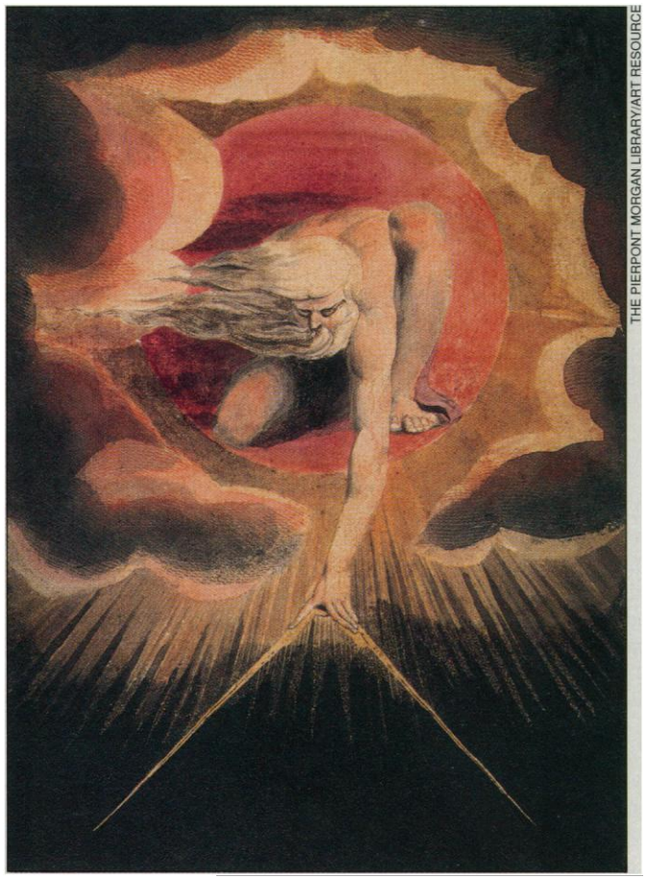
Science and God: A Warming Trend?

Can rational inquiry and spiritual conviction be reconciled? Although some scientists contend that the two cannot coexist, others believe they have linked destinies

"Keep that which is committed to thy trust, avoiding profane and vain babblings and oppositions of science falsely so called," the New Testament cautions in one of the Bible's rare references to science.* This verse helped set the tone for 2000 years of antagonism between scientific inquiry and spiritual conviction—a history of strife stretching from the religious persecution of Baruch Spinoza and Galileo Galilei through the 1860 boast by the biologist Thomas Huxley, the first popularizer of Darwinism, that "extinguished theologians lie about the cradle of every science, as strangled snakes beside that of Hercules."

Maybe it's the greenhouse effect, but recent signs point toward a thaw in the ice between science and faith. In the religion camp, the Vatican has at last formally apologized for its arrest of Galileo, while last fall Pope John Paul II gingerly acknowledged evolution to be "more than just a hypothesis." Later this year, the Fuller Theological Seminary in Pasadena, California, the intellectual hub of conservative Protestant denominations, will publish a book acknowledging a natural origin for the human family tree. And increasingly, spiritual thinkers are endorsing the proposition of German theologian Dietrich Bonheoffer, who wrote in the early 1940s that growing understanding of the natural world simply means people need no longer look to the church for answers to questions they can now answer for themselves.



THE PIERPONT MORGAN LIBRARY/ART RESOURCE

***God Creating the Universe*, William Blake (1757–1827)**

On the research side, both the National Academy of Sciences and the American Association for the Advancement of Science (AAAS, which publishes this magazine) have launched projects to promote a dialogue between science and religion. New institutions aimed at bridging the gap have been formed, including the Chicago Center for Religion and Science, and the Center for Theology and Natural Sciences in Berkeley, California. Universities such as Cambridge and Princeton also have established professorships or lectureships on the reconciliation of the two camps.

