

Life Ascending

The Ten Great Inventions of Evolution

Chapter 9: Consciousness

Nick Lane

Biochemist and writer

About

Dr Nick Lane is a British biochemist and writer. He was awarded the first Provost's Venture Research Prize in the Department of Genetics, Evolution and Environment at **University College London**, where he is now a Reader in Evolutionary Biochemistry. Dr Lane's research deals with evolutionary biochemistry and bioenergetics, focusing on the origin of life and the evolution of complex cells. Dr Lane was a founding member of the UCL Consortium for Mitochondrial Research, and is leading the UCL Research Frontiers Origins of Life programme. He was awarded the 2011 BMC Research Award for Genetics, Genomics, Bioinformatics and Evolution, and the 2015 Biochemical Society Award for his sustained and diverse contribution to the molecular life sciences and the public understanding of science.



Life Ascending

The Ten Great Inventions of Evolution

Chapter 9: Consciousness

In 1996, Pope John Paul II wrote a celebrated message to the Pontifical Academy of Sciences, in which he recognised that evolution is more than a hypothesis. 'It is indeed remarkable that this theory has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge. The convergence, neither sought nor fabricated, of the results of work that was conducted independently is in itself a significant argument in favour of this theory.'

Perhaps not surprisingly, though, the Pope was not about to throw the baby out with the bathwater. The human mind, he said, was forever beyond the domain of science. 'Theories of evolution which, in accordance with the philosophies inspiring them, consider the mind as emerging from the forces of living matter, or as a mere epiphenomenon of this matter, are incompatible with the truth about man. Nor are they able to ground the dignity of the person.' Inner experiences and self-awareness, he said, all the metaphysical apparatus through which we communicate with God, are impervious to the objective measurements of science, falling instead within the realms of philosophy and theology. In short, while conceding the reality of evolution, he was careful to discriminate the Magisterium of the Church as above evolution.

This is not a book about religion, and I have no wish to attack anyone's devoutly held beliefs. Nonetheless, for exactly the same reasons that the Pope was writing about evolution ('The Church's Magisterium is directly concerned with the question of evolution, for it involves the conception of man') scientists are concerned with mind, for that involves the conception of evolution. If the mind is not a product of evolution, what actually is it? How does it interact with the brain? The brain is obviously physical, so presumably it is the product of evolution like animal brains, which share many, if not all,

structures. But if so, does the mind evolve as the brain evolves, for example during the expansion of brain size in hominid skulls over the last few million years (certainly not a bone of scientific contention)? For that matter, how do matter and spirit interact at a molecular level, as they would have to; for otherwise how could drugs or brain injuries affect the mind?

Steven Jay Gould wrote positively of two non-overlapping Magisteria, Science and Religion, yet there are inevitably a few places where the twain must meet and overlap, consciousness being the prime example. These issues plumb the depths of history. Descartes, in proposing a split between spirit and substance, was in reality doing no more than formalising an idea with roots in antiquity and favoured by the Church – as a devout Catholic, he had no stomach for the condemnation meted out to Galileo by the Church. By formalising the split, Descartes freed the body, even the brain, for scientific study. Unlike the Pope, few scientists today are out-and-out Cartesian dualists, in the sense of believing in a separation between spirit and substance, but the concept is not ludicrous, and the questions I pose above are susceptible to scientific exploration. Quantum mechanics, for example, still holds open the door to deeper cosmic mysteries of mind, as we shall see.

I'm quoting the Pope because I think that what he says goes beyond religion, into the heart of man's conception of himself. Even those who are not religious may feel that their spirit is somehow immaterial, uniquely human, and in some way 'beyond science'. Few people who've read this far will feel that science has no right to pontificate on consciousness, and yet perhaps equally few would give evolutionists any special rights over a ruck of other disciplines that can claim insight – robotics, artificial intelligence, linguistics, neurology, pharmacology, quantum physics, philosophy, theology, meditation, Zen, literature, sociology, psychology, psychiatry, anthropology, ethology, and more.

I should say at the outset that this chapter is different from the other chapters in this book, in that not only does science not (yet) know the answer, but at present we can barely conceive of how that answer might look in terms of the known laws of physics or

biology or information. There is no agreement among scholars of the mind about exactly how the firing of neurons could give rise to intense personal sensations.

But that is all the more reason to enquire what science can tell us about the workings of the human mind, and where those efforts meet a wall of unknowing. The Pope's position strikes me as defensible, insofar as we do not know how 'mere matter' generates the perceived immateriality of mind; indeed, we don't even know what mere matter actually is, or why matter exists, rather than nothing at all (in some ways a similar question to that of why consciousness exists, rather than non-conscious information processing). However, I think, or perhaps I should say I believe, that evolution does explain the most ethereal monuments of mind. And more: the known workings of the human mind are so much more marvellous than the untutored mind can even begin to imagine that there is every reason to ground the dignity of the person in the majesty of the biological mind.

There are other compelling reasons for science to take up the challenge. The human mind is not always the rich vessel that we treasure. Diseases of the brain strip away the workings of the mind. Alzheimer's disease cruelly peels back the layers of a person, revealing ultimately their innermost lack of being. Deep depression is far too common, a malignant sadness that consumes the mind from within. Schizophrenia pulls the most real and harsh illusions, while some epileptic seizures dissolve the conscious mind altogether, exposing the zombie within. These conditions give a chilling impression of the vulnerability of the human mind. Francis Crick famously observed that 'you're nothing but a pack of neurons'; he might have added that they build a fragile house of cards. For society, for medicine, not to strive to understand and try to cure such conditions would be to deny the very charity that is esteemed so highly by the Church.

