

Christians in Science Lecture 7 High Cross Church Camberley 17th October 2017

'God and the Brain: What Neuroscience can teach us about people and God'

Revd. Professor Alasdair Coles

Professor Coles is a research neurologist at Cambridge University with a primary research interest in the immunology and treatment of multiple sclerosis. His other research interest is in the neurological basis for religious experience, stemming from managing a small cohort of patients with temporal lobe epilepsy. Dr Coles also does clinical work as a consultant neurologist at Addenbrooke's and Peterborough Hospitals. In addition he was ordained as a Church of England priest in 2009 and is a minister in secular employment at Addenbrooke's Hospital. His talk on 'God and the Brain' and the subsequent discussions were both engaging and informative and very well received by an audience of about 145 people.

A casual observation of the media might lead one to think that neuroscience could be regarded as the enemy of religious faith and incompatible with religion, and, indeed, Dr Coles said that in his experience most neuroscientists are atheists. However, Alasdair said that he personally had never felt a conflict between his Christian faith and his work as a scientist. Some people think that faith is no more than a part of the brain that 'lights up' when exposed to a scanner and that, therefore, God doesn't exist. Conversely neuroscience can't be used to prove that God does exist. Dr Coles said that in his talk he would refer to a number of experiments and studies which might be helpful in elucidating his subject.

The first point that Dr Coles made about the brain is that it does not passively observe the world around it but makes hypotheses about what it observes. Most of the latter are true/correct, but not always. He illustrated this with a trick drawing which could be seen in two ways – either of a beautiful young woman or of an old witch-like woman, depending on which outline the eye follows – but not simultaneously. The brain is also a 'believing' entity – it is routine for the brain to 'believe' where belief can be said to be making a hypothesis based on (potentially) uncertain facts. In the case of the eye it has been shown that in the optic nerve most of the fibres run from the retina to the brain but about 10% go in the opposite direction allowing the brain to modify what the retina observes. This is true of all sensory organs. There is no separate specific area of the brain for 'belief'. A second point was that human beings are inherently unreliable although that is not what we like to think. Dr Coles illustrated this by referring to two quite separate studies, one involving 'magic' mushrooms – the so-called 'Good Friday' experiment – and the other where Israeli Judges made decisions regarding probation for prisoners (a desirable outcome). In the first, a double-blind experiment, American student volunteers were alternately given an extract of magic mushrooms (mms – active ingredient psilocybin, known for many years to induce feelings of euphoria, joy, calmness etc) and two weeks later 'speed' (amphetamine). After administration of mms all the students felt really mystical, peaceful and in touch with another spiritual realm. After 'speed' the students felt elated but not particularly 'mystical'. A year later, the students were again interviewed and asked about the impact of the two drugs. They all said that taking the mms was one of the most – if not **the most** – spiritually uplifting experience of their lives and that it had had a long-lasting beneficial effect, making them better people! And so, psilocybin had triggered the mechanism that imparts significance (salience) to an event. Most people have experienced such an event in their lives – it might be a book or a film – which has assumed huge significance. The Gospels give us examples of this but our experiences need to have a reality check and we need to interpret them cautiously. In the case of the Israeli judges, the chance of a prisoner obtaining probation was plotted against the time of

day and it was found that on a regular, replicatable basis there was a 'spike' in the numbers given probation after every mealtime - breakfast, morning coffee, lunch etc - despite the judges being certain they were being equally even-handed throughout the day. And so the state of our bodies has a significant impact on our brain, our behaviour, our thinking and our rationality. Dr Coles pointed out that this was something the Jews of the Old Testament were well aware of. In Hebrews, for example, words used for the brain and the soul come from words to do with parts of the body and the OT Jews would not have been surprised that your appetite influences your thinking, and neuroscience is affirming the view that the state of our whole body has an influence on the brain.