Another sign of easing tensions is scientists' increasing willingness to discuss their spiritual beliefs in public. Nobel Prize winner Charles Townes (see sidebar) devoted 30 pages to religious questions in his 1995 book on physics, *Making Waves*. Sir John Houghton, former head of the scientists' working group of the Intergovernmental Panel on Climate Change, is a devout believer who in 1994 published a book on global warming not with a university press, but a religious house. Houghton recently discussed his faith during a speech at a scientific meeting, and says "I expected to be attacked, but the reception was warm, which might not have happened a few years ago." God talk has come into vogue among some scientists, with theoretical physicist Stephen Hawking of Cambridge University writing that big-bang cosmology may reveal "the mind of God," and astrophysicist George Smoot of Lawrence Berkeley National Laboratory in California suggesting that background radiation represents "the handwriting of God." Strikingly, a 1997 poll by Edward Larson of the University of Georgia, Athens, published in *Nature*, has found that about 40% of working physicists and biologists hold strong spiritual beliefs.

Thorny ethical questions raised by discoveries in cloning, genetic testing, and other fields are prompting both sides to seek a dialogue. But science and the church are impelled by pragmatic considerations as well. Seeking adherents from a progressively better educated population, mainstream faith must show it can accommodate scientific thought. Similarly, says geneticist Francisco Ayala of the University of California, Irvine, who spearheaded the AAAS project, it is vital that American scientists "dispel" the commonly held belief that science and religion cannot coexist. "A principal reason for low scientific proficiency in the United States is that students assume that if they get involved in science courses, teachers will attempt to destroy their religious beliefs," Ayala contends.

Arthur Peacocke, a former biochemist and Cambridge University dean who left research to become a minister—and who is now warden emeritus of the Society of Ordained Scientists, which has nearly 3000 members worldwide—has pointed out that in the 19th century the scientific establishment took a combative stance toward religion in order to secure independence in hiring and funding decisions, because many universities were then closely affiliated with churches. Today, Ayala thinks, a friendlier position toward religion may help protect those same jobs: "The financial structure of American research depends on the goodwill of a body politic that values religion. We are not wise to have the body politic seeing science as antagonistic to spiritual commitment."

Signs of thaw hardly mean, of course, that

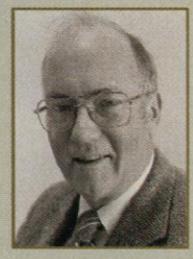
* 1 Timothy 6:20, King James translation.

Of Lasers and Prayer

"It is not uncommon for good scientists to be believers," says a scientist clearly in the "good" category, physicist Charles Townes, who in 1964 shared with two Russian researchers the Nobel Prize for the invention of the laser. Townes, who has also been provost of the Massachusetts Institute of Technology, is a lifelong churchgoer and a devout, although "nondoctrinaire," believer. He prays daily and "accepts the Bible as a record of history," one with "no strong conflict with contemporary science, unless you insist on taking Scripture literally."

Born in Greenville, South Carolina, Townes graduated from the California Institute of Technology in 1939 and went to work for Bell Laboratories just as the lab was shifting its focus from research to applied engineering for World War II. Assigned to a hush-hush project to develop combat radar, Townes irked superiors by suggesting that the wavelength they had chosen would be absorbed by water vapor, neutralizing the device in the humid air of the Pacific theater. He turned out to be right, and the early American combat radars for World War II were of limited value. "This got me thinking about the relationship between microwaves and molecules, a field that was practically nonexistent," Townes says.

"Science wants to know the mechanism of the universe, religion the meaning. The two cannot be separated."
–Charles Townes



After the war, Townes began to explore microwave spectroscopy, aided by a storage room stuffed with equipment from failed radar projects. Eventually he realized that tightly controlled microwaves could be produced by stimulating molecules, such as ammonia, which led to his discovery of the maser. Townes and a Bell colleague, Arthur Schawlow, then applied the same principle to light and won the first U.S. patents on the laser. Townes says God was a "source of strength" during these historic discoveries, aiding him at times to overcome self-doubt. Later Townes delved into radio and infrared astronomy, helping establish that organic compounds are present in large volumes in space. In 1981, he chaired the commission that persuaded President Reagan not to field large numbers of the highly destructive MX missile. Townes says that before each commission meeting, he prayed for guidance. Today, at 82, Townes is a University Professor emeritus at the University of California, Berkeley, and continues to supervise astronomy graduate students.

