

God and the Brain: What neuroscience can teach us about people and God

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Introduction

About a year ago I gave a talk, and at the end of it I was walking out behind two ladies. One of them said to the other, 'I didn't understand a word of that.' And her companion said, 'But at least he finished on time!' I've taken this very much to heart: I know how I can satisfy at least fifty percent of any audience. So the schedule is this: I plan to talk for half an hour plus a little bit, with a couple of slots of *Test of FAITH*, and then it really very much is open to you to ask questions or make comments. My personal goal for this evening is to trigger some discussions—perhaps tonight, but, perhaps even more importantly, discussions in your home or your workplace, or if you're a person of faith, in your place of worship, in your community. I would feel extremely pleased if I trigger some discussions and raise some issues with a few people.

What I'm going to do is tell you a story; then describe to you three experiments which I think speak to some of the interesting things that neuroscience can contribute to discussions around faith; then tell you about two experiments that I'm going to do, to show you the sort of way in which I'm thinking (and I have no results of these, I haven't started them); and then I'm going to finish with a word on reductionism. If I have a sort of party political manifesto tonight, it is to let you know how I feel about the way that neuroscience is used as the new form of reductionism. I think in the past we had evolution and we had genetics, and now neuroscience, it seems, explains all—and I'll have some comments to make about that.

Now, I don't get paid any money if material from *Test of FAITH* gets sold, so you don't need to misinterpret me when I say that I think it's excellent material. I really encourage you to buy it, borrow it, steal it—however you can come across it—and use it in your local church or place of worship, or your workplace. I've been saying this for a while, so I am going to do it in my workplace in the autumn—otherwise I lack integrity if I keep advocating that. So, please have a look at that material, and please also have a look at the Faraday Institute website, because apart from anything else there is fantastic material to download in the form of podcasts and talks and things like that. I have about twenty hours of lectures sitting on my iPhone—admittedly as yet un-listened-to—but it makes me feel great to know that it's there.

The Reluctant Theologian

Let me just tell you how it is that I got into this with a little story. Ruth's very kind about the things that I do. The key thing about having different things is that people never quite know where you are. So you can be sitting at home, and people are imagining that you're in these other places doing great things while you're just watching DVDs all day. So that's a little tip.

I was minding my own business, walking along the corridors of Addenbrooke's Hospital one day, when a colleague came up to me and said, 'You believe in God, don't you?' I said, 'Yes', and he said, 'Well, we need you to come and see a patient who is refusing to see anyone unless they have a faith in God'. OK, that's not usual request, but anyway... So off I go to the out-patients department, where I sit down to meet this woman in my twelve-minute allocated slot, and two-and-a-half hours later I'm still there talking to her, with a queue of irritated people outside. Here's the story: this is a lady whose name I could tell you (and she's given me permission to tell you this story), but I'm not going to because I think that's slightly weird, frankly—but she's very keen for this story to be popularised. She's in her middle age. Her profession is as a theologian, and in particular, she's a theologian who is called upon to test the truth of miracles on behalf of the Catholic Church; that's one of things she does. So when people see a vision, or when there's a miraculous healing,

'We need you to come and see a patient who is refusing to see anyone unless they have a faith in God.'

she gets involved as one of many in deciding whether or not this is credible. She

did not want to

come and see a doctor; she was only there because she'd been made to come by the religious community in which she lived, because that community were getting increasingly concerned that there was something radically wrong with this theologian.

This is her story. When she was a teenager, she suddenly experienced attacks where God would speak to her. Out of the blue, without warning, she would suddenly feel at peace, calm—as though she were on an ocean with a sense of goodness and peace around her, which she interpreted as God speaking to her. These would last for seconds and then they would go. There seemed to be no rhyme or reason to them, until an unpleasant encounter with some pornography induced one of these attacks, which she felt was a divine gift to allow her to overcome her feelings: God had given her a sense of peace in a context where she was very troubled. That led her to a very firm faith. She's continued to experience these divine encounters more and more frequently, and longer and longer. One which particularly began to worry people occurred while she was on a train. She has very little recollection of it except that she ended up in prison in Cardiff (which was not her intended destination), and it turns out that her behaviour had become increasingly erratic on the train, and the police had been called and she had been taken to prison. It was decided that this was some sort of one-off, a blip, and no more legally was taken forward. But her attacks, or these divine encounters, became longer and longer. She went missing for a few days. When she returned she didn't know where she had been, except that she was with a person of the opposite gender and it seemed an inappropriate relationship had been formed. This was extremely difficult for the context in which she lived, which was within a type of religious community; in fact, she was ejected from the community.

