

Christians in Science Lecture at St Paul's Church Camberley 12th February 2019

Professor Paul Ewart - 'Chaos, Chance and the Character of God'

Professor Ewart was formerly Professor of Physics and Head of Atomic and Nuclear Physics at the Clarendon Laboratory at Oxford University. He is an Associate of the Faraday Institute of Science and Technology (Cambridge) and has enjoyed a wide-ranging teaching and research career. He is an active and committed Christian and frequently gives lectures similar to this evening's talk.

Professor Ewart began his talk with a (Jewish) joke about the Lottery partly to illustrate our faith in God, or otherwise, and more seriously to see how we might answer the charge that 'life is a lottery' and how we might deal, from a Christian viewpoint, with events that appear totally random. It is extremely difficult to understand the role 'chance' plays in the life of this world - it always has been - and Paul spent some considerable time outlining this dilemma. One of the arguments for atheism is that life seems to lack meaning and purpose and could be considered to be just a 'blip' in a meaningless universe. Lotteries are deemed to be 'fair', being based on mere chance, and yet many people feel that life, with all its apparent randomness, 'just isn't fair'. There seems to be no correlation between what happens to people who are seen to be 'good' or 'bad' and the moral issues surrounding suffering might be an even more robust argument in favour of atheism. But, if chance or randomness has been a problem for 'religious' people it has also been a problem for scientists. Randomness is apparent in nature but one can also perceive considerable 'orderliness' and the latter was seen by the early philosophers and scientists as reflecting an 'orderly God'. The God of the Bible was also seen to be an orderly, rational God and early scientists such as Kepler and Isaac Newton similarly saw in their mathematical discoveries the reality of just such a God - 'the chief aim of all investigations of the external world should be to discover the rational order and harmony imposed on it by God and revealed to us in the language of mathematics'. The regularity of the solar system 'spoke of the counsel and dominion of an intelligent Being'.

So, if the perceived order and reliability in nature tells us something about the character of a Creator God, what does chance and randomness say about God? One approach to this apparent conundrum is simply to deny the reality of chance altogether, that is to say that chance is just an illusion. Underneath everything there is deterministic order - it only superficially 'looks like' randomness and chance - and, indeed, even Einstein, who declared 'God does not play dice', remained a resolute determinist all his life. He remained sceptical that Quantum Theory could ever be a complete description of nature - 'everything is determined by forces over which we have no control ... human beings, vegetables or cosmic dust, we all dance to a mysterious tune intoned in the distance by an invisible piper'. Einstein's God seemed to be responsible for everything including all kinds of evil and suffering and this was a problem for him. The classical theological approach has also been to deny the reality of chance, famously put by Calvin - 'there is nothing cheaper than a sparrow and yet God's eye is upon it, and nothing happens to it by chance'. Indeed, today many Christians still hold to the belief that absolutely everything is controlled by God right down to the smallest atom - 'there is no maverick molecule' - that is God leaves absolutely nothing to chance. If that is true, we have a problem. If every atom and molecule in our brains is controlled by God then every thought we have, what we believe, is determined by God, and this implies that free will is an illusion. However, modern science has begun to study randomness per se and chance is now a subject of scientific analysis. Paul alluded to two 'sorts' of chance - one where the outcomes of extremely complicated problems (which might include for example long-term weather forecasting) are unpredictable largely because of a lack of sufficient knowledge on our part, and the other 'pure' chance where there is inherent unpredictability and the outcomes can never be predicted with complete certainty. The latter (ontological chance) is the case in atomic physics (Quantum Theory) where all we can do is to calculate the probability that something will happen - worst case scenario for God where even He can't predict the outcome! This sort of unpredictability is quite common in science as exemplified by the underlying randomness in biological evolution. In the latter case, the whole theory rests on random genetic mutation which enables an organism to better adapt to life and hence pass the change on through the species, leading to the development of new life forms. Some mutations can, of course, also be detrimental. So, we have to take account of the fact that chance is in some sense real and we have to deal with that, which

could be a problem for some 'believers'. Jacques Monod in his book 'Chance and Necessity' states that 'Man at last knows that he is alone in the unfeeling immensity of the universe out of which he has emerged by chance'. Richard Dawkins has developed this thinking more recently as part of his thesis that the evolution of space and randomness has essentially destroyed the argument for God's existence and the idea of God as the Designer. We can, he says, account for everything in terms of random variation and so, because chance is real, God is a delusion. On the other hand, 'Creationists' and advocates for 'Intelligent Design' would argue that because there is 'design' in the world through a (real) Designer God, chance is an illusion. The reality of chance would, for them, mean that God is not in control.