Townes does not see science and faith as opposing forces. "Science wants to know the mechanism of the universe, religion the meaning. The two cannot be separated," he says. "Many scientists feel there is no place in research for discussion of anything that sounds mystical. But it is unreasonable to think we already know enough about the natural world to be confident about the totality of forces. That is more illogical than any claim of illogic made against faith."

Townes believes science and religion are about to enter a cycle of reconciliation, as researchers find themselves up against seemingly unanswerable questions, among them what triggered the big bang and why, of many possible outcomes, quantum cosmology seems to favor those circumstances that lead to a stable universe. "Physicists are running into stone walls of things that seem to reflect intelligence at work in natural law," he asserts. "Biologists [also] will hit stone walls if they fail to find explanations for essential effects like sudden jumps in neurological sophistication."

Townes even uses the unfashionable term "design," despite the main current of 20th century thought, which views life and the universe as existing independently of any divine influence. "The more we know about the cosmos and evolutionary biology, the more they seem inexplicable without some aspect of [intelligent] design," Townes asserts. "And for me that inspires faith." –G.E.

the ice age has ended. Dating roughly to the 1859 publication of *The Origin of Species*, relations between science and religion have been seen by many as a hostile exercise in which one side's gain is the other's loss. Even today, some members of the scientific establishment have seemed nearly as illiberal toward religion as the church once was to science. In 1990, for instance, *Scientific American* declined to hire a columnist, Forrest Mims, after learning that he had religious doubts about evolution. When the physicist Leon Lederman titled his 1994 book about the Higgs boson, *The God Particle*, Robert Park of the American Physical Society criticized him for "pandering" to people's yearnings for a glimpse of God. (Park had missed the fact that the title was in jest.)

The creationist sideshow

In many cases, such confrontations between science and spirituality can be traced to scientists' fears of creationism, which many confuse with mainstream belief. But "flood" creationism, which attempts to deny both evolution and the basic findings of geology, is preached only by a few subsets of the monotheist denominations. Catholicism, for instance, is today conservative but not creationist, while mainstream Protestant denominations and most of Judaism and Islam long ago stopped making claims such as Earth was only recently created. "Creationism is an incredible pain in the neck, neither honest nor useful, and the people who advocate it have no idea how much damage they are doing to the credibility of belief," says physicist Houghton, who has written articles on the value of prayer.

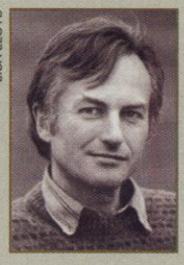
Still, because the political wing of American creationism generates noise well out of proportion to its numbers, some scientists have felt compelled to strike back with blanket condemnations of spirituality. A 1981 statement by the National Academy of Sciences, which says "religion and science are separate and mutually exclusive realms of human thought," was, by many accounts, made mainly as a preemptive strike against creationism. But to some members of the academy, including Townes, it seemed to foreclose constructive exchanges between science and faith.

Fear of association with creationism can spill over into personal relations as well. Anne Foerst, a postdoctoral student in theology at Harvard Divinity School, who is teaching a course this fall on "God and Computers" in the Electrical Engineering and Computer Science Department at the Massachusetts Institute of Technology, says, "When I started on the project, there was a lot of prejudice. The technical types didn't want me around; they would look at me and say, 'She must be a crazy creationist.' "

Because creationists often fail in attempts to force their doctrine upon schools, their most damaging effect may be to make belief in higher purpose appear antirational. "In my field, biology, because of the creationists the standard assumption is that anyone who has faith has gone soft in the head. When scien-

Of Genes and Meaninglessness

Richard Dawkins, the acclaimed Oxford zoologist who has emerged as contemporary science's leading opponent of spiritual thought, sees life this way: "The universe we observe has precisely the properties we should expect if there is at bottom no design, no purpose, no evil and no good, nothing but pointless indifference." And that was on one of his sunnier days.