Neurological Links to Religious Experiences

So why should she be seeing a neurologist? Well, there is a type of epileptic seizure, which has now been called Dostoevsky's Seizure. Dostoevsky writes about them in, amongst other places, *The Idiot*, where the central character, Prince Myshkin, has epileptic seizures. In the book, Dostoevsky writes, through Prince Myshkin, that just before the actual epileptic convulsion, suddenly, Prince Myshkin's 'brain [seems] to catch fire... all his doubt and worries [seem] composed in a twinkling, culminating in a great calm, full of sense and harmonious joy and hope' and 'a blinding inner light flooded his soul'. The reason Dostoevsky was able to write so beautifully about these was because he himself experienced these events. He himself had epilepsy, and just before the convulsion he experienced these things. He says later on in an autobiography, 'You have no idea, you who do not have epilepsy, what joy we epileptics experience just before a seizure'.

This experience, which has been documented now probably for centuries, began to be investigated by the great Canadian neurosurgeon Wilder Penfield. He used to legitimately operate on awake patients and stimulate their brains, because he was working out how far he could resect part of the brain without causing too much damage. This is a procedure that goes on to this day, so it's a legitimate exploration of stimulating the cortex of the awake human brain and seeing what happens. When Wilder Penfield stimulated a certain part of the brain, the awake patient in the operating theatre would say, 'I feel as though a light has come into the room' or 'I feel a sense of calm. I feel there is someone here in the operating theatre who cares about me, who loves me.' Some people went on and said that they felt that God, Mary, or some other figure was in the operating theatre. But when the electricity was cut off, that was that. This has been documented time and time again. The particular part of the brain where you can elicit these, what have been called, 'numinous' feelings, is the temporal lobe, and I'm showing it here.

What do we make of information like that? One of the important questions to ask when people like me tell you stories like this is, 'So what?' So what? What significance does that have for me? One person who has said 'so what', and has answered that question in this context, is a character called Michael Persinger. He has, from that information, made the hypothesis that all religious experience is due to mini epileptic seizures in the temporal lobe. As proof of this, he's devised this motorcycle helmet, with the electrical wires over the temporal lobe. He puts subjects in a room, puts a helmet on them and delivers small electric currents across the temporal lobe. In what he describes as 'susceptible people', these currents will induce feelings of the divine. Richard Dawkins, very famously, put that motorcycle helmet on, and to the disappointment of both of them, nothing happened. This is Persinger's answer to the 'so what' question: Because people with epilepsy experience this, then that experience is always due to epilepsy. This reasoning is, in my opinion, a false move, a false use of reductionism. I'm going to come back to this, but just let me play you a little clip from the material that we offer...

'One of the important questions to ask [of scientific findings] is "So what?" . . . What significance does that have for me?'

Test of FAITH Clip: More than 'just' a camera

Narrator: Any neuroscientist knows how much our biology determines our behaviour. For centuries, some philosophers have concluded we're just sophisticated machines. Professor Bill Newsome is a neurobiologist at Stanford University. He thinks differently.

Bill Newsome: I have a lot of problem with saying that any high level behaviour is 'just' biochemistry, I don't like the word 'just'. In some ways we could say that the camera that I'm looking into right now is just metal and glass and plastic and that would be a true statement, but it misses the point. The secret to the camera is not the materials – the individual materials that go into it – it's how it's organised, it's the human purpose for which it's made, it's the function that gets captured as the camera is used. A camera is so much more than just the metal that goes in to it. Now in some sense the brain, and our behaviour, you could say, is just biochemistry because the brain is totally made up of biochemical molecules, but it would be making the same mistake that it is to say that that camera is just glass and plastic and metal. I think it is a true statement, but it's an impoverished statement. It does not capture the richness and the reality and the levels of understanding that we want to have about the camera, and it does not capture the levels of understanding that we want to have about the brain and behaviour in particular.

Experiment #1: Belief vs. disbelief

That's a little introduction to the idea of the limits of reductionism, which is going to be where I end in about twenty minutes, so just hold that thought. Now I want to describe to

you three experiments that have been done, which I think are interesting, and which nuance my understanding of my faith. They may be of no interest to you; that's fine.

