



The science of religion

Where angels no longer fear to tread

Science and religion have often been at loggerheads. Now the former has decided to resolve the problem by trying to explain the existence of the latter

BY THE standards of European scientific collaboration, €2m (\$3.1m) is not a huge sum. But it might be the start of something that will challenge human perceptions of reality at least as much as the billions being spent by the European particle-physics laboratory (CERN) at Geneva. The first task of CERN's new machine, the Large Hadron Collider, which is due to open later this year, will be to search for the Higgs boson—an object that has been dubbed, with a certain amount of hyperbole, the God particle. The €2m, by contrast, will be spent on the search for God Himself—or, rather, for the biological reasons why so many people believe in God, gods and religion in general.

"Explaining Religion", as the project is known, is the largest-ever scientific study of the subject. It began last September, will run for three years, and involves scholars from 14 universities and a range of disciplines from psychology to economics. And it is merely the latest manifestation of a growing tendency for science to poke its nose into the God business.

Religion cries out for a biological explanation. It is a ubiquitous phenomenon—arguably one of the species markers

of *Homo sapiens*—but a puzzling one. It has none of the obvious benefits of that other marker of humanity, language. Nevertheless, it consumes huge amounts of resources. Moreover, unlike language, it is the subject of violent disagreements. Science has, however, made significant progress in understanding the biology of language, from where it is processed in the brain to exactly how it communicates meaning. Time, therefore, to put religion under the microscope as well.

I have no need of that hypothesis

Explaining Religion is an ambitious attempt to do this. The experiments it will sponsor are designed to look at the mental mechanisms needed to represent an omniscient deity, whether (and how) belief in such a "surveillance-camera" God might improve reproductive success to an individual's Darwinian advantage, and whether religion enhances a person's reputation—for instance, do people think that those who believe in God are more trustworthy than those who do not? The researchers will also seek to establish whether different religions foster different levels of co-operation, for what reasons,

and whether such co-operation brings collective benefits, both to the religious community and to those outside it.

It is an ambitious shopping list. Fortunately, other researchers have blazed a trail. Patrick McNamara, for example, is the head of the Evolutionary Neurobehaviour Laboratory at Boston University's School of Medicine. He works with people who suffer from Parkinson's disease. This illness is caused by low levels of a messenger molecule called dopamine in certain parts of the brain. In a preliminary study, Dr McNamara discovered that those with Parkinson's had lower levels of religiosity than healthy individuals, and that the difference seemed to correlate with the disease's severity. He therefore suspects a link with dopamine levels and is now conducting a follow-up involving some patients who are taking dopamine-boosting medicine and some of whom are not.

Such neurochemical work, though preliminary, may tie in with scanning studies conducted to try to find out which parts of the brain are involved in religious experience. Nina Azari, a neuroscientist at the University of Hawaii at Hilo who also has a doctorate in theology, has looked at the brains of religious people. She used positron emission tomography (PET) to measure brain activity in six fundamentalist Christians and six non-religious (though not atheist) controls. The Christians all said that reciting the first verse of the 23rd psalm helped them enter a religious state of mind, so both groups were scanned in six different sets of circumstances: while reading the first verse of the 23rd psalm, ►►

▶ while reciting it out loud, while reading a happy story (a well-known German children's rhyme), while reciting that story out loud, while reading a neutral text (how to use a calling card) and while at rest.

Dr Azari was expecting to see activity in the limbic systems of the Christians when they recited the psalm. Previous research had suggested that this part of the brain (which regulates emotion) is an important centre of religious activity. In fact what happened was increased activity in three areas of the frontal and parietal cortex, some of which are better known for their involvement in rational thought. The control group did not show activity in these parts of their brains when listening to the psalm. And, intriguingly, the only thing that triggered limbic activity in either group was reading the happy story.

Dr Azari's PET study, together with one by Andrew Newberg of the University of Pennsylvania, which used single-photon emission computed tomography done on Buddhist monks, and another by Mario Beauregard of the University of Montreal, which put Carmelite nuns in a magnetic-resonance-imaging machine, all suggest that religious activity is spread across many parts of the brain. That conflicts not only with the limbic-system theory but also with earlier reports of a so-called God Spot that derived partly from work conducted on epileptics. These reports suggested that religiosity originates specifically in the brain's temporal lobe, and that religious visions are the result of epileptic seizures that affect this part of the brain.