LISA LLOYD

"Only the scientifically illiterate accept the 'why' question where living creatures are concerned."
–Richard Dawkins

Born in Nairobi in 1941, the son of an official of the old British Colonial Service, Dawkins has spent nearly all his adult life at Oxford as a student or instructor. His much-noted book *The Selfish Gene*, published in 1976, argued that the fundamental struggle of evolution takes place not among individuals or species but at the level of the chromosome. Organisms serve genes, rather than the other way around: "We are machines for propagating DNA. ... It is every living object's sole reason for living," he has written. Even consciousness, however interesting, has no larger significance: Human minds are just an evolutionary adaptation genes use to advance their interests. Dawkins also has produced several popular defenses of the theory of natural selection, including the unusually well-written 1986 book *The Blind Watchmaker*, and he has starred in science specials for BBC television. Two years ago, the American software tycoon Charles Simonyi endowed an Oxford chair for Dawkins in "public understanding of science."

The determinism of the selfish-gene hypothesis has come to inform Dawkins's views on spiritual matters as well, which he has written and spoken about extensively, including a 1992 speech called "A Scientist's Case Against God." Scientific inquiry, he argues, has shown higher purpose to be an illusion. "In a universe of selfish genes, blind physical forces and genetic replication, some people are going to get hurt, others are going to get lucky, and you won't find any rhyme or reason for it," Dawkins wrote in his 1995 book *River Out of Eden*. People who believe life came into being for a purpose are not only mistaken, but ignorant: "Only the scientifically illiterate accept the 'why' question where living creatures are concerned." There is no evidence to support religion, and "nowadays the better educated admit it," he said in his "against God" speech.

Today Dawkins pronounces faith a dead issue. In declining to be interviewed for this article, he said he now finds religion "very boring and not worth talking about." –G.E.

tists like me admit they are believers, the reaction from colleagues is 'How did this guy get tenure?' " says Francis Collins, a geneticist and director of the National Human Genome Research Institute at the National Institutes of Health.

Collins, who co-directed the team that found the gene for cystic fibrosis, has worked in an African missionary hospital and describes himself as a "serious" Christian. He does not hesitate to find religious implications in his work. "When something new is revealed about the human genome," Collins says, "I experience a feeling of awe at the realization that humanity now knows something only God knew before. It is a deeply moving sensation that helps me appreciate the spiritual side of life, and also makes the practice of science more rewarding. A lot of scientists really don't know what they are missing by not exploring their spiritual feelings."

Collins's mere reference to the "spiritual side of life" is enough to make some researchers blanch. "In postmodern academic culture, the majority of scientists think that to be taken seriously they must scoff at faith," contends David Scott, a former Berkeley physicist who is now chancellor of the University of Massachusetts, Amherst. "Yet the truly great scientists were not afraid to ponder larger religious aspects of their work. They found this intellectually engaging," Scott notes. Newton, for instance, was fascinated by biblical prophecy. He argued that the more-or-less uniform zodiac of the planets did not occur by chance and showed an aesthetic sense on the part of a Maker. Werner Heisenberg drew on Eastern mysticism to help develop uncertainty theory. Erwin Schrödinger considered the inherent beauty of theorems a possible indication of larger influence in natural law.

Room for God

Is science, as many researchers believe, intrinsically at odds with religious faith? The idea that scientific inquiry will disprove faith unless researchers uncover physical evidence of the divine can be traced back at least to the 18th century rationalist Denis Diderot, who in 1769 wrote that study of something as simple as a chicken's egg can topple "every church or temple in the world."