A question that people have been asking for a long time is, 'Is religious

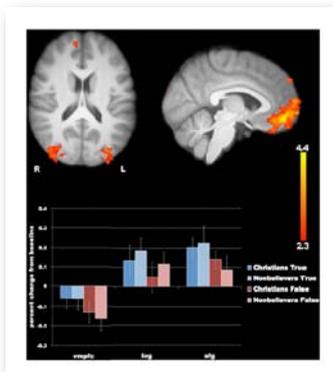
belief something special? Is it different from secular belief? And is belief different from disbelief?' If I say that I believe in God, is that fundamentally different from saying 'I believe there isn't a God'? I've heard many atheists say there is a difference, whereas other people give a standard argument that atheism is a form of faith; it's just another belief. One way of getting at this is to say, 'How does our brain handle these different things?' This is an experiment that was done by Sam Harris, who is one of the New Atheists, if you like—but the beauty of science is, provided he's done the science properly (which I think he has), we can choose to interpret this however we like. That's the beauty of science.

Here's his experiment. He takes individuals who are either 'signed up' Christians or 'signed up' atheists. He puts them in a scanner, and he asks them a series of four questions, and then a little later, another four questions. They all take the same format: the first question would be answered—probably—'yes' by the Christian, 'no' by the atheist. The second question would probably be answered 'no' by the Christian and 'yes' by the atheist. The third question would probably be answered 'yes' by both. The fourth would be 'no' by both. It's quite a nice design; it's two by two, four by four, however you look at it. The idea is to repeatedly ask these questions and to look at the activity of the brain—in particular, which brain pathways are being used in each of these different contexts. Then you can begin to tease

out the elements of saying that I believe something to be true, which would be the Christian saying the biblical God does exist and the atheist saying the biblical God is a myth. Those are both positive belief statements, the same as them both saying 'Santa Claus is a myth'. All of that would be a positive belief. A disbelief would be the atheist saying, 'No, the biblical God does not really exist' or the Christian saying, 'No, the biblical God is not a myth'. So you can separate out belief and disbelief, religious and secular.

What do we see? Well, the first thing that is really interesting is when you just take all the belief statements and look at which parts of the brain are active during them, and then look at all the disbelief statements and look at which parts are active, and then you subtract one from the other.

Belief versus disbelief



No difference between religious and non-religious beliefs

vmpc = ventromedial prefrontal cortex; log = lateral occipital gyrus; sfg = superior frontal gyrus).

My prior hypothesis would have been that me saying, 'I believe God exists' is exactly the same (as far as my brain is concerned), as an atheist saying, 'I believe God does not exist'. I would have thought they were the same sort of things.

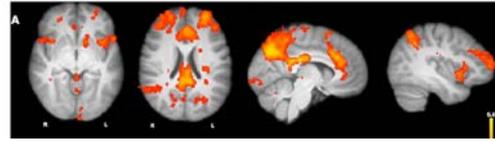
However, if they were the same, the scans would cancel out, but instead, here we have a part of the brain that is very active when you're making an assertion of your belief, that is not active when you're asserting a disbelief. Furthermore, it doesn't matter whether this is religious, whether you're Christian or an atheist, or whether it's about the existence of Santa Claus or the existence of eagles—it doesn't matter. The brain pathways for asserting belief are different from asserting disbelief. Now that, to me, is very interesting. It's also interesting that the brain pathways are much more rapid when you're asserting a belief, but it takes a lot longer to assert a disbelief. It's as though when you're asserting a disbelief you have to do some checks, but if you're asserting a belief it's part of your identity; it's rapid, it's readily available to you. So I don't think atheists' saying they don't believe in God is the same thing as me saying, 'I believe in God', at least as far as my brain is concerned. That's been an interesting nuance for me. Now, I don't say that an atheist has a form of faith in the same way that I have a form of faith. Just a little nuance.

Now here's another thing—same experiment. This is now saying, let's take the response to statements about religion (about angels) versus the response to the secular propositions (about eagles); is there any difference?

In the first, top panel, we're saying what's special about making a religious statement that is not found in a non-religious statement, and the bottom panel is the converse: what's special about a non-religious statement that isn't a religious statement as far as our brain is concerned.

