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Guest Editorial

The open mind

News that the complete works of Charles Darwin will become accessible for the first time through a project based at the University of Cambridge (http://darwin-online.org.uk) has excited much interest. Both Darwin and Einstein were prolific letter-writers: during their lifetimes they sent at least 7,500 and 14,500 letters (0.59 and 1.02 a day during their last thirty years), respectively, and each received a similar number. It turns out that both great men prioritised their replies to letters in the same way that we rate our e-mails today. In other words, there was a pattern to their writing that the famous were no better at escaping than the rest of us, according to Oliveira and Barabási.[1]

Simon Conway Morris's lecture published in this issue which relates to aspects of his magnum opus 'Life's Solution' draws us to the issue of convergence, the process whereby life seems to evolve toward similar solutions. Convergence reveals a deeper structure to life than had been previously appreciated and Conway Morris's contention that once the imaginary tape of life is unleashed it would eventually converge on the sophisticated properties of advanced sensory systems, intelligence and complex societies, has challenged the cherished views of certain evolutionary biologists. Its implication is that we, and all other life, may not be quite the random accident promoted by arch-reductionists. On the other hand, when competition occurs between more similar forms, it can strongly influence how evolution proceeds by divergence and living things show an expanding tree-like pattern of relationships. Species apparently push one another apart in evolution because, as Darwin said, 'modified offspring of all dominant and increasing forms tend to become adapted to many and diversified places in the economy of nature'.

The importance of convergence to the philosophical and religious implications of evolution will take time to penetrate widely, not least in the USA where the conflict between science and religion has been reopened despite serious scholarship in evolutionary biology of the past half century. A poll conducted by the Pew Forum on Religion in Public Life and published recently in the *New York Times* showed that among the people of the world's most technologically advanced nation 42% believed in creationism and 48% in evolution. Evolution was believed to occur through natural selection by 26% of people and to be directed towards a goal by 18%. Creationism, like intelligent design, has become a religion in its own right. However, Michael Ruse[2] in his most recent

1 Oliveira, J. G. & Barabási, A-L 'Human dynamics: Darwin and Einstein correspondence patterns' *Nature* (2005) 437, 1251.
2 Ruse, M. *The Evolution-Creation Struggle*, Cambridge MA: Harvard University Press (2005).

book, has reminded us that 'evolutionism' is itself also a religion that has its own story of human origins, the unique role of humans in shaping their destiny, and moral prescriptions such as eugenics that are now frowned upon.

While this conflict continues, the evolution debate itself has taken a much more interesting turn with the question that is central to all biology and to our understanding of human nature, namely: How can natural selection lead to cooperation? Their ability to cooperate is one of the main reasons why humans have managed to survive in almost every ecosystem on earth and is set to become of even greater significance. Gretchen Vogel[3] raises questions that still pose real problems for evolutionary biologists – Are cooperative urges programmed in our genes? Are we taught by our culture to play well with others and are these outdated urges that once upon a time were drivers of survival but make little sense today?

Vogel draws attention to the cooperative interactions that exist among non-human animals and seem 'hard-wired', as in bees that collect pollen for the whole hive, and meerkats that risk their lives to guard a common nest. Proponents of the well known theory of kin selection would say that these behaviours increase the chances of survival by passing on one's genes to the next generations. Helping unrelated individuals can also increase one's fitness as long as the recipient can be reasonably expected to return the favour. So, female baboons living in a social setting have a greater chance than less social females of having an infant survive to its first birthday. Somehow, grooming and staying in close contact with other group members provides female baboons with a reproductive advantage consistent with the theory of reciprocal altruism.

Martin Nowak of Harvard explored three forms of reciprocity in a lecture to a full house at the Royal Society, London in May 2005 sponsored by the Templeton Foundation.[4] Drawing on a long history of work including that of William Hamilton,[5] Robert Trivers[6] and Ed Wilson[7] he examined the basis of direct reciprocity – the exchange of altruistic acts between the same two individuals so that, in total, both obtain a net benefit. Whereas this means that you help somebody who might help you, it is a category of altruism criticised by Jesus – 'If you love those who love you, what credit is that to you? Even "sinners" love those who love them' (Luke 6:32). Clearly, Jesus was much more interested in ways to encourage positive behaviour when reciprocity was challenged by aggression. Indirect reciprocity, say Nowak and Sigmund,[8] means that your cooperation will be returned not by the recipient but by another individual, as occurs when people are willing to help someone who won't pay them

3 Vogel, G. 'The evolution of the Golden Rule' *Nature Science* (2004) 303, 1128-1131.
4 Nowak, M. A. 'Why we cooperate' *http://www.royalsoc.ac.uk/* (2005).
5 Hamilton, W. D. *Narrow Roads of Gene Land, Vol 1*, New York: Freeman (1996).
6 Trivers, R. *Social Evolution*, Menlo Park: Benjamin Cummings (1985).
7 Wilson, E. O. *Sociobiology*, Cambridge MA: Harvard University Press (1975).
8 Nowak, M. A. & Sigmund, K. 'Evolution of indirect reciprocity' *Nature* (2005) 437, 1291-1298.

back, provided other people see the charitable act. The generous person builds up a reputation for cooperation and others who observe this behaviour are more likely to cooperate with him or her – in other words 'do good and talk about it'! Jesus at times welcomed such publicity as in the healing of a demonic man (Mark 5:19), though at other times he shunned it and demanded silence, as in the remarkable recovery of the little daughter of Jairus, the synagogue ruler (Mark 5:43). Spatial reciprocity, the third form, means that neighbours help each other across societal boundaries, consistent with much Jewish and Christian teaching that speaks about doing to others what you would have them do to you (Matthew 7:12).

Any evolutionary analysis of cooperative interactions, let alone the form of altruism in which an act is costly to perform and confers a benefit on another individual, reminds us that in the real world science and religion cannot be as easily compartmentalised as the conflict hypothesis would suppose. Martin Nowak encourages his audience to be open-minded in their approach to the cooperation of science and religion, a long-held view of this year's Templeton Prize winner and Nobel Laureate, Charles