Is God in Our Genes?

A provocative study asks whether religion is a product of evolution. Inside a quest for the roots of faith

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It's not hard to see the divinity behind the water temples that dot the rice terraces of Bali. It's there in the white-clad high priest presiding in the temple at the summit of a dormant volcano. It's there in the 23 priests serving along with him, selected for their jobs when they were still children by a bevy of virgin priestesses.

It's there in the rituals the priests perform to protect the island's water, which in turn is needed to nurture the island's rice.

If the divine is easy to spot, what's harder to make out is the banal. But it's there too—in the meetings the priests convene to schedule their planting dates and combat the problem of crop pests; in the plans they draw up to maintain aqueducts and police conduits; in the irrigation proposals they consider and approve, the dam proposals they reject or amend. "The religion has a temple at every node in the irrigation system," says David Sloan Wilson, professor of biology and anthropology at Binghamton University in Binghamton, N.Y. "The priests make decisions and enforce the code of both religion and irrigation."

Ask true believers of any faith to describe the most important thing that drives their devotion, and they'll tell you it's not a thing at all but a sense—a feeling of a higher power far beyond us. Western religions can get a bit more doctrinaire: God has handed us laws and lore, and it's for us to learn and practice what they teach. For a hell-raising species like ours, however—with too much intelligence for our own good and too little discipline to know what to do with it—there have always been other, more utilitarian reasons to get religion. Chief among them is survival. Across the eons, the structure that religion provides our lives helps preserve both mind and body. But that, in turn, has raised a provocative question, one that's increasingly debated in the worlds of science and religion: Which came first, God or the need for God? In other words, did humans create religion from cues sent from above, or did evolution instill in us a sense of the divine so that we would gather into the communities essential to keeping the species going?

Just as a hurricane spins off tornadoes, this debate creates its own whirlwind of questions: If some people are more spiritual than others, is it nature or nurture that has made them so? If science has nothing to do with spirituality and it all flows from God, why do some people hear the divine word easily while others remain spiritually tone-deaf? Do such ivied-hall debates about environment, heredity and anthropology have any place at all in more exalted conversations about the nature of God?

Even among people who regard spiritual life as wishful hocus-pocus, there is a growing sense that humans may not be able to survive without it. It's hard enough getting by in a fang-and-claw world in which killing, thieving and cheating pay such rich dividends. It's harder still when there's no moral cop walking the beat to blow the whistle when things get out of control. Best to have a deity on hand to rein in our worst impulses, bring out our best and, not incidentally, give us a sense that there's someone awake in the cosmic house when the lights go out at night and we find ourselves wondering just why we're here in the first place. If a God or even several gods can do all that, fine. And if we sometimes misuse the idea of our gods—and millenniums of holy wars prove that we do—the benefits of being a spiritual species will surely outweigh the bloodshed.

Far from being an evolutionary luxury then, the need for God may be a crucial trait stamped deeper and deeper into our genome with every passing generation. Humans who developed a spiritual sense thrived and bequeathed that trait to their offspring. Those who didn't risked dying out in chaos and killing. The evolutionary equation is a simple but powerful one.

Nowhere has that idea received a more intriguing going-over than in the recently published book *The God Gene: How Faith Is Hardwired into Our Genes* (Doubleday, 2004; 256 pages), by molecular biologist Dean Hamer.

Chief of gene structure at the National Cancer Institute, Hamer not only claims that human spirituality is an adaptive trait, but he also says he has located one of the genes responsible, a gene that just happens to also code for production of the neurotransmitters that regulate our moods. Our most profound feelings of spirituality, according to a literal reading of Hamer's work, may be due to little more than an occasional shot of intoxicating brain chemicals governed by our DNA. "I'm a believer that every thought we think and every feeling we feel is the result of activity in the brain," Hamer says.

"I think we follow the basic law of nature, which is that we're a bunch of chemical reactions running around in a bag."

Even for the casually religious, such seeming reductionism can rankle. The very meaning of faith, after all, is to hold fast to something without all the tidy cause and effect that science finds so necessary. Try parsing things the way geneticists do, and you risk parsing them into dust. "God is not something that can be demonstrated logically or rigorously," says Neil Gillman, a professor of Jewish philosophy at the Jewish Theological Seminary in New York City. "[The idea of a God gene] goes against all my personal theological convictions." John Polkinghorne, a physicist who is also Canon Theologian at England's Liverpool Cathedral, agrees: "You can't cut [faith] down to the lowest common denominator of genetic survival. It shows the poverty of reductionist thinking."