Religious & non-religious belief

religious versus non religious statements



non-religious versus religious statements

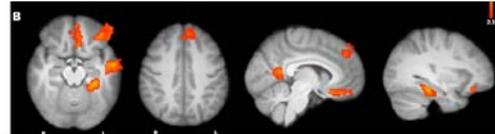


Figure 2. Religious versus nonreligious statements. (A) The fMRI signal was greater when subjects evaluated religious statements compared with nonreligious statements in areas throughout the brain, including the precuneus, anterior cingulate, insula, and ventral striatum. (B) Increased signal was found for nonreligious statements compared with religious statements in several left hemisphere regions including the parahippocampal gyrus, intraparietal cortex, temporal pole, middle temporal gyrus and hippocampus. doi:10.1371/journal.pone.0007272.g002

The first thing to say is they're different. You can see that when we make religious statements—and this can be as a Christian or as an atheist or whatever—we're involving quite a wide area of our brain. When we're making a statement about eagles, we're involving one or two rather discrete areas. Now here you have to believe me when I say this: I've seen these pictures before, and this is one of the problems of this sort of experiment, you have to trust the experimenter who says "I've seen this before and I will now tell you what it shows". That actually isn't science—that's called reverse inference, and it's dodgy, but... The non-religious statements seem to be using brain pathways that are used to bring back memories of facts, so it's the left temporal lobe: the storage of simple facts of everyday life. Thus, the statement is about eagles, I know about eagles, that's that. The statement is about books, novels—I know about them, that's easy.

Now the pattern in the religious statements is much more complicated: it doesn't look like you're retrieving knowledge; it looks like you're resolving conflict. Sam Harris did another set of experiments where he had a third arm of uncertainty. Here the question might be something like, 'Jesus says 1,472 words in the gospel'. For a moment we're all a bit stunned (unless we're Baptists because we would know the answer instantly), but for

'Atheists' saying they don't believe in God is [not] the same thing as me saying "I believe in God", at least as far as my brain is concerned.'

a moment we're a bit stunned and uncertain. Now that looks like the resolution—so Sam Harris would say, and I agree—of

conflict and uncertainty. So it's a different process.

How does that help me? Well, in my encounters with individuals who are on their faith journey, I routinely see conflict. I routinely see conflict, and I identify with it in myself, that saying that we believe in God does feel very different from saying you believe that eagles fly. It feels very different. You feel, as you say it, that you have some reservations or some concerns. Most people—not everyone—will admit to having some difficulties, some reservations. It is as though they're calculating every time whether God does exist or not; they're going through this process. That seems to me to ring true, so I find that helpful. It's a little nuance.

Experiment #2: A uniquely human experience?

Experiment number two is, I think, the most important study in the imaging of the religious brain. I'm a huge fan of this study. I think it has profound importance, and it deals with this basic question: Is religion special to humans? Now, language is special to humans. There'll be people here who want to speak out for monkeys and so on, but you're in the minority. The human brain, structurally, demonstrates that we have evolved language as a special tool of being human. We have a hugely expanded set of areas, which you can barely see in monkeys but which are structurally enormous in our brain, to do with language. Language is a special function that has been bolted on, or grafted on, or however you like to put it, in our evolutionary path. You can look at a human brain and a monkey brain and say, 'That is radically different'.

So the question is this: Is religion the same? Does the brain have special slots, a special place, for dealing with God, that has evolved since monkeys and marks us out as being the only thing that can talk to God? That is surely a profound question. Every so often, on the BBC science website or in your Sunday newspaper, you'll see, 'Is there a God spot?' which is the kind of shortened version of what I've just said. Is there something special in our brain, the 'God spot', which deals with God and which only we have?

This experiment is a study of just twenty-six people, all of whom have a faith—as it happens, a Christian faith, but I don't think that's terribly relevant. (In passing I'll just say most of the science in this area is on people with a Christian faith, and that's something we could discuss maybe). The first step in this experiment is to ask these twenty-six people literally hundreds of questions about their experience of God, their belief, their practice, whether they pray, whether they go to church, how often they read the Bible—hundreds of questions. Then, a particular statistical technique was used to try and reduce the variability of these twenty-six individuals so that you can plot each individual on a three-dimensional map as it were. This statistical technique says, 'I can reduce this array of answers in these twenty-six people down to a point that's described as somewhere on the dimension of these three axes.'