The first problem faced by any scientific account of consciousness is definition: consciousness means all things to all people. If we define consciousness as the awareness of self embedded in the world – a rich autobiographical awareness that defines an individual in the context of society and culture and history, with hopes and fears for the future, all cloaked in the dense, reflective symbolism of language – if this is

consciousness, then of course mankind is unique. There is a chasm between humans and animals, none of which can be graced with the word, nor even our own ancestors or young children.

Perhaps the apotheosis of this view came in a strange book, *The Origin of Consciousness in the Breakdown of the Bicameral Mind*, by the American psychologist Julian Jaynes. He sums it up nicely: 'At one time, human nature was split in two, an executive part called a god, and a follower part called a man. Neither part was consciously aware.' What is surprising is how recently Jaynes places that period – some time between the composition of the Iliad and the Odyssey. (Of course, Jaynes takes these very different epics to be composed by different 'Homers', hundreds of years apart.) The essential point is that consciousness, for Jaynes, is purely a social and linguistic construct, and a recent one at that. The mind is conscious only when it becomes aware that it is conscious: when the penny drops. As an argument that's fine, but any argument that sets the bar so high as to exclude the author of the Iliad is surely too high. If Homer the elder was not conscious, was he then some unconscious zombie? If not, there must be a spectrum of consciousness, in which the highest form is self-awareness as a free and literate member of society, and lower forms are simply lower.

Most neuroscientists make a distinction between two forms of consciousness, which have their roots in the structure of the brain. The terms and definitions vary, but essentially 'extended consciousness' refers to the full glories of the human mind, utterly unattainable without language, society, and so on; while 'primary' or 'core' consciousness is something altogether more animalistic – emotions, motivations, pain, a rudimentary sense of self lacking an autobiographical perspective or a sense of death, and an awareness of objects in the world. The world of a fox that, when caught in a jawed trap, gnaws off its own leg to escape. As the distinguished Australian scientist Derek Denton observes in his fine book on animal consciousness, *The Primordial Emotions*, surely the animal is aware that it is held by the trap jaws and has an intention to get free. It has some awareness of self, and it has a plan.

The irony is that extended consciousness is relatively easy to explain, even if the word 'easy' should be qualified. Given a low-grade sense of 'awareness', there is nothing about extended consciousness that transgresses our physical understanding of the world; there is just a daunting parallel circuitry in the brain, embedded in the complex setting of society. There is nothing miraculous about society itself, for example. Plainly a child who is raised in isolation in a cave will possess no more than rudimentary consciousness, just as we may suspect that a Cro-Magnon child, raised in Paris today, would be indistinguishable from the French. Likewise with language. Most people find it impossible to conceive of any form of developed consciousness in a person or species lacking language, and again that is almost certainly true. But there's nothing magical about language. Language can be programmed into a robot sufficiently well to pass an intelligence test (such as the Turing test) without the robot ever becoming 'conscious' or possessing even a basic awareness. Memory, too, is eminently programmable; thank God my computer can remember every word I type. Even 'thinking' is programmable – just consider the chess-playing computer 'Deep Thought' (named from *The Hitchhiker's Guide to the Galaxy*) and its successor, 'Deep Blue', which in 1997 defeated the reigning world champion Gary Kasparov.³ If humans can program these things, so too can natural selection, of that there can be no doubt.

I don't want to belittle the importance of society, memory, language and reflection to human consciousness: obviously it feeds on them all. The point is that, to be conscious, all of them depend on a deeper form of consciousness – feelings. It's easy to imagine robots with the brainpower of Deep Blue, with language, with sensors of the external world, with a near-infinite memory, but with no consciousness. No joy, no sorrow, no love or sadness of parting, no exultation of understanding, no hope, faith or charity, no thrill of a delicate scent or of lightly glancing flesh, no warmth of the sun on the back of your neck, no poignancy of the first Christmas away from home. Perhaps one day a robot will feel all this in its cogs, but for now we don't know how to program poignancy.

This is the same inner life ring-fenced by the Pope as falling within the Magisterium of the Church, and was famously described at about the same time by the Australian

philosopher David Chalmers as the 'hard problem' of consciousness.

Since then there have been many attempts to address the problems of consciousness, some quite successfully; but none has successfully addressed Chalmers' hard problem. Even the iconoclastic philosopher Daniel Dennett, accused of denying the problem altogether, actually sidesteps it in his celebrated 1991 opus, *Consciousness Explained*. Why shouldn't neurons firing feel of something, he asks at last, in closing his chapter on qualia (subjective sensations)? Why not indeed; but doesn't that just beg the question?

I am a biochemist, and I know its limitations. If you want to explore the role of language in fashioning consciousness, read Steven Pinker. I didn't include biochemistry in my list of subjects that can lay claim to any expertise in consciousness. Remarkably few biochemists have ever tried seriously to tackle consciousness, Christian de Duve being a possible exception. And yet surely Chalmers' hard problem is actually a problem in biochemistry. For how does the firing of neurons generate a 'feeling' of anything? How do calcium ions rushing through a membrane generate the sensation of red, or fear, or anger, or love? Let's keep this question in mind as we explore the nature of core consciousness; how and why extended consciousness must be built on core consciousness; and why core consciousness turns on a feeling. Even if I can't answer the question, I hope to frame it clearly enough to see where we might look for an answer. I don't think it is in the heavens, but here on earth, among the birds and the bees.

Nick Lane

Biochemist and writer

www.nick-lane.net