Is Hamer really guilty of such simplification? Could claims for a so-called God gene be merely the thin end of a secular wedge, one that risks prying spirituality away from God altogether? Or, assuming the gene exists at all, could it somehow be embraced by both science and religion, in the same way some evolutionists and creationists—at least the less radicalized ones—accept the idea of a divinely created universe in which evolving life is simply part of the larger plan? Hamer, for one, hopes so. "My findings are agnostic on the existence of God," he says. "If there's a God, there's a God. Just knowing what brain chemicals are involved in acknowledging that is not going to change the fact."

Whatever the merits of Hamer's work, he is clearly the heir of a millenniums-long search for the wellsprings of spirituality. People have been wrestling with the roots of faith since faith itself was first codified into Scripture. "[God has] set eternity in the hearts of men," says the Book of Ecclesiastes, "yet they cannot fathom what God has done from beginning to end."

To theologians in the 3rd century B.C., when Ecclesiastes is thought to have been written, that passage spoke to the idea that while all of us are divinely inspired to look for God, none of us are remotely capable of fully comprehending what we are seeking. Scientists in the 21st century may not disagree, provided that "hearts of men" is replaced with "genes of men." The key for those researchers is finding those genes.

Hamer began looking in 1998, when he was conducting a survey on smoking and addiction for the National Cancer Institute. As part of his study, he recruited more than 1,000 men and women, who agreed to take a standardized, 240-question personality test called the Temperament and Character Inventory (TCI). Among the traits the TCI measures is one known as self-transcendence, which

consists of three other traits: self-forgetfulness, or the ability to get entirely lost in an experience; transpersonal identification, or a feeling of connectedness to a larger universe; and mysticism, or an openness to things not literally provable. Put them all together, and you come as close as science can to measuring what it feels like to be spiritual.

"This allows us to have the kind of experience described as religious ecstasy," says Robert Cloninger, a psychiatrist at Washington University in St. Louis, Mo., and the designer of the self-transcendence portion of the TCI.

Hamer decided to use the data he gathered in the smoking survey to conduct a little spirituality study on the side. First he ranked the participants along Cloninger's self-transcendence scale, placing them on a continuum from least to most spiritually inclined. Then he went poking around in their genes to see if he could find the DNA responsible for the differences. Spelunking in the human genome is not easy, what with 35,000 genes consisting of 3.2 billion chemical bases. To narrow the field, Hamer confined his work to nine specific genes known to play major roles in the production of monoamines—brain chemicals, including serotonin, norepinephrine and dopamine, that regulate such fundamental functions as mood and motor control. It's monoamines that are carefully manipulated by Prozac and other antidepressants. It's also monoamines that are not so carefully scrambled by ecstasy, LSD, peyote and other mind-altering drugs—some of which have long been used in religious rituals.

Studying the nine candidate genes in DNA samples provided by his subjects, Hamer quickly hit the genetic jackpot. A variation in a gene known as vmat2—for vesicular monoamine transporter—seemed to be directly related to how the volunteers scored on the self-transcendence test. Those with the nucleic acid cytosine in one particular spot on the gene ranked high. Those with the nucleic acid adenine in the same spot ranked lower. "A single change in a single base in the middle of the gene seemed directly related to the ability to feel self-transcendence," Hamer says. Merely having that feeling did not mean those people would take the next step and translate their transcendence into a belief in—or even a quest for—God. But they seemed likelier to do so than those who never got the feeling at all.

Hamer is careful to point out that the gene he found is by no means the only one that affects spirituality. Even minor human traits can be governed by the interplay of many genes; something as complex as belief in God could involve hundreds or even thousands. "If someone comes to you and says, 'We've found the gene for X,'" says John Burn, medical director of the Institute of Human Genetics at the University of Newcastle in England, "you can stop them before they get to the end of the sentence."

Hamer also stresses that while he may have located a genetic root for spirituality, that is not the same as a genetic root for religion.

Spirituality is a feeling or a state of mind; religion is the way that state gets codified into law. Our genes don't get directly involved in writing legislation. As Hamer puts it, perhaps understating a bit the emotional connection many have to their religions, "Spirituality is intensely personal; religion is institutional."

At least one faith, according to one of its best-known scholars, formalizes the idea of gene-based spirituality and even puts a pretty spin on it. Buddhists, says Robert Thurman, professor of Buddhist studies at Columbia University, have long entertained the idea that we inherit a spirituality gene from the person we were in a previous life. Smaller than an ordinary gene, it combines with two larger physical genes we inherit from our parents, and together they shape our physical and spiritual profile. Says Thurman: "The spiritual gene helps establish a general trust in the universe, a sense of openness and generosity." Buddhists, he adds, would find Hamer's possible discovery "amusing and fun."