So, in dimension one, some people might say, 'God is with me every day. I feel God's presence with me as I make every decision. He—or she—is close; he's involved in my life, cares about me'. That

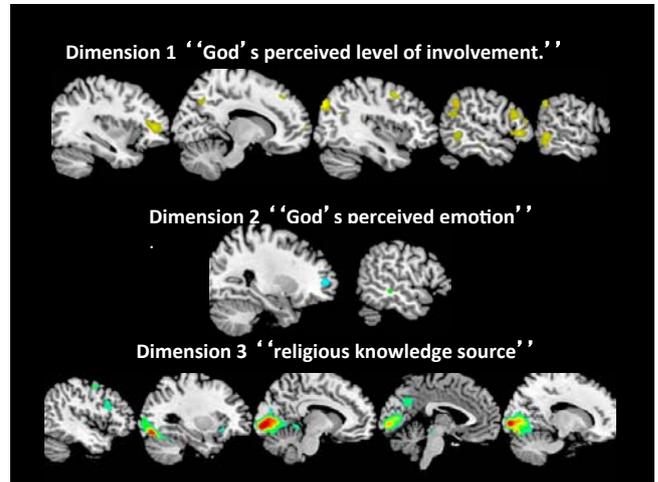
would be one extreme. Another extreme might be, 'God is distant, doesn't care, has created us

and left us alone'. Everyone, they argue, you can plot at some point along that scale. Dimension two is people who say, 'God always loves me. Unconditionally, I feel love and peace from God. I feel nothing else'. Other people might say, 'God hates me because I'm sinful', and some people might plot themselves somewhere on that dimension. The final dimension is 'How do I know about God? Where do I learn about God?' Some people might say, 'Well I study theology eight hours a day. I read books, I listen to lectures, and I'm a very word-based, knowledge-based person'. Other people might say, 'I wait for the Holy Spirit. I just experience everything, and what I don't experience is not real'. You can, as it were, argue with this, but for the sake of the experiment, just run with it a bit. Each of these twenty-six

'Does the brain have special slots, a special place, for dealing with God, that . . . marks us out as being the only thing that can talk to God?'

individuals can be plotted along those three dimensions, for the sake of this experiment.

Then the subjects are put into these scanners and they are asked hundreds and hundreds of questions, and they give graded responses—this takes hours for each individual, several days coming back, many months—and then the outcome of it all is these statistical maps.



The top map here is the map that says, wherever you lie on the dimension of God's perceived level of involvement—either very very close to me or indifferent and uncaring—the variability in responses in that dimension can be summed up by brain activity in these pathways. It doesn't say which represents which; that's not the point as it were. It says, if you're in the zone of thinking about whether God's involved with me or not, then you will be activating these pathways. Dimension number two: if you're thinking about whether God hates me or loves me or somewhere in between, you'll be activating these pathways. Finally, if you're asked, 'Where does your religion come from?' as it were, you'll be activating these pathways. This is quite a nice example because we recognise bits of this: if you're a very word, knowledge-based person you'll be accessing the temporal lobe; if you're more visual it'll be the occipital lobe; if it's more integrative, the parietal lobe; and so on. We can follow that.

Now here's the thing—and you have to believe me: I've seen this before. There is nothing special about this, because these are exactly the same pathways that I use when I look at you, madam, and I am wondering whether you're involved in my life or not. I don't think you are. And when I look at you, sir, for dimension number two, I'm thinking, 'Does he like me or not like me, or is he getting bored?' And then I think, 'Does he think that I like him? Does he think that I think that he likes me?'

This, to give this its technical name, is theory of mind. This is me trying to work out the minds and the emotions of other people around me. We use it all the time. When I get in through the door at the end of the evening, I see my wife, and within an instant, I know that she's furious with me; I often don't know why, but she is... We use that all the time. When we're first meeting people, first dating someone, first starting in a job with a boss, or whatever, there's a lot of energy involved in working out, what does he think of me, what does he think I think of him, and all of that stuff. Here's the point: within the limits of this experiment, this is telling us that we think of God as we think of another person, and there is no difference. There's nothing 'special' about

our brains when we think of God. Now that seems to me to be a profound conclusion, if correct.

For me, let me tell you what I take from that, and you can disagree with me if you like. One of the things that I take from that, which might annoy theologians, is to say, there are some higher animals that can do a limited sense of this. My dog does know what I think, doesn't it? And if you've got dogs, not hamsters, but dogs, they can tell what you think, a bit, can't they? There's some theory of mind going on there. So the question is, this allows the possibility for animals to have some concept of something like God. That always upsets theologians—but this is good, isn't it? This is scientists coming and saying, 'Well look, have you thought about this, because the science is saying it's possible'. That, I think, is the good dialogue that we should be having.