While the above examples might seem somewhat disappointing, Dr Coles said there was good news relating to the 'plasticity' and amazing adaptability of the brain. 'Training' (or practice) is key. He cited some examples of this. One of these was learning to play an instrument such as the piano. Even middle-aged people, after only 30 minutes exercise, begin to find their finger movements becoming more flexible. More tellingly, neuroscientists could detect a difference in the volume (size) of a particular part of the brain between professional (performing) pianists, who might practice three to four hours a day, and piano teachers who perhaps practice only one hour per day. Similarly, it has been shown that the size of the London cabbies' hippocampus (the part of the brain relating to spatial navigation) increased over time as they underwent training in the 'knowledge'. Apparently, one can choose, even as an adult, to change the structure of our brain just by what we do for, say, 3-4 hours a day. Sachin Tendulkar, the famous cricketer, was able to return pretty well any fast delivery **and** to place it accurately according to the field. He might have 400 msec to respond to a fast ball – so how could he do that when others could not? Answer – practice, of course – but not in **consciously** thinking about which stroke he might play, as the time required physiologically-speaking to do that is considerably greater than 400 msec. An individual will become very adept at whatever he/she chooses to do regularly every day, as is well known, and this is because the brain is adapting to the activity, which itself will become more and more subconscious/automatic. TD might say he thought about each stroke but actually he didn't! Likewise professional pianists are not actually thinking about their finger movements. The mechanism of 'behaviour/character' change is often described by neuroscientists as a process of 'bottom-up reductionism' – there is a 'molecular event' in the brain (repeated), which leads to a change in electrical activity (altered activity in a specific pathway) which leads to an altered network activity, which in turn leads to a change in behaviour/character. More recently, neuroscientists think that a 'top-down' mechanism is also involved whereby we can alter 'character' by the conscious choices we make. The more time we spend 'training' the more our 'character' develops in the direction we train it in, which may well not always be our 'natural' inclination. In this regard, Dr Coles often felt this was analogous to St Paul's very human predicament as described in Romans chapter 7, very roughly translated as 'I know what I want to do but there is something in me that wants me to do the opposite'. He saw this as the clash between the bottom-up and the top-down approaches. 'Training' – how we spend our time, perhaps in regular prayer - is the way through this human dilemma.

Dr Coles claimed that in the population as a whole (irrespective of whether they attend church or synagogue etc) about half will have one 'numinous' (mystical, spiritually elevating, other-worldly) experience in their lifetime. Is that from God, or just from our brain, is it real? We know from studies of patients suffering from a particular rare type of epilepsy that the brain is built to (potentially) have such experiences. Instead of having the more common convulsive attacks, these patients experience feelings of peace, light and joy, and doubts and worries disappear. Dostoyevsky, who was such an epileptic himself, describes this in his book 'The Idiot'. So are 'ordinary' people who have such a numinous experience having an epileptic fit? No, it is simply that even in a 'normal, healthy' brain it is biologically natural to experience the 'numinous' - and hence, to experience God? Dr Coles went on finally to discuss the question of 'communication with God' and whether the brain has a special 'compartment' that deals with God. In a well-researched, balanced study American students were questioned about many aspects of their religious life – their beliefs, behaviour, practices, prayer etc –

and their answers statistically processed so that their religious experience, or otherwise, could be plotted in a 3-dimensional space where the axes (domains) represented 'How is God involved in your life (God's perceived level of involvement)', 'What does God think of you (God's perceived emotion towards you)', and 'How do you get your religious knowledge (your source of religious knowledge)'. Clearly, an atheist and a practising Christian would give very different answers and be placed some way apart on the graph. Churchgoers were then placed in a 'scanner' and questioned in detail about these 'domains' with the parts (networks) of the brain that were active under questioning noted. It was found that the brain networks involved in discussing a person's knowledge and experience of God were exactly the same networks as those used in dealing with any other human relationship eg with parents, teachers or friends. So the conclusion is that there is no special compartment or module of the brain for dealing with God. Professor Coles was not surprised at this conclusion and he found it really encouraging to see that while the brain has the capacity to relate to other human beings it has also the capacity to relate to God. The reverse will also be true and people, who for example are autistic and don't relate well to other people, will have a very different view of God from that of the average person.