Though there is clearly still a long way to go, this sort of imaging should eventually tie down the circuitry of religious experience and that, combined with work on messenger molecules of the sort that Dr McNamara is doing, will illuminate how the brain generates and processes religious experiences. Dr Azari, however, is sceptical that such work will say much about religion's evolution and function. For this, other methods are needed.

Dr McNamara, for example, plans to analyse a database called the Ethnographic Atlas to see if he can find any correlations between the amount of cultural co-operation found in a society and the intensity of its religious rituals. And Richard Sosis, an anthropologist at the University of Connecticut, has already done some research which suggests that the long-term co-operative benefits of religion outweigh the short-term costs it imposes in the form of praying many times a day, avoiding certain foods, fasting and so on.

Leviticus's children

On the face of things, it is puzzling that such costly behaviour should persist. Some scholars, however, draw an analogy with sexual selection. The splendour of a peacock's tail and the throaty roar of a stag



really do show which males are fittest, and thus help females choose. Similarly, signs of religious commitment that are hard to fake provide a costly and reliable signal to others in a group that anyone engaging in them is committed to that group. Free-riders, in other words, would not be able to gain the advantages of group membership.

To test whether religion might have emerged as a way of improving group co-operation while reducing the need to keep an eye out for free-riders, Dr Sosis drew on a catalogue of 19th-century American communes published in 1988 by Yaacov Oved of Tel Aviv University. Dr Sosis picked 200 of these for his analysis; 88 were religious and 112 were secular. Dr Oved's data include the span of each commune's existence and Dr Sosis found that communes whose ideology was secular were up to four times as likely as religious ones to dissolve in any given year.

A follow-up study that Dr Sosis conducted in collaboration with Eric Bressler of McMaster University in Canada focused on 83 of these communes (30 religious, 53 secular) to see if the amount of time they survived correlated with the strictures and expectations they imposed on the behaviour of their members. The two researchers examined things like food consumption, attitudes to material possessions, rules about communication, rituals and taboos, and rules about marriage and sexual relationships.

As they expected, they found that the more constraints a religious commune placed on its members, the longer it lasted (one is still going, at the grand old age of 149). But the same did not hold true of secular communes, where the oldest was 40. Dr Sosis therefore concludes that ritual constraints are not by themselves enough

to sustain co-operation in a community—what is needed in addition is a belief that those constraints are sanctified.

Dr Sosis has also studied modern secular and religious kibbutzim in Israel. Because a kibbutz, by its nature, depends on group co-operation, the principal difference between the two is the use of religious ritual. Within religious communities, men are expected to pray three times daily in groups of at least ten, while women are not. It should, therefore, be possible to observe whether group rituals do improve co-operation, based on the behaviour of men and women.

To do so, Dr Sosis teamed up with Bradley Ruffle, an economist at Ben-Gurion University, in Israel. They devised a game to be played by two members of a kibbutz. This was a variant of what is known to economists as the common-pool-resource dilemma, which involves two people trying to divide a pot of money without knowing how much the other is asking for. In the version of the game devised by Dr Sosis and Dr Ruffle, each participant was told that there was an envelope with 100 shekels in it (between 1/6th and 1/8th of normal monthly income). Both players could request money from the envelope, but if the sum of their requests exceeded its contents, neither got any cash. If, however, their request equalled, or was less than, the 100 shekels, not only did they keep the money, but the amount left was increased by 50% and split between them.

Dr Sosis and Dr Ruffle picked the common-pool-resource dilemma because the communal lives of kibbutz members mean they often face similar dilemmas over things such as communal food, power and cars. The researchers' hypothesis was that in religious kibbutzim men would be better collaborators (and thus would take less) than women, while in secular kibbutzim men and women would take about the same. And that was exactly what happened.

Big father is watching you

Dr Sosis is not the only researcher to employ economic games to investigate the nature and possible advantages of religion. Ara Norenzayan, an experimental psychologist at the University of British Columbia, in Vancouver, has conducted experiments using what is known as the dictator game. This, too, is a well-established test used to gauge altruistic behaviour. Participants receive a sum of money—Dr Norenzayan set it at \$10—and are asked if they would like to share it with another player. The dictator game thus differs from another familiar economic game in which one person divides the money and the other decides whether to accept or reject that division.

As might be expected, in the simple version of the dictator game most people take ▶▶

► most or all of the money. However, Dr Norenzayan and his graduate student Azim Shariff tried to tweak the game by introducing the idea of God. They did this by priming half of their volunteers to think about religion by getting them to unscramble sentences containing religious words such as God, spirit, divine, sacred and prophet. Those thus primed left an average of \$4.22, while the unprimed left \$1.84.

