



Fact and Faith: why science and spirituality are not incompatible

Physicist Alan Lightman's purely scientific view of the world changed one evening looking at the stars in Maine – here's why he now calls himself a spiritual atheist.



By [Alan Lightman](#)

Published: April 5, 2018 at 11:00 pm

For many years my wife and I have spent our summers on an island in Maine. It's a small island, only about 30 acres in size, and there are no bridges or ferries connecting it to the mainland. Consequently, each of the six families who live on the island has their own boat. My story

concerns a particular summer night, in the wee hours, when I was out in my boat coming to my home on the island. I had just rounded the south end of the island and was carefully motoring towards my dock. No one was out on the water but me. It was a moonless night, and quiet, and the sky vibrated with stars. Taking a chance, I turned off my running lights, and it got even darker. Then I turned off my engine. I lay down in the boat and looked up. A very dark night sky seen from the ocean is a mystical experience. After a few minutes, my world had dissolved into that star littered sky. The boat disappeared. My body disappeared. And I found myself falling into infinity. A feeling came over me. I felt an overwhelming connection to the stars, as if I were part of them. And the vast expanse of time – extending from the far distant past long before I was born and then into the far distant future long after I would die – seemed compressed to a dot. I felt connected not only to the stars but to all of nature, and to the entire cosmos. I felt a merging with something far larger than myself, a grand and eternal unity. After a time, I sat up and started the engine again. I had no idea how long I'd been lying there looking up.

I've worked as a physicist for many years, and I have always held a purely scientific view of the world. By that, I mean that the Universe is made of material and nothing more, that the Universe is governed exclusively by a small number of fundamental forces and laws, and that all composite things in the material world, including humans and stars, eventually disintegrate and return to their component parts. Even at the age of 12 or 13, I was impressed by the logic and materiality of the world. When I was a teenager, I built my own laboratory. Among other projects, I began making pendulums by tying a fishing weight to the end of a string. I'd read in *Popular Science* that the time for a pendulum to make a complete swing was proportional to the square root of the length of the string. With the help of a stop watch and ruler, I verified this wonderful law. Logic and pattern. Cause and effect. As far as I could tell, everything was subject to analysis and quantitative test. I saw no reason to believe in a supernatural being. That's still pretty much my view.

Yet after my experience in that boat in Maine many years later, I understood the powerful allure of the spiritual world, the nonmaterial and the ethereal, things that are all encompassing, unchangeable, eternal, sacred. At the same time and perhaps paradoxically, I

remained a scientist. I remained committed to the material world. I would call myself a spiritual atheist. So, how does a spiritual atheist reconcile science and spirituality, or science and religion?

Science and religion differ profoundly in the way that truths are discovered. In religion and theology, these truths and beliefs seem to have two origins. First are the sacred books, such as the *Bible*, the *Qur'an*, the *Vedas*, the *Pali Canon*. Believers have faith that these books contain the true word of God or of special enlightened beings. If so, the authority of the teachings derives from the infinite wisdom associated with those beings. Since God, as conceived of by all earthly religions, exists outside the physical world (but may enter at times), science cannot prove or disprove the existence of God.

I respect the notions of God and other divine beings. However, I insist on one thing. I insist that any statements made by such beings about the *material world*, including statements recorded in the sacred books, must be subject to the experimental tests of science. In my view, the truth of such statements cannot be assumed. They must be tested and revised or rejected as needed. The spiritual world has its own domain. The physical world should be the province of science. In the physical world, the laws of science cannot apply to some phenomena but not to others, or apply at some times but not at other times. It is not OK with me if the principles of aerodynamics work on some of my airplane flights but not on others.

As a corollary to the above ideas, a God who actively intervenes in the physical world and performs "miracles" – that is, events that are not explainable in material terms even in principle – would be incompatible with science. In practice, the incompatibility is complicated. It is not as simple as science versus religion. The majority of religious nonscientists accept the value of science. On the other side of the coin, there are individual scientists who accept the notion of an interventionist God. Such people believe that some events in the physical world cannot be analyzed by the methods of science or may even contradict science. Ian Hutchinson, professor of nuclear science and engineering at MIT, told me: "The Universe exists because of God's actions. What we call the "laws of nature" are upheld by God, and they are our description of the *normal way* in which God orders the world. I do think miracles take place today and have taken place over history. I take the view that

science is not all the reliable knowledge that exists. The evidence of the resurrection of Christ, for example, cannot be approached in a scientific way.”

