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“wire” and synapse. At this resolution, a cubic millimeter would yield a petabyte of image data, the equivalent of a billion photos from a digital album. MRI brain scans, by contrast, blur a cubic inch such that it’s single pixel.

To handle the deluge of data, my laboratory has created Eyewire, a website that recruits volunteers to explore the retina, the neural tissue of the eye. Think of the eye as a gigantic 3D colouring book, the pages of which are images of the retina. By playing a game of colouring neurons, amateur neuroanatomists trace the wires of the retina, working together to find a neural “wiring diagram.” Such a map, also known as a connectome, will help us understand how the retina serves visual perception.

Anyone can sign up to play; the only qualifications are curiosity and a zest for careful observation. By 2013, we should be ready to scale up from thousands to millions of players. This is a new age of exploration. By recruiting enough amateur and professional scientists, we will be able to make significant breakthroughs in our understanding of the human brain.

Neuroscientists have long hypothesised that our memories are encoded in our connectomes, because each experience leaves a trace on the brain by altering neural connections. We will test this hypothesis by attempting to read memories from connectomes. And that is just the start. We will be able to tackle other scientific mysteries — such as perception, consciousness and psychiatric disorders — by uniting our minds to explore the brain.

Sebastian Seung is professor of computational neuroscience at MIT and the author of Connectome: How the Brain’s Wiring Makes Us Who We Are (Allen Lane/Eyewire.org)

RELIGION GOES INTO THE SCIENCE
THE MYSTERIES OF FAITH WILL SOON BE UNLOCKED, THANKS TO A BLEND OF PSYCHOLOGY, HISTORY AND NEUROSCIENCE.
BY OMAR SULTAN HAQUE AND DAVID RAND

Being supernatural is often seen as fundamentally beyond the reach of scientific study. But an emerging movement suggests that its social, psychological and biological manifestations are not, and it is profoundly changing our understanding of religion and religious belief.

Traditionally, scholars studied religion by reading and interpreting texts and historical archives, or by observing and trying empirically to describe a culture. But interdisciplinary cognitive science can complement these methods. This approach is exploring how religion works. Scholars are dispensing with boundaries, combining psychology, neuroscience and history to study religious beliefs and experiences.

For example, what makes some people, but not others, believe in God? One of us, David Rand, is involved in a study at Harvard that found that people who go with their gut tend to be more religious, whereas more reflective people tend to be more atheistic. Furthermore, just recalling a situation where one’s first instinct was correct led to a dramatic increase in reported belief in God. Another study, published in Science, found similar effects with even subtler cues. So, although theologies may be the result of explicit extrapolation over time, it seems that most everyday beliefs come from default intuitions. For example, the tendency to see agency behind events facilitates social interactions. But, as Deborah Kelemen and Susan Carey at, respectively, Boston and Harvard’s psychology departments have shown, this tendency is often extended to see the hand of God behind natural events.

Another area explores how people represent supernatural concepts in their minds. Central to most religions is the idea of a God that is all-knowing, all-powerful and all-present. However, a study by a team at Cornell University, New York, found that religious people often think of God as being like a normal person, with limited attention (for example, having to finish answering one prayer before attending to the next) or limited perception (thinking a loud sound made God unable to hear another). This difference between implicit and explicit understandings of God is not unique to Americans: the same result was found in a study of Hindu concepts in India by Justin Barrett at Calvin College, Michigan. Our understanding of God is shaped by our own intuitions and it is hard for us not to anthropomorphise the supernatural.

As research such as this grows, what will the future hold? Traditional humanistic scholarship will always play a central role in our understanding of religion. However, it is clear that the humanities and sciences will continue to cross-pollinate. With the rise in experimental methods, we are poised to understand the role of religion in our past and present in a much more systematic and reliable way.

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boosted fuel cells
hydrogen fuel cells could be five times more powerful — if research by scientists at the Institute of Bioengineering and Nanotechnology in Singapore is put into production. Platinum is used to accelerate the reaction between hydrogen and oxygen that generates power, but combining it with gold and copper significantly increases its catalytic effect. It also boosts cell stability.

Seawater uranium
Harvesting some of the 4.5 billion tonnes of uranium dissolved in the oceans will soon become viable. A team at the US Department of Energy’s Oak Ridge National Laboratory has developed a material made from polyethylene fibres and compounds that have a high affinity with uranium, which captures seven times more of the metal than conventional processes in a seventh of the time.

Recycle your blood
Patients will be needing fewer transfusions: thanks to HemoSep. A process developed by a team at University of Strathclyde, it collects blood spilled in surgery.

The scientists also found that the experience of synapses — the electrical signals that neurons use to communicate — were encoded by the shape of the retinal neurons. This provided direct evidence that our memories are the result of changes in the brain resulting from neural activity.

Mary’s Voorwerp is, the green cloud, below spiral galaxy IC 2497