Exactly what Dr Norenzayan has discovered here is not clear. A follow-up experiment which primed people with secular words that might, nevertheless, have prompted them to behave in an altruistic manner (civic, jury, court, police and contract) had similar effects, so it may be that he has touched on a general question of morality, rather than a specific one of religion. However, an experiment carried out by Jesse Bering, of Queen's University in Belfast, showed quite specifically that the perceived presence of a supernatural being can affect a person's behaviour—although in this case the being was not God, but the ghost of a dead person.

Dr Bering, too, likes the hypothesis that religion promotes fitness by promoting collaboration within groups. One way that might work would be to rely not just on other individuals to detect cheats by noticing things like slacking on the prayers or eating during fasts, but for cheats to detect and police themselves as well. In that case a sense of being watched by a supernatural being might be useful. Dr Bering thus proposes that belief in such beings would prevent what he called “dangerous risk miscalculations” that would lead to social deviance and reduced fitness.

One of the experiments he did to test this idea was to subject a bunch of undergraduates to a quiz. His volunteers were told that the best performer among them would receive a \$50 prize. They were also told that the computer program that presented the questions had a bug in it, which sometimes caused the answer to appear on the screen before the question. The volunteers were therefore instructed to hit the space bar immediately if the word “Answer” appeared on the screen. That would remove the answer and ensure the test results were fair.

The volunteers were then divided into three groups. Two began by reading a note dedicating the test to a recently deceased graduate student. One did not see the note. Of the two groups shown the note, one was told by the experimenter that the student's ghost had sometimes been seen in the room. The other group was not given this suggestion.

The so-called glitch occurred five times for each student. Dr Bering measured the amount of time it took to press the space bar on each occasion. He discarded the first result as likely to be unreliable and then averaged the other four. He found that

those who had been told the ghost story were much quicker to press the space bar than those who had not. They did so in an average of 4.3 seconds. That compared with 6.3 seconds for those who had only read the note about the student's death and 7.2 for those who had not heard any of the story concerning the dead student. In short, awareness of a ghost—a supernatural agent—made people less likely to cheat.

Who is my neighbour?

It all sounds very Darwinian. But there is a catch. The American communes, the kibbutzim, the students of the University of British Columbia and even the supernatural self-censorship observed by Dr Bering all seem to involve behaviour that promotes the group over the individual. That is the opposite of Darwinism as conventionally understood. But it might be explained by an idea that most Darwinians dropped in the 1960s—group selection.

The idea that evolution can work by the differential survival of entire groups of organisms, rather than just of individuals, was rejected because it is mathematically implausible. But it has been revived recently, in particular by David Sloan Wilson of Binghamton University, in New York, as a way of explaining the evolution of human morality in the context of intertribal warfare. Such warfare can be so murderous that groups whose members fail to collaborate in an individually self-sacrificial way may be wiped out entirely. This negates the benefits of selfish behaviour within a group. Morality and religion are often closely connected, of course (as Dr Norenzayan's work confirms), so what holds for the one might be expected to hold for the other, too.

Dr Wilson himself has studied the relationship between social insecurity and religious fervour, and discovered that, re-

gardless of the religion in question, it is the least secure societies that tend to be most fundamentalist. That would make sense if adherence to the rules is a condition for the security which comes from membership of a group. He is also interested in what some religions hold out as the ultimate reward for good behaviour—life after death. That can promote any amount of self-sacrifice in a believer, up to and including suicidal behaviour—as recent events in the Islamic world have emphasised. However, belief in an afterlife is not equally well developed in all religions, and he suspects the differences may be illuminating.

That does not mean there are no explanations for religion that are based on individual selection. For example, Jason Slone, a professor of religious studies at Webster University in St Louis, argues that people who are religious will be seen as more likely to be faithful and to help in parenting than those who are not. That makes them desirable as mates. He plans to conduct experiments designed to find out whether this is so. And, slightly tongue in cheek, Dr Wilson quips that “secularism is very maladaptive biologically. We're the ones who at best are having only two kids. Religious people are the ones who aren't smoking and drinking, and are living longer and having the health benefits.”

That quip, though, makes an intriguing point. Evolutionary biologists tend to be atheists, and most would be surprised if the scientific investigation of religion did not end up supporting their point of view. But if a propensity to religious behaviour really is an evolved trait, then they have talked themselves into a position where they cannot benefit from it, much as a sceptic cannot benefit from the placebo effect of homeopathy. Maybe, therefore, it is God who will have the last laugh after all—whether He actually exists or not. ■