The second origin of religious and spiritual truth is more personal, what one might call the “transcendent experience.” The experience I had looking up at the stars that night in Maine was a transcendent experience.

It was an extremely personal experience, and no one could refute the authority and validity of that experience. Furthermore, that experience is not easily analyzable by science. You could hook up all hundred billion of my neurons to a giant computer and read out all the electrical and chemical data during that experience, and you would not have come close to understanding the experience in the way that you can understand the reason why the sky is blue or the orbits of planets. The transcendent experience does not require the existence of God. It is the sum of such experiences that constitutes my spiritual universe.

Let’s turn now to scientific knowledge. Scientific knowledge is of two types: knowledge of the properties of physical objects, like the size and mass of a raindrop, and knowledge of what we call “laws of nature.” One of the first human beings to formulate a law of the physical world was Archimedes, more than two thousand years ago. Archimedes’ “law of floating bodies”:

Any solid lighter than a fluid will, if placed in the fluid, be so far immersed that the weight of the solid will be equal to the weight of the fluid displaced.

We can speculate on how Archimedes arrived at his law. At the time, balance scales were available for weighing goods in the market. The scientist could have first weighed an object, then placed it in a rectangular container of water and measured the rise in height of the water. The area of the container multiplied by the height of the rise would give the volume of water displaced. Finally, that volume of water could be placed in another container and weighed. Undoubtedly, Archimedes would have performed this exercise many times with different objects before devising the law. He probably also performed the experiment with other liquids, like mercury, to discover the generality of the law.

All laws of the physical world are like Archimedes' law. They are precise. They are quantitative. And they are general, applying to a large range of phenomena. Most importantly, all laws of nature discovered by scientists are considered *provisional*. They are considered to be approximations to deeper laws. They are constantly being revised as new experimental evidence is found or new (and testable) ideas are proposed.

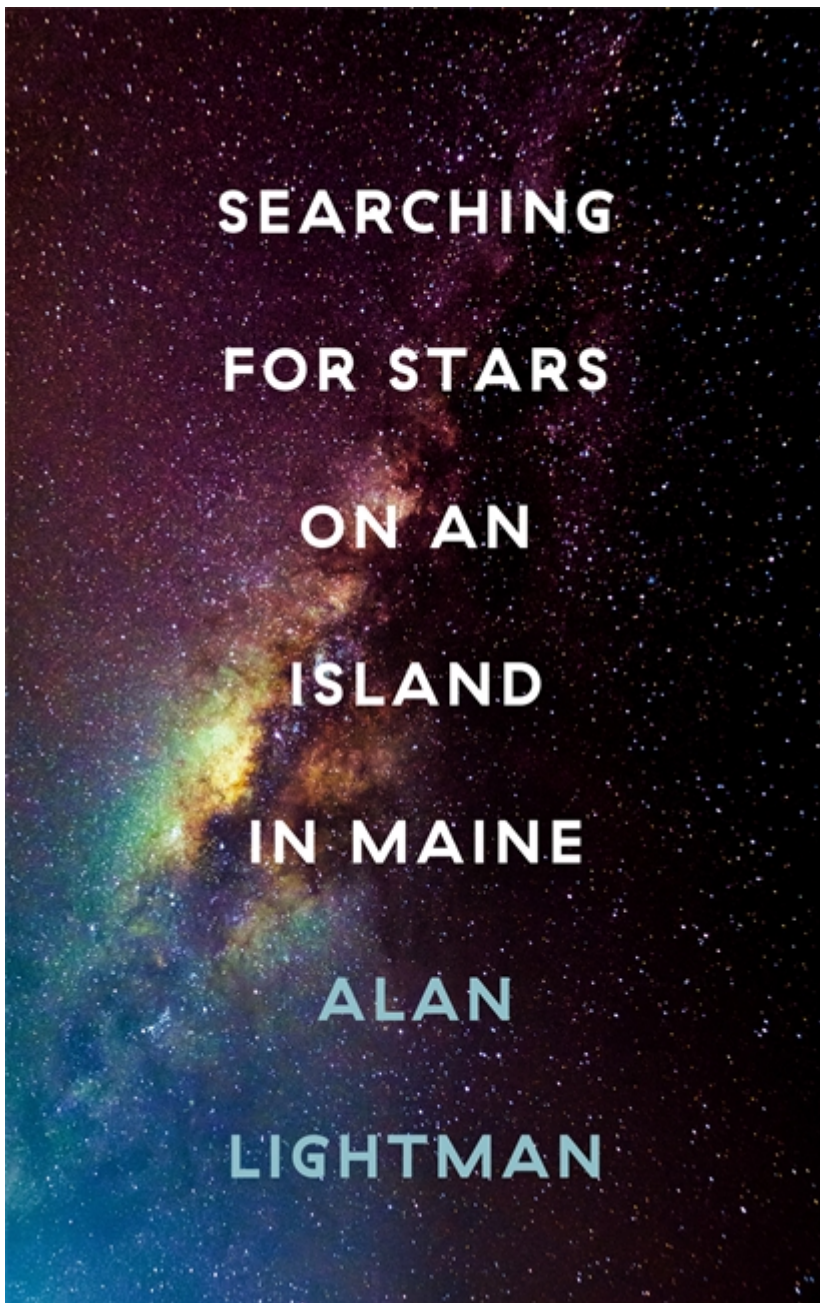
It is in the process of *revision*, in fact, that we see the strongest differences between the methods and beliefs of science and religion. Everything that we know about the physical world – the domain of science – is subject to revision. Everything must be tested and proved. The knowledge of religion, coming from either the divine authority of the sacred books or from the irrefutable personal transcendent experience, is not subject to revision. It is not an approximation. It is certain. And it cannot be proved. It must be taken on faith. Paradoxically, all of the knowledge of religion is considered certain, and all of the knowledge of science is considered uncertain. Still, science has done pretty well with its uncertainties and approximations. The approximations of science have been good enough to give us antibiotics and smartphones and rocket ships that can land humans on the Moon.