So, the question is - if chance and randomness is real, can God still be the Creator and still be in control of things? Would a good Creator God leave anything to chance? With some qualifications, Paul might well answer 'yes' to this question! But, of course, that still leaves difficult issues like that of suffering, which is bad enough to deal with in itself, but seems even worse for those who seem not 'to deserve it'. He referred to Rabbi Kushner's book 'When bad things happen to Good People', written out of his own personal experience of suffering. Kushner concluded in the end that 'stuff just happens' and that God is not omnipotent. While we can clearly sympathise with Kushner in his distress, that does not necessarily validate his conclusions. Some people feel that if God is not responsible for the bad things in life neither can He be responsible for the good, and hence becomes irrelevant. On the other hand, if God is in control of everything, including suffering, is that God worthy of our worship?

So, how do we deal with this problem? In the **main thrust** of his talk Professor Ewart attempted to answer this problem by suggesting that chance and randomness – usually seen in a negative light (as a source of disorder) – might not be 'the villain of the piece' after all but be an essential part of God's Creation. Are there any clues in the Bible? Paul cited the story of Gideon and the fleece in Judges where Gideon statistically tests the sign (of guidance) from God by checking whether the presence of dew on the fleece, or otherwise, was a fluke (ie a chance occurrence) or not! In Ecclesiastes we see that 'the swift,the strong,..... the wiseand the intelligent' are not guaranteed success but 'time and chance happen to them all', and in Genesis '... the Spirit of God was moving upon the face of the waters (or the 'deep')'. To the Hebrews the 'deep' or the oceans represented chaos. Could it be that the writer of Genesis was saying that the first thing God did was to create chaos, out of which His Spirit brought order? And so, it might be that God intentionally gave chance a (constructive) role in His creation and Paul referred again to the role of chance in evolution, where one could argue that randomness was the most efficient way of developing robust life, as exemplified by our immune system's ability to quickly develop antibodies to an invading organism. He referred also to an experiment he carried out as part of his own research work. This involved the use of lasers to cause atoms to 'jump' from one energy state to a higher one (a quantum jump). When the atoms were irradiated with two different photons at random the quantum jump did not occur, as predicted by quantum theory. (This is due to destructive interference – the probabilities of the quantum jumps up and down are equal and opposite). However, somewhat to Paul's surprise, when the randomness of the irradiating photons was increased, the quantum jump did sometimes happen, showing that randomness or chaos can under certain conditions 'destroy' rigid determinism and lead to a constructive outcome – 'randomness can free the universe from the iron grip of determinism' and chance enables nature to do things which would otherwise be forbidden.

Returning to the problem of suffering and its random occurrence, Paul offered another viewpoint where the Laws of Nature (physics), Chance and Free Will are all equally real and interact with each other. Suppose that suffering isn't random ie bad things only happen to bad people, but at the same time we have free will and the laws of nature operate in God's world. If Paul Ewart, for example, decided to inflict some harm on a 'good' person and the world is governed by some sort of 'moral law', then God would have to intervene to prevent that happening. This would imply either that God would take control of Paul's free will or that God's actions would themselves be controlled in some predictable way – Paul could only inflict harm on a bad person. In resolving this situation, Paul suggested that because all three factors, including chance and randomness, **do** operate in God's world the outcomes of his (Paul's) actions (and likewise the occurrence of suffering) are unpredictable and in that way God is 'insulated' from Paul's free will. So, he argued that the randomness that God has built into the universe acts to protect His sovereignty over the world. Paul illustrated his thinking with a number of analogies – firstly from the