Indeed, some contemporary scientists contend that science has already supplanted God. In his book *A Brief History of Time*, Hawking says that the big-bang model suggests the universe was generated entirely through autonomous forces. Lederman, who won the Nobel Prize in physics in 1988, says that science has turned up no proof of the divine, and although "at the edges of science there is the unknown, and that leaves room for a creator, there is a lot less room than 50 years ago." In sum, he says, "The space available for God appears to be shrinking."

James Larrick, director of the Palo Alto Institute of Molecular Medicine in Mountain View, California, expresses a common scientists' refrain when he notes, "Just as people came to understand that God does not cause lightning, gradually society will understand that consciousness and other things attributed to the almighty arise naturally, too." The zoologist Richard Dawkins, successor to Huxley as science's chief gladiator against religion (see sidebar), now goes so far as to say that anyone who believes in a creator God is "scientifically illiterate."

Yet if the space available for God is shrinking, this hasn't made much of a dent in the proportion of scientists who believe in God. The results of Larson's poll, in which nearly 40% identified themselves as believers, almost exactly matched those of a similar poll conducted in 1916. Some prominent scientists also argue strongly that science still contains plenty of room for God. Christian de Duve, a molecular biologist at the University of Louvain in Belgium, who won a Nobel Prize in 1974, says, "Many of my scientist friends are violently atheist, but there is no sense in which atheism is enforced or established by science. Disbelief is just one of many possible personal views." Joshua Lederberg, an evolutionary biologist at Rockefeller University in New York City and 1958 Nobel winner, says, "Nothing so far disproves the divine. What is incontrovertible is that a religious impulse guides our motive in sustaining scientific inquiry. Beyond that, it's

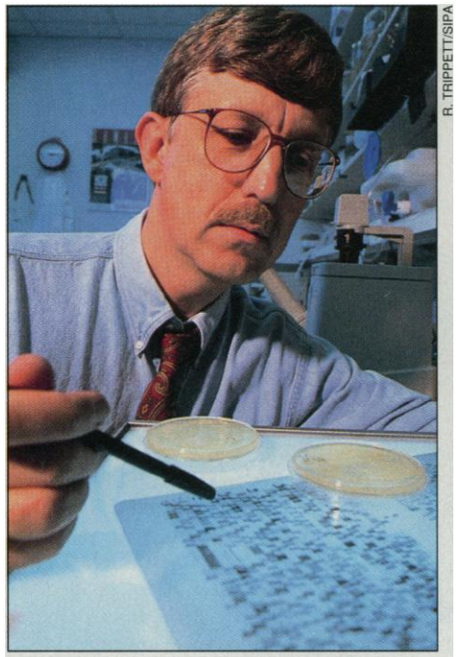
all speculation."

John Polkinghorne, president of Queens College at Cambridge University, a physicist for 25 years before becoming an Anglican priest, notes that "the trend is to look for God in dramatic discontinuities in physics or biology, and if none are found, to declare religion vanquished. But God may act in subtle ways that are hidden from physical science." Reverend Christopher Carlisle, a chaplain for the University of Massachusetts, Amherst, adds that it is not at all clear that rational inquiry is capable of detecting larger purpose to the universe: "The lab only measures what's in the lab. It is tautological to say that you do not find the divine when you test for the physical." He cites as an example the spiritual paradox that the more you give of yourself the more you gain. "What laboratory test could detect that? Yet I can show you human beings where the effect is unquestionably present and acutely moving."

Some contemporary believers even argue that scientific advances might be seen as dovetailing with biblical accounts. When astrophysicist and Catholic abbé Georges Lemaître first proposed in 1927 that the universe began with the detonation of a "primordial atom," the idea later dubbed the big bang, many scientists opposed the theory in part because it seemed overly reminiscent of the Genesis story of a discrete moment of creation. In addition, the troubling enigma of what might have sparked the big bang seemed to fit right in with Aristotle's contention that temporal existence was set in motion by a supernatural "unmoved mover." Today, some theologians are warming to the big-bang theory as they become aware of its spiritual parallels.