Science demands proof for what it believes, even though those beliefs are constantly changing as new experimental evidence becomes available. There is something that scientists believe in that cannot be proven. It is a principle I call the Central Doctrine of Science: The physical world is *lawful*. All properties and events in the physical Universe are governed by laws, and those laws hold true at every time and place in the Universe. Graduate students in science absorb this belief through every pore of their skin. It is an unconscious but powerful commitment.

I call the Central Doctrine of Science a doctrine because, despite its success in the past, it cannot be proved. It must be accepted as a matter of faith. No matter how lawful and logical the material cosmos has been up to now, we cannot be certain that something illogical, unexplainable, and fundamentally unlawful might happen tomorrow. Our faith in the Doctrine is so strong that when we find physical phenomena that cannot be explained in terms of current laws, we attempt to revise those laws rather than abandon our belief in a lawful

Universe. When it was found in the nineteenth century that the orbit of Mercury could not be completely explained in terms of Newton's law of gravity, scientists did not attribute the discrepancy to an unsolvable mystery or to the breakdown of order in the physical world or to the intervention of a whimsical god. Instead, they recognized a physical problem that required a more advanced physical understanding. That more advanced understanding was provided by Einstein's theory of gravity. In fact, I cannot imagine *any* event in the material world that would cause most scientists to label the event a miracle, unexplainable by science. If a wheelbarrow suddenly began to float, a scientist would look for magnetic levitators or, if necessary, assign the phenomenon to some new kind of force. But a natural and lawful force, not a supernatural force.

About one thing I am certain. Science and religion are both here to stay. And I would suggest that the contrast between the materiality of the physical world and the immateriality of the spiritual world goes deeper than religion and science, into the dualism and complexity of human existence. We are idealists and we are realists. We are dreamers and we are builders. We are experiencers and we are experimenters. We long for certainties, yet we ourselves are full of the ambiguities of the *Mona Lisa* and the *I Ching*. Our yearning for the unprovable ethereals of the spiritual world and, at the same time, our commitment to the physical world reflects a necessary tension in how we relate to the cosmos and relate to ourselves. I have gone on that fraught journey myself. It is a winding and difficult path, with boundaries sometimes in clear view and sometimes dissolving into the mist. It is a journey sometimes of contradictions. It is part of being human.



Searching for Stars on an Island in Maine by Alan Lightman is out now (£12.99, Corsair)

Follow Science Focus on [Twitter \(https://twitter.com/sciencefocus\)](https://twitter.com/sciencefocus), [Facebook \(https://www.facebook.com/sciencefocus\)](https://www.facebook.com/sciencefocus), [Instagram \(https://www.instagram.com/bbcsciencefocus/\)](https://www.instagram.com/bbcsciencefocus/) and [Flipboard \(https://flipboard.com/@sciencefocus\)](https://flipboard.com/@sciencefocus).

Share this article

[Alan Lightman](#)