The Buddhist theory has never been put to the scientific test, but other investigations into the biological roots of belief in God were being conducted long before Hamer's efforts—often with intriguing results. In 1979, investigators at the University of Minnesota began their now famous twins study, tracking down 53 pairs of identical twins and 31 pairs of fraternal twins that had been separated at birth and raised apart. The scientists were looking for traits the members of each pair had in common, guessing that the characteristics shared more frequently by identical twins than by fraternal twins would be genetically based, since identical twins carry matching DNA, and those traits for which there was no disparity between the identicals and fraternals would be more environmentally influenced.

As it turned out, the identical twins had plenty of remarkable things in common. In some cases, both suffered from migraine headaches, both had a fear of heights, both were nail biters. Some shared little eccentricities, like flushing the toilet both before and after using it. When quizzed on their religious values and spiritual feelings, the identical twins showed a similar overlap. In general, they were about twice as likely as fraternal twins to believe as much—or as little—about spirituality as their sibling did. Significantly, these numbers did not hold up when the twins were questioned about how faithfully they practiced any organized religion. Clearly, it seemed, the degree to which we observe rituals such as attending services is mostly the stuff of environment and culture. Whether we're drawn to God in the first place is hardwired into our genes. "It completely contradicted my expectations," says University of Minnesota psychologist Thomas Bouchard, one of the researchers involved in the work. Similar results were later found in larger twin studies in Virginia and Australia.

Other researchers have taken the science in a different direction, looking not for the genes that code for spirituality but for how that spirituality plays out in the brain. Neuroscientist Andrew Newberg of the University of Pennsylvania School of Medicine has used several types of imaging systems to watch the brains of subjects as they meditate or pray. By measuring blood flow, he determines which regions are responsible for the feelings the volunteers experience.

The deeper that people descend into meditation or prayer, Newberg found, the more active the frontal lobe and the limbic system become.

The frontal lobe is the seat of concentration and attention; the limbic system is where powerful feelings, including rapture, are processed. More revealing is the fact that at the same time these regions flash to life, another important region—the parietal lobe at the back of the brain—goes dim. It's this lobe that orients the individual in time and space. Take it off-line, and the boundaries of the self fall away, creating the feeling of being at one with the universe. Combine that with what's going on in the other two lobes, and you can put together a profound religious experience.

Even to some within the religious community, this does not come as news. "In India in Buddha's time, there were philosophers who said there was no soul; the mind was just chemistry," says Thurman. "The Buddha disagreed with their extreme materialism but also rejected the 'absolute soul' theologians." Michael Persinger, professor of behavioral neuroscience at Laurentian University in Sudbury, Ont., puts the chemistry argument more bluntly. "God," he says, "is an artifact of the brain."

Even if such spiritual deconstructionism is true, some scientists—to say nothing of most theologians—think it takes you only so far, particularly when it comes to trying to determine the very existence of God. Simply understanding the optics and wiring of the eyes, after all, doesn't mean there's no inherent magnificence in the Rembrandts they allow us to see. If human beings were indeed divinely assembled, why wouldn't our list of parts include a genetic chip that would enable us to contemplate our maker?

"Of course, concepts of God reside in the brain. They certainly don't reside in the toe," says Lindon Eaves, director of the Virginia Institute for Psychiatric and Behavioral Genetics at Virginia Commonwealth University in Richmond. "The question is, To what is this wiring responsive? Why is it there?"

Says Paul Davies, professor of natural philosophy at Macquarie University in Sydney, Australia: "I think a lot of people make the mistake of thinking that if you explain something, you explain it away. I don't see that at all with religious experience."

Those religious believers who are comfortable with the idea that God genes are the work of God should have little trouble making the next leap: that not only are the genes there but they are central to our survival, one of the hinges upon which the very evolution of the human species turned. It's an argument that's not terribly hard to make.

For one thing, God is a concept that appears in human cultures all over the globe, regardless of how geographically isolated they are.

When tribes living in remote areas come up with a concept of God as readily as nations living shoulder to shoulder, it's a fairly strong indication that the idea is preloaded in the genome rather than picked up on the fly. If that's the case, it's an equally strong indication that there are very good reasons it's there.

One of those reasons might be that, as the sole species—as far as we know—capable of contemplating its own death, we needed something larger than ourselves to make that knowledge tolerable. "Anticipation of our own demise is the price we pay for a highly developed frontal lobe," says Persinger. "In many ways, [a God experience is] a brilliant adaptation. It's a built-in pacifier."

But the most important survival role religion may serve is as the mortar that holds a group together. Worshipping God doesn't have to be a collective thing; it can be done in isolation, disconnected from any organized religion. The overwhelming majority of people, however, congregate to pray, observing the same rituals and heeding the same creeds. Once that congregation is in place, it's only a small step to using the common system of beliefs and practices as the basis for all the secular laws that keep the group functioning.