The other thing is that this makes sense, to me, of a lot of people's struggles with God, and of the advice that's often given, which is to treat God as a friend, as a partner, as someone to be with you, alongside. There are various phrases that are used—some phrases you may like, some you may not—but the Song of Solomon in the Bible is all about this. There are bits in the Bible that suddenly make sense to me, that we can be intimate with God. I'm sorry to talk about the Bible specifically, but that's all I know about in terms of sacred texts; I'm not meaning to exclude other religions in this. So that's what I take from this. I think that when people say they have a personal experience of God, that is very real and true as far as their brain is working.

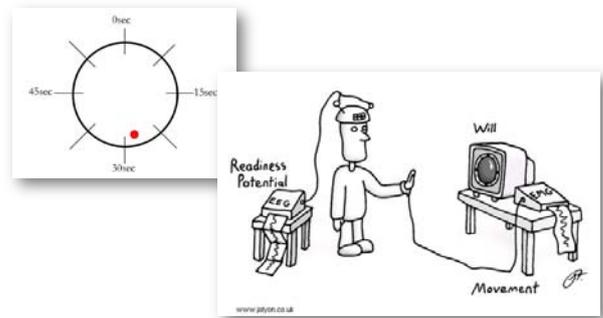
'Within the limits of this experiment . . . we think of God as we think of another person, and there is no difference. There's nothing "special" about our brains when we think of God.'

I suppose another way of looking at this is, 'Well, what would you expect?' What would you actually expect? Some people expect, when you image the brain of people experiencing God, to see nothing, because they think that somehow experiencing God bypasses normal, everyday life. And some people get very upset when shown scans like this, because they think the brain is matter—maybe they think it's sinful, dirty matter, I'm not sure—and it somehow should be left to one side when experiencing God. Some people in audiences like this have told me that. I think that's wrong; I think the science tells us that isn't true. I think the brain is intimately involved in a way which we'll come onto in a second.

Experiment #3: Do we have free will?

Just one more experiment, and this is an old classic: free will. Do we truly have free will or not? The experiment that has upset a lot of people over the years—although to be honest it's never worried me—is this. This is Benjamin Libet's experiment.

Benjamin Libet & Free Will



Libet B, Brain (1983), 106, 623-642

So here is a subject, and he or she is allowed to press a button whenever he or she wants: this is free will; it's not very exciting free will, but... You can press the button whenever you want. The person is able to look at this clock. There's the clock, and this red dot goes round in a regular way. The idea of the experiment is, you say to the subject, 'Whenever you want, at your discretion, press the button. Only the one thing you much remember is where the red dot was when you decided to press the button'. It's not that you have to say, 'I'll press the button in fifteen seconds'; no, you go whenever you want, but when you make that decision, you press the button. At the same time, the electrical activity over the scalp of the brain is recorded.

So what do you see? These are individual traces. These are three different subjects, and these are different trials, different events. The red line is the time at which the subject is conscious of having decided to move. Wherever it was on that clock is now; I decide to move now, and here's the recordings of activity over the brain. It's no surprise that after that event, we see increased activity, because you've decided to move and you've pressed the button.

Cerebral and Conscious Times of Volition

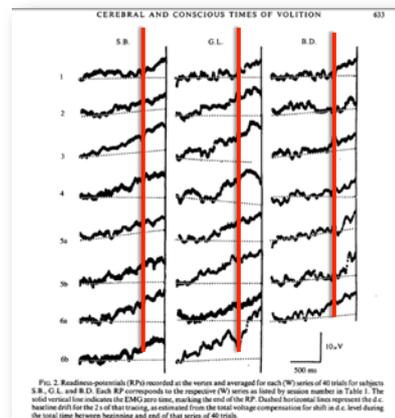


FIG. 2. Readiness-potentials (RPs) recorded at the vertex and averaged for each (W) series of 40 trials for subjects S.B., G.L. and B.D. Each RP corresponds to the respective (W) series as listed by session number in Table 1. The solid vertical line indicates the time of the RP onset. Dashed horizontal lines represent the time of the RP onset for the 2 of that tracing, as estimated from the total voltage compensation for shift in d.c. level during the total time between beginning and end of that series of 40 trials.

However, the thing that's upset some people over the years is that you see increased activity before the event. This is called the

'readiness potential', technically: the idea is that before you're even conscious of having decided to press that button, your brain knows about it before you. You are under control of your brain. Your conscious self is just a puppet. 'You have no free will', is the conclusion that some people have drawn from Benjamin Libet's experiment. Personally, I'm much more relaxed about it. When my wife and I go to a party, if my conscious self is a bit late on the act, I'm not too bothered; we still intended to come. I think where people run into trouble is that they think that their conscious self is the only thing they have. So really, what you're doing is denying intentionality of your unconscious self. I allow that my unconscious brain, or bits of my brain, can work and do things without it ever hitting my consciousness. Getting ready to prepare a movement, so that when I decide to do it (as it were), everything works out, seems to me an entirely reasonable way for the brain to behave. But let's see what someone very clever says.