world of computers. The great benefit of the latter derives from their totally deterministic nature but this in turn makes them vulnerable to viruses. The latter can 'infect' an otherwise reliable program and create a loop from which the program cannot escape. However, an intelligent programmer can add a bit of 'random' programming which allows the program to (randomly) jump out of loops and so complete the processing. In another analogy Paul compared God to an infinitely wise chess grandmaster whose (human) opposite number is able freely to choose any number of possible moves but the chess master will always be able to adapt to these and win the game. In this way God is 'insulated' from our actions - and similarly from random events in nature - and still be able to achieve His purposes and retain His sovereignty. Nature is free and our wills are free but God has the love, wisdom and power to deal with any situation that arises.

Professor Ewart 'digressed' into the concept of **emergence** where any entity - an inanimate material or an organism of any sort - displays (emergent) properties apparently unrelated to those of its constituent parts and is, in effect, greater than the 'sum of its parts'. There are very many examples of this phenomenon but Paul reflected in particular on how the concept **might** help us to interpret the relationship between the brain and the 'mind' and provide a further insight into God's providential role in a world of randomness and free will. The workings of the mind or the brain can be thought of in two ways - either through a 'bottom-up'/reductionist approach or via a 'top-down' view. In the former - advocated by many, including some scientists - the brain is essentially controlled by what the atoms and molecules at base level (in the cells of the brain) are doing. We do have a brain, of course, but what is referred to as a 'mind' is something of an illusion - it's just what the brain does! This can be construed as saying, whatever we might think, our thoughts are an illusion and we are in fact being controlled by the atoms and molecules of our brain via the laws of physics and chemistry. Paul was not over-impressed by this way of 'thinking' as it could be seen to mean that ultimately there is no reason to believe our thinking processes are real or to suppose, for that matter, that our brains are made of atoms and molecules (!), and that certainly there can be no such thing as free will. More recently, however, scientists have begun to take more seriously the concept of emergence and to see the 'mind' as an example. We all grow from a single cell in the womb into a very complex organism from which, at a certain level of complexity, the phenomenon of 'mind' emerges, which in turn is able, in some way, to act downwards (the top-down approach) and create changes at a lower level. The brain seems to have the facility to select, from all the random molecular movements, particular currents and circuits that correspond to rational thought. A similar process is thought to be involved in the formation of memories. Such processes cannot be adequately explained simply on the basis of the movement of the atoms and molecules present in the brain. Paul **speculated** that, through the combination of this level of randomness and emergence, we can have rational thoughts and indeed free will, even within a world dominated by the laws of physics and chemistry. As a consequence, this implies that we have a (moral) responsibility for what we think and do - we cannot just blame our genes, or what's happening in our brain, for bad or evil deeds. In similar vein, Paul's view was that God does not micro-manage the world - He might **know** that the sparrow in Matthew's gospel has fallen to the ground or that we are having particular thoughts but He doesn't '**will**' these things to happen but He is nevertheless there whatever happens.

And so, he returned to the perennial problem of suffering that seems unrelated to a person's deserts, and finally to his own personal philosophy of life as a committed Christian. Suffering was, of course also a problem in Jesus' time and Paul referred to the instance where Jesus and his disciples met up with the congenitally blind man. At the time, blindness was seen as a punishment for sin, committed even by a blind person's parents, but Jesus said this was not the case. Suffering can be seen as an opportunity to experience God's grace in some special way, which of course is easy to say. Paul compared God to a parent teaching a child to ride a bicycle. The parent initially holds the saddle but gradually releases his grip while continuing to run alongside. In that way the child learns to cope with the twists and bumps in the road - the ups and downs of life - a further suggested reason as to why God might allow chance to figure in this world. We learn by experiencing random, unpredictable events to trust God and through faith in Him to develop a more dynamic relationship. Paul maintained that trust is only meaningful where there is uncertainty and unpredictability, as was well articulated in Psalm 16 - 'The Lord is my chosen portion and my cup; thou holdest my lot'. He quoted also from Rupert Brooks who experienced the

horrors of WWI and yet still held onto Christ's promise of eternal safety - 'Safe shall be my going and if these poor limbs die, safest of all'.