Dr Coles' final slide was a summary of the above ranging from the notion that the brain is a 'believing' entity – where it uses exactly the same parts for believing verifiable truths and non-verifiable truths, such as belief in God - through to it being involved in mediating religious experience in exactly the same way as it handles human relationships with other people.

Professor Coles (AC) then dealt with a number of interesting questions, for example –

- the authenticity or otherwise of **religious visions**. At a scientific level it is possible that the mind is being 'tricked', for example to have a momentary vision of a bereaved person. A significant proportion of 'ordinary' people see things that aren't there. Whether a vision of Jesus or Mary has authentic religious significance or not, AC felt, as a Christian, depended on whether there was a real change in the life of the person concerned following the vision.
- does having a faith lead people to behave 'better'? That would be a difficult thing to measure and, no, AC was not aware of any **hard** scientific evidence in support of this.
- AC was asked to comment on neurologist Dr Eben Alexander's book 'Proof of Heaven' where he describes his dramatic experiences whilst being 'brain-dead' for a week (in heaven?). There are many compelling anecdotes of similar 'near-death' experiences which AC felt could well be a physiological effect of reduced blood flow to the cortex. He and others had, in fact, carried out a (rather trivial) study of surviving heart-failure patients who on questioning, following recovery, had not apparently 'risen to the ceiling', or at least had not seen any of the artefacts placed high out of view above their beds!
- does the brain adapt differently to training depending on whether it is 'active' (personal decision) or 'reactive' (eg training a child)? No, no physiological difference.
- in a similar vein, are their discrete brain mechanisms for prayer, and different types of prayer? Again the answer is no – reciting the Lord's prayer uses exactly the same parts of the brain as reciting a nursery rhyme and 'free' prayer (talking to God) uses the same (but different) networks as used talking to another person. However, AC's Carmelite nun's brain had subtle differences in shape and activity from that of an 'ordinary' praying person.
- is there a danger of a 'closed loop' in training the brain? AC agreed there was such a danger where the brain decides that it is going to change its character (what it is going to train), therefore I'm going to train and therefore my brain is changed/modified. In practice though, much of religious life, for example, is bound up within a community and the influences of this (like the 'external' influences of parents bringing up a child) 'nudge' us out of any loop.
- Would AC like to comment on those cases where a person has suffered some sort of severe trauma, say in a road accident, following which he/she is able, for example, to play the piano or speak a foreign language? These are very rare but real events which **may** be explicable on the basis

of the healthy brain consisting of many competing domains (like an ant colony!) which are normally in balance. Following the trauma, some domains may be damaged, and therefore suppressed, causing others (representing a latent ability) to come to the fore and be dominant. AC cited cases of dementia patients - where the dementia affects just one frontal lobe - becoming very artistic suggesting this latent ability had previously been suppressed.

- people with mental health problems, psychosis? Under the 'ordinary' microscope there appears to be no structural difference in the brain of a psychotic person from that of a 'normal' person. However, electron microscopy suggests that psychotic people have fewer connections (synapses) between the nerve cells leading to their brains being less 'stable' than the norm and that, as a result, thoughts and ideas that are normally suppressed 'escape' or emerge. AC postulated that this could be one result of the evolutionary development of human imagination where in psychotic minds imaginings become reality.

Following the Q/A session Richard Heddle gave an excellent and amusing vote of thanks where he thanked Professor Coles for an excellent talk in which there had been no pre-conceived agenda regarding the existence, or otherwise, of God.

The next CIS meeting dealing with Science and Faith issues will be in February 2018 at St Peter's Church, Frimley on a date still to be decided. The proposed subject is **Artificial Intelligence**.

John Wood