One of the best examples of religion as social organizer, according to Binghamton University's Wilson, is early Calvinism. John Calvin rose to prominence in 1536 when, as a theologian and religious reformer, he was recruited to help bring order to the fractious city of Geneva. Calvin, perhaps one of the greatest theological minds ever produced by European Christianity, was a lawyer by trade. Wilson speculates that it was Calvin's pragmatic genius to understand that while civil laws alone might not be enough to bring the city's deadbeats and other malefactors into line, divine law might be.

Calvin's catechism included the familiar Ten Commandments—which, with their injunctions against theft, murder, adultery and lying, are themselves effective social organizers. Added to that were admonitions to pay taxes, perform civic duties, behave in a civil manner and submit to the authority of magistrates. "You must understand religions very thoroughly in relation to their environments," says Wilson. "And one problem for Calvin was to make his city function."

The heirs to Calvinism today—Presbyterians, many Baptists and believers in the Reformed tradition in general—see the roots of their faith as something far more divine than merely good civic management. But even some theologians seem to think that a deep belief in the laws of God can coexist with the survival demands of an evolving society. "Calvin had a reverence for the Scriptures,

which then became institutionalized," says James Kay, professor of practical theology at the Princeton Theological Seminary. "The Bible is concerned about justice for the poor, equity and fairness, and all of those things were seen to in Calvin's Geneva."

Other struggling cultures have similarly translated godly law into earthly order and in doing so helped ensure their survival. The earliest Christians established a rough institutional structure that allowed them to transmit their ideas within a generation of Christ's death, and as a result succeeded in living through the Roman persecution; the Jews of the Diaspora moved as a cultural whole through the nations of Europe, finding niches wherever they could but maintaining their identity and kinship by observing the same rites.

"All religions become a bit secular," says Wilson. "In order to survive, you have to organize yourselves into a culture."

The downside to all this is that often religious groups gather not into congregations but into camps—and sometimes they're armed camps.

In a culture of Crusades, Holocausts and jihads, where in the world is the survival advantage of religious wars or terrorism? One facile explanation has always been herd culling—an adaptive way of keeping populations down so that resources aren't depleted. But there's little evolutionary upside to wiping out an entire population of breeding-age males, as countries trying to recover from wars repeatedly learn. Why then do we so often let the sweetness of religion curdle into combat?

The simple answer might be that just because we're given a gift, we don't necessarily always use it wisely. Fire can either light your village or burn down the one next door, depending on your inclination. "Religions represent an attempt to harness innate spirituality for organizational purposes—not always good," says Macquarie University's Davies. And while spiritual contemplation is intuitive, says Washington University's Cloninger, religion is dogmatic; dogma in the wrong hands has always been a risky thing.

Still, for every place in the world that's suffering from religious strife, there are many more where spirituality is doing its uplifting and civilizing work. A God who would equip us with the genes and the smarts to cooperate in such a clever way is a God who ought to be appealing even to religious purists. Nonetheless, sticking points do remain that prevent genetic theory from going down smoothly. One that's particularly troublesome is the question of why Hamer's God gene—or any of the others that may eventually be discovered—is distributed so unevenly among us. Why are some of us spiritual virtuosos, while others can't play a note? Isn't it one of the central tenets of religion that grace is available to everybody? At least a few scientists shrug at the question. "Some get religion, and some don't," says Virginia Commonwealth University's Eaves.

But this seeming inequity may be an important part of the spiritual journey. It would be easy for God simply to program us for reverence; it's more meaningful when the door is opened but you've got to walk through on your own—however hard those steps may be for some. "I have never had a Big Bang conversion experience," says the Jewish Theological Seminary's Gillman. "My sense is that slowly and gradually, out of a rich experience of the world, one builds a faith."

Such experiences may ultimately be at least as important a part of our spiritual tool kit as the genes we're born with. A poor genetic legacy but lucky spiritual circumstances might mean more than good genes and bad experiences. "Fortune includes the possibility of divine grace as well as environmental influences," says Cloninger.

No matter how the two factors balance out, scientists may eventually find that trying to identify the definitive cluster of genes that serves as our spiritual circuit board is simply impossible—like trying to draw a genetic schematic of love. Still, they're likely to keep trying. "I am personally convinced that there is a scheme of things," says Davies of Macquarie University, "that the universe is not just any ragbag of laws." In the end, genes may prove to be a part of that scheme—but clearly one of very many.

— With reporting by Jeff Chu/London, Broward Liston/Orlando, Maggie Sieger/Chicago and Daniel Williams/Sydney