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# Editorial

## God, Science and Freedom: Where Next?

The results of neuroscience research suggest that our brains are sophisticated neural computers, obeying the laws of physics and chemistry. This may challenge theological and humanistic beliefs in several ways, not least by the implication that our brains are to be conceived on a deterministic model, and four articles in the present issue are relevant to this problem. Two of the four (those by Malcolm Jeeves and Alan Torrance) stem from the October 2003 *Christians in Science* London Conference on **God, Science and Freedom**.

The core of the problem is that if our brains work mechanistically, our behaviour must be predetermined. But how then can we be free? How can we be responsible for our choices if they were predetermined before we made them?

Solutions to this problem fall into two main groups. Those in the first (*libertarianism*) deny physical determinism, and argue either for fundamental indeterminacy, or for a dualistic form of determinism in which the mind (or soul etc.) plays a causative role in determining brain activity. Those in the second (*compatibilism*) admit physical determinism, but assert that it is compatible with free will. Thus, compatibilism (or 'soft determinism') attempts to provide a middle way between the inhumanity of hard determinism and the seemingly unscientific basis of libertarianism. In practice, the debate between hard determinism, compatibilism and libertarianism is frequently linked to a second debate, that of materialistic monism (all is atoms and molecules) versus interactive dualism (the soul/mind pushes the atoms around and vice versa). Here too, many Christian writers propose a middle way, emphasising that the strong dualist tradition in Christian thought has its roots in Plato, not in the Bible[1]. Since traditional defences of libertarianism have often invoked dualism, the two debates are often fused, but they are logically distinct.

In line with many modern scientists and philosophers, Malcolm Jeeves and Patrick Richmond both adopt forms of compatibilism. Jeeves' article sets the scene, providing striking illustrations from neuropsychology and neurogenetics of the close link between brain activity and mind, and spells out the problem that this poses to human freedom. He and Richmond candidly admit that neuroscientific determinism raises difficult problems, but both, in very different ways, argue that dualism and libertarianism do little to solve them.

In contrast, Alan Torrance, despite considerable agreement with Jeeves, considers compatibilism to be problematic not least because of arguments by the

1. Booth, D. 'Human Nature: Unitary or Fragmented? Biblical Language and Scientific Understanding', *Science & Christian Belief* (1998) 10(2), 145-162.

philosopher Galen Strawson, and leads us into some difficult ground in the search for a solution. He first considers a recent alternative advocated by Nancey Murphy and other non-dualists known as *non-reductive physicalism*, but in view of criticisms by Jaegwon Kim, he prefers an alternative third way provided by the 'pluralism' of Nancy Cartwright, namely the view that patterns emerge in physical processes which have genuine causal powers. My amateurish impression is that the difference between Cartwright's pluralism and the compatibilism of authors such as MacKay and Jeeves is rather subtle.

Finally, Peter Bussey, rather than addressing directly the issue of libertarianism versus compatibilism versus hard determinism, focuses on the nature of the mind-body problem, and proposes that 'the concept of the "mental" be broadened to encompass the laws of nature, taken as mathematical ideas which determine the behaviour and properties of physical things'. So, despite the very different focus of his article, Bussey joins Torrance with the key notion that abstract features or ideas can determine physical events.

### *What's moving on the scientific horizon?*

As a neuroscientific spectator of the philosophical debate I am struck that it moves more slowly than the relevant science. The latest versions of compatibilism and pluralism do not seem very different from those of Austin Farrer[2] and Donald MacKay[3] several decades ago. Progress may be real, but the basic agenda has not changed. So what changing areas of science should we keep an eye on in the expectation that they may modify the debate?

*First, the neuroscience of decision making, of volition.* We are not concerned with the entire brain, but with the particular functions in the brain that underlie decision-making and willing and wanting. While neuroscientific exploration of these areas began in the 1950s and 1960s, progress has been slow, but there has been a gradual increase in momentum over the last two decades. The two areas that have so far been most amenable to experimentation have been the questions of *where* in the brain decision-making processes occur and that of *when* they occur in relation to the conscious experience of willing. The *where* question has yielded to modern advances in functional imagery, coupled with more classical evidence from neuropsychology, and there is now little doubt that the dorsolateral prefrontal cortex is a key area, perhaps the key area. The *when* question goes back to the seminal papers of Libet et al. in the early 1980s reporting that the brain events initiating voluntary action, manifested by the *'readiness potential'*, began about 300-400 ms before the conscious decision to move, implying that the latter was too late to be causally responsible for the

2. Farrer, A. *The Freedom of the Will*, Black (1958).
3. MacKay, D.M. *Freedom of Action in a Mechanistic Universe,* Cambridge: Cambridge University Press (1967).

movement. The interpretation of this is still debated, but real progress can be expected as further experimentation is continuing.

*Secondly, the interactions between quantum indeterminism and chaos.* The attempt to base dualistic theories of mind-brain interaction in Heisenbergian indeterminism has long been controversial. The basic idea is that quantum level fluctuations provide an envelope within which the mind might influence the brain without violation of the laws of physics, and the site of such interactions has been postulated to be at synapses (Eccles) or in microtubules (Hameroff, Penrose). Despite the well-known philosophical difficulties and lack of evidence to support such theories, I do not think we should ignore them. For once we have suggestions that can be investigated experimentally. A major problem with such theories is the doubt whether quantum-level fluctuations could have a significant effect on such gigantic objects as neurons, which leads to the question of whether they might be amplified by chaos. This turns out to be an extremely difficult area, and while the notion of 'quantum chaos' has been with us for almost two decades, specialists currently debate whether it exists at all, because of the mathematically predicted 'quantum suppression of chaos'. In a recent volume on quantum physics and divine action, that was recently reviewed in this journal, quantum chaos is dealt with by leading specialist Michael Berry[4], who argues that the quantum suppression of chaos is itself suppressed by another quantum effect called *decoherence*. He goes on to show that this decoherence will be very important (because very fast) even in so large an object as Hyperion, the 16th satellite of the planet Saturn (radius 142 km). He chooses Hyperion because its rotation is known to be chaotic. It follows from this that quantum chaos can exist under certain conditions, and that quantum fluctuations can be greatly magnified through their effect on the chaotic behaviour of objects much larger than neurons. The question of quantum chaos in the brain is virgin territory, but progress in this area can be expected; it should surely contribute to the question of mental determinism, and might even prove relevant to free will.

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4. Berry, M.V. 'Chaos and the semiclassical limit of quantum mechanics (is the moon there only when somebody looks?)', in Russell, R.J., Clayton, P., Wegter-McNelly, K. & Polkinghorne, J. (eds) *Quantum Mechanics: Scientific Perspectives on Divine Action, Vol. 5.,* Vatican City: Vatican Observatory Publications and Berkeley CTNS (2001).