who reject God imply that reasons for the existence of an orderly natural world are not to be sought. The laws of nature exist simply because they are, or because we find ourselves in one of countless "multiverses" in which ours happens to be hospitable to life. No need to ask why this should be so or to inquire about the mechanism that generates so many worlds. The curiosity of the theist who embraces science is greater, not less, because he seeks an explanation that is deeper than science can provide, an explanation that includes science, but then seeks the ultimate reason why the logic of science should work so well. The hypothesis of God comes not from a rejection of science, but from a penetrating curiosity that asks why science is even possible, and why the laws of nature exist for us to discover.

It is true, of course, that organized religions do not point to a single, coherent view of the nature of God. But to reject God because of the admitted self-contradictions and logical failings of organized religion would be like rejecting physics because of the inherent contradictions of quantum theory and general relativity. Science, all of science, is necessarily incomplete—this is, in fact, the reason why so many of us find science to be such an invigorating and fulfilling calling. Why, then, should we be surprised that religion is incomplete and contradictory as well? We do not abandon science because our human efforts to approach the great truths of nature are occasionally hampered by error, greed, dishonesty, and even fraud. Why then should we declare faith a "delusion" because belief in God is subject to exactly the same failings?

Albert Einstein once wrote that "the eternal mystery of the world is its comprehensibility." Today, even as science moves ahead, that mystery remains. Is there a genuine place for faith in the world of science? Indeed there is. Far from standing in conflict with it, the hypothesis of God validates not only our faith in science, but our sheer delight at the gifts of knowledge, love, and life.

Stuart Kauffman

No, but only if…



Stuart Kauffman is the director of the Institute for Biocomplexity and Informatics at the University of Calgary and an external professor at the Santa Fe Institute. His most recent book is Reinventing the Sacred: A New View of Science, Reason, and Religion.

we continue to develop new notions of God, such as a fully natural God that is the creativity in the cosmos.

Humans have been worshipping gods for thousands of years. Our sense of God in the Western world has evolved from Abraham's jealous God Yahweh to the God of love of the New Testament. Science and faith have split modern societies just as some form of global civilization is emerging. One result is a retreat into religious fundamentalisms, often bitterly hostile. The schism between science and religion can be healed, but it will require a slow evolution from a supernatural, theistic God to a new sense of a fully natural God as our chosen symbol for the ceaseless creativity in the natural universe. This healing may also require a transformation of science to a new scientific worldview with a place for the ceaseless creativity in the universe that we can call God.

We must "reinvent the sacred," but it is dangerous: it implies that the sacred is invented. For billions of believers this is Godless heresy. Yet how many gods have we worshiped down the eons? It is we who have told our gods what is sacred, not they who have told us. This does not mean that what we deem sacred is not sacred. It means something wonderful: what we deem sacred is our own choice. At this stage in the evolution of humanity, are we ready to take responsibility for what we will claim as sacred, including all of life and the planet? If so, we must also avoid a dangerous moral hegemony and find ways to allow our sense of the sacred to evolve wisely as well. Reinventing the sacred is also likely to anger many who, like myself, do not believe in a supernatural God. For many of us, the very words "God" and "sacred" have become profoundly suspect. We think of Galileo forced to recant his heliocentric views by the Inquisition. We do not want to return to any form of religion that demands that we abandon the truth of the real world. We think of the millions killed in the name of God. We often ignore the solace, union with God, and the orientation for living that religion brings.

I believe that reinventing the sacred is a global cultural imperative. A global race is under way, between the retreat into fundamentalisms and the construction of a safe, shared space for our spirituality that might also ease those fundamentalist fears.

The new scientific worldview is just beginning to become visible. It goes beyond the reductionism of Descartes, Galileo, and Laplace in which all that occurs in the universe is ultimately to be described by physical law. In its place, this new scientific vision includes the emergence of life, and with life, of agency, meaning, value, doing, hence of "ought" and ultimately our moral reasoning. The rudiments of morality are already seen in the higher primates. Evolution, despite the fears of some faithful, is the

first source of morality. While no law of physics is broken, the emergence of all this in the natural evolution of the biosphere cannot be deduced by physics alone.

What we think of as natural law may not suffice to explain nature. We now know, for example, that evolution includes Darwinian preadaptations—unused features of organisms that may become useful in a different environment and thus emerge as novel functionalities, such as our middle ear bones, which arose from the jaw bones of an early fish. Could we prestate all the possible Darwinian preadaptations even for humans, let alone predict them? It would seem unlikely. And if not, the evolution of the biosphere, the economy, and civilization are partially beyond natural law.

If this view holds, then we will undergo a major transformation in our understanding of science. Partially beyond law, we are in a co-constructing, ceaselessly creative universe whose detailed unfolding cannot be predicted. Therefore, we truly cannot know all that will happen. In that case, reason, the highest virtue of our beloved Enlightenment, is an insufficient guide to living our lives. We must reunite reason with our entire humanity. And in the face of what can only be called Mystery, we need a means to orient our lives. That we do, in reality, live in the face of an unknown is one root of humanity's age-old need for a supernatural God.

Yet our Abrahamic God is too narrow a stage for our full human spirituality. In the Old Testament, this God created the world and all its creatures for the benefit of humanity. How self-serving and limiting a vision of God. How much vaster are our lives understood as part of the unfolding of the entire universe? We are invited to awe, gratitude, and stewardship. This planet and this life are God's work, not ours. If God is the creativity in the universe, we are not made in God's image. We too are God. We can now choose to assume responsibility for ourselves and our world, to the best of our limited wisdom, together with our most powerful symbol: God, as the creativity in the natural universe.

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