Test of FAITH Clip: Computers made of meat?

John Polkinghorne: I think that it's just a fundamental human experience, a fundamental of human personhood, that we are creatures of choice and moral responsibility. Of course I know that philosophers can deny that, but nobody outside their studies lives as if they were automata of one sort or another. You only have to throw a glass of water in the face of a reductionist philosopher to see that that's the case.

Bill Newsome: You can make the argument that in reality we have no choice, we have no control over our actions - it's all physics in the brain, it's all motions of atoms. But I don't believe that that's true, I believe that all of our choices have mechanisms underlying them. If my brain were not active I wouldn't even, I wouldn't be here, I wouldn't be capable of making a choice. So the brain mechanisms are necessary to enable choice, and our choices are constrained. I can't choose to play golf like Tiger Woods. I can't choose to play basketball like Michael Jordan. There are certain things I cannot choose to do because of the biology of my body and the biology of my brain, but I think that within large arenas of behaviour, we really do have the ability to make meaningful choice, and how that gets reconciled with neurobiology at a mechanistic level is still quite mysterious and we don't know the answers to that, but I think it's a very very important question for all of us to reason about in the future, scientists and non scientists alike.

John Polkinghorne: In the end I think all these things are promises and not threats, though of course they may lead to perplexities, and we have to be careful not to allow reductionist interpretations of what's going on to just take over. Neuroscience isn't going to tell us all about the human person. It's going to tell us interesting important things - we're embodied people, how our bodies work is important - but it's not the whole story about us, we are more than computers made of meat, or something like that.

Dementia and Religious Experience

I'm watching time, so I'm going to skip on. Let me tell you about something that I'm really interested in doing in the future. We'll be about five minutes, and then we'll be done. I'm a neurologist and I'm interested in people with brain diseases, and there's one particular type of dementia where the frontal lobes are specifically damaged first. Sometimes you get one frontal lobe damaged first, before another. The advantage, if you don't mind me putting it like this because it's tragic for the people involved, but the advantage of this experiment of nature, or this experiment of disease, is that we get to see what happens if you lose the function of one frontal

lobe. This is an artist who developed just such a problem, and this is a picture the artist drew of the Rialto Bridge when he was well.

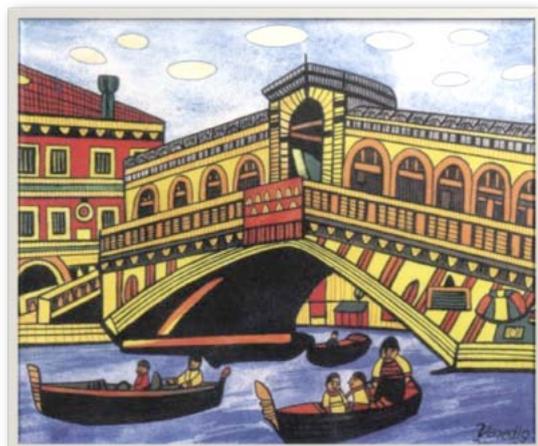
Carolus Horn 1921-1992



He then developed frontal temporal dementia affecting the left frontal lobe, which meant that he was having increasing difficulties with speech and with language—with writing, with reading—and yet his art flourished. At this point, he was unable to speak or read or write. Some people have said that his paintings just got better and better. This is nine months before he died, completely unable to communicate using language in any form.



I'm not an artist, but I do recognise there is a change of quality that you could describe as increasingly stylised; it's increasingly mannered, and perhaps it's more competent in some way, I'm not sure. That is his final picture of the Rialto Bridge before he died.



Why do I raise this? Well, Bruce Miller, who's the neurologist who looked after this patient, has described a syndrome where, as people lose function of the left frontal lobe, new creative and musical talents emerge—as though they were always dormant and had been suppressed in health, and suddenly, because part of the brain is dis-functioning, are allowed to emerge. That is a very provocative belief.