In conclusion, Professor Ewart said that:

- chance is real and not illusory
- chance frees nature from determinism
- chance similarly allows us to have free will, coupled with responsibility for our actions
- chance provides a partial answer to the problem of suffering
- chance preserves God's sovereignty - everything is still within God's providential care
- chance is consistent with a God who is real and a God who is personal.

Following his talk, Paul answered a range of questions:

- Regarding emergence. He cited water as another example of this. At a certain level water exhibits the emergent property of 'wetness', which is not a property of the individual molecules. Similarly, 'mind' is an emergent property which develops out of the brain and can in some way act 'downwards'.
- 'Why on earth would God design a world that has entropy (a measure of disorder)? We, homo sapiens, have a sense of design and yet the universe seems to work against us'. Without answering the questioner directly, Paul talked about the beginnings of the universe and our world – in Genesis it began in some kind of disordered state (chaos) and for physicists it began with the Big Bang and the creation of time and space. In both accounts, somehow 'orderliness' emerged with a precision (fine tuning) that is unbelievably improbable. At some point carbon atoms appeared thus enabling life forms to evolve into conscious beings like ourselves, who are able to talk about issues such as purpose and meaning. Yet there is a limit to what we can know. All we can see, as Christians, is that we are playing a part in a 'process'. Paul agreed that in the model of the expanding (an accelerating process) universe, entropy will increase to the point that life as we know it will end, but the Christian hope is that out of the existing creation a new one will emerge. A clue to this might lie in the resurrection of Jesus where his resurrected body had a different kind of properties.
- 'If God's ultimately in control of the world should we be worried about the current state of things?' Yes, we should. We have a moral responsibility to take action, for example, to prevent global warming and climate change. Not doing so is not how we express God's love in the world.
- 'How would you square the apparent precision of the many Biblical prophecies regarding the birth, life and death of Jesus with your theory of randomness in the world? And does prophecy remove the element of free will, for example in the actions of Judas?' Paul agreed that these prophecies **were** fulfilled in some sense but that the details were not necessarily that important and that there has been an element of 'backward interpretation' of events. The actions of Jesus still allowed Judas to be responsible for what he did. He still had a choice and Jesus might have died in some other way and, indeed, Jesus' birth could have taken place in a different way. God works providentially through the choices people make.
- 'How does Stephen Hawkins' 'end theory' and the theory of the Multiverse idea fit with your theology?' This is a very sophisticated mathematical construct about the ultimate structure of matter but it has not (as yet?) been accepted by scientists as real 'science'. Not every mathematical theory turns out to correspond to reality although many, such as Quantum Theory, do. There is no way of testing the Multiverse Theory but if we **could** detect one of these other universes, it would in effect become part of our known universe.
- 'It's true that Jesus did use the incident of the blind man (in Matthew's gospel) as a way of bringing glory to God, but are there not many more examples (in the Old Testament) of God 'causing' suffering?' Paul Ewart saw things in a different light. While the evil that man does always has consequences (= 'judgement?'), God does not '**cause**' the evil, but **uses** it for His own purposes. He instanced the actions

of the militaristic Babylonians and their consequences, and also the evil of the murder of Jesus which God turned into our salvation.

- ‘Do you have a view on the role of prayer in healing, particularly faith healing, and is it a random event?’ Paul felt one has to think carefully about what one means by prayer – it is not simply a mechanism for getting what one wants from God, but a way of involving us in His work in the world. Paul did think God answers prayer but not necessarily in a way we might expect, and certainly not in a way that would chime with a convinced atheist – ‘it might have happened anyway, just coincidence’ – and, here, we are reminded of Einstein’s comment – ‘Coincidence is God’s way of remaining anonymous’!

In thanking Professor for his exceptional talk, John Walton likened it to being taken on a journey of exploration in which the ‘plusses and minuses’ of uncertainty and chance in this world are examined and used to draw the conclusion that ‘God is real and personal’.

The next meeting of the Surrey Heath Group will be on July 9th at St Peter’s Church, Frimley, at which Dr Stuart Judge (Emeritus Reader in Physiology at Oxford University) will discuss ‘The Christian View of Human Nature’.

John Wood