The fact that the universe exhibits many features that foster organic life—such as precisely those physical constants that result in planets and long-lived stars—also has led some scientists to speculate that some divine influence may be present. Although some theorists, such as Andrei Linde of Stanford University, have argued that very large or even infinite numbers of universes have existed or now exist, and it is only by chance ours can support life, other researchers find such thinking on the fringe of plausibility. Charles Townes says, "To get around the anthropocentric universe without invoking God may force you to extreme speculation about there being billions of universes. [This] strikes me as much more freewheeling than any of the church's claims."

The case for a Maker is further strengthened, in the eyes of some researchers, by the fact that science has not yet accounted for the origin of life. Evolutionary biology can explain adaptation and descent, notes Belgium's de Duve, but so far there's no scientific consensus on how natural selection and other living processes began in the first place. Until such time as biologists can demonstrate an entirely material origin for life, the divine will remain a contender. "I am unaware of any irreconcilable conflict between scientific knowledge about evolution and the idea of a creator God," Collins says. "Why couldn't God have used the mechanism of evolution to create?"



R. TRIPPETT/SIPA

"When something new is revealed about the human genome, I experience a feeling of awe at the realization that humanity now knows something only God knew before."

–Francis Collins

For some skeptical scientists, the fact that natural selection and other laws of nature seem to operate impersonally deals a blow to arguments for the existence of higher powers. "The more the universe seems comprehensible, the more it also seems pointless," wrote physicist Steven Weinberg of the University of Texas, Austin, who won a Nobel in 1979, to conclude his 1977 book *The First Three Minutes*. Weinberg's line has been frequently cited on both sides of the science-belief controversy. Today Weinberg says, "I'm not taking that line back, but I did add that people can grant significance to life by loving each other, investigating the universe, and doing other worthwhile things." As for advances in science, Weinberg thinks, "What we are learning about physical law seems coldly impersonal and gives no hint of meaning or purpose."

But even cold and mechanical natural laws could be capable of supporting profound purpose, says Alan Dressler, an astronomer at the Observatories of the Carnegie Institution in Pasadena, California. When researchers say cosmology reveals the "mind" or "handwriting" of God, they are ascribing to the divine what ultimately may be the lesser aspect of the universe—its physical structure. Although that is important to know about, it pales before the meaning of human existence, Dressler believes. He adds, "Many scientists seem on a crusade to run down human worth, because they think this will destroy the arrogance that leads to religious intolerance. But it also makes science soulless. Much of the antiscience mood in the country today stems from the perception that by venerating meaninglessness, science has become inhuman."

According to Dressler, science faces a stiff challenge: "People have given up the old belief that humanity is at the physical center of the universe, but must come back to believing that we are at the center of meaning." That, of course, is precisely the ground that religion also seeks to occupy. As Scott, the university chancellor, puts it: "The two leading disciplines that still look to truth as the essence of the human quest are science and religion." They were once joined in that endeavor by the humanities, Scott says, but he argues that many humanities departments are now dominated by postmodernists who maintain that nothing is "true"—there are no absolutes, only constructs governed by cultural determinism.

The Society of Ordained Scientists' Peacocke sees it similarly: "Science and religion are the intellectual forces that do not reject the dreams of the Enlightenment and do not think all ideas reduce to nihility under a social contextual critique. Long after postmodern intellectual fads have exhausted themselves, science and religion will still be here and still be searching."

Perhaps the fact that the two schools of thought have so often been at each other's throats stems from mutual recognition of their linked destinies, and their joint commitment to the idea that the truth is out there. Rather than being driven ever farther apart, tomorrow's scientist and theologian may seek each other's solace.

–Gregg Easterbrook

Gregg Easterbrook is a contributing editor for The Atlantic Monthly *and author of the forthcoming book* Beside Still Waters: Faith and Reason in an Age of Doubt.