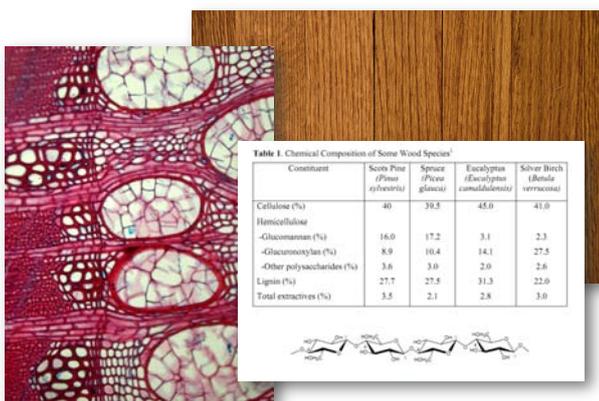
Bruce Miller has described this for music and art, but the experiment that we're about to start in Cambridge is to question whether people have a religious flowering in this context. We have some evidence to suggest that's the case. It may be that in health our brain is the site of a war, or conflict, between different appetites. It may be, for instance, as a hypothesis, that every single person has a strong religious appetite which is being suppressed in health by another part of the brain—not allowed to flower. That is hugely provocative as an idea, and we could go with that a long way, but we're not going to—and I'm actually going to skip a few slides because I want to leave time for discussion, and I just have one point to make.

Reductionism: Lessons from a chair

This is about reductionism. I have to be honest with you and say that, as I've started to think about this, I have had times when it's been a real problem for me: it seems you can explain human behaviour by the activity of a certain part of the brain, and that has at times undermined for me the integrity of my emotions, my beliefs, my experiences. I've kind of moved on from that, and the reason I've moved on from that is because of this chair. If you think this is simplistic, that will just give you some insight into me.

So this is a chair. My question to you is, how do you describe this chair? How can you most satisfactorily describe this chair? Here's one way you could do it; this is a very functional description of this chair. You could say what it's made of: it's made of wood. You could say, well, wood is made up of something, and we could look down a microscope. I don't know if you've ever done that, but this is wood under a microscope.

“nothing but”



Isn't that beautiful? It's stunning, isn't it? Those aren't ordinary colours, I'm afraid; that's stained. Just in passing we're just taken aback by the beauty of something like that. Then we say, but actually, we know that those fibres are made of something, and we can analyse them, and it turns out that cellulose is the main component of most types of wood, and here is cellulose.

How do you best describe this chair? What's the most satisfactory description for it? I think it depends a bit on who you are and what you want. If you've been asked to repair this chair, then you probably want to know what sort of wood it is, and that would be a very satisfactory explanation. You'd want to know who designed it and what manner in which to do it. If you were a chemist, I suppose this would be your thing, wouldn't it? You'd get really excited about just what proportion of cellulose was in this chair.

Now, it's absolutely necessary for this chair to exist that cellulose exists, just as it's absolutely necessary for us to have a brain that has neurons in it, that has neurotransmitters. There is no question of that. You can't say cellulose is irrelevant; it's absolutely fundamental. But is it the entire explanation for my chair? I'm a bit like the chemist here as far as the brain's concerned. I do get excited, metaphorically, with how much cellulose is in that chair—but you might not, and you might say, 'I'm completely uninterested in that'. It may be that one conclusion from this evening is to say, 'Right, frankly, I'm just not interested in the brain and religion'. Actually, I wouldn't be disappointed with that at all, because I think in saying that, you've come to the limits—you've recognised just how limited the useful information for our everyday lives can emerge from brain study.

‘Everything we believe and experience requires a brain-- but the brain is not the full and adequate explanation for it.’

But here's my point. This chair belongs to my mother-in-law. She gave it to me. It was made

by her grandfather. It was made for her father who died when my mother-in-law was four; he was killed in Singapore. So when I look at this chair, to be honest with you, how much cellulose is in it is frankly irrelevant. This chair has a story: it's a story about relationships, it's a story about history, it's a story about a present, it's a story about a blighted love, it's a story about my family. And that can't be replaced by another chair that's identical. I'm being honest with you in saying that this chair has helped me to see the limits of reductionism. I think it is perfectly acceptable to say that everything we believe and experience requires a brain—but the brain is not the full and adequate explanation for it. On that point I'm going to stop and invite questions.



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Dr Coles' other research interest, in the neurological basis for religious experience, came from managing a small cohort of patients with spiritual experiences due to temporal lobe epilepsy - seizures in the parts of the brain that are involved in speech, memory and hearing. He is currently supervising a research project with Dr Clare Redfern of the Faraday Institute, looking at the effect of neurological disease on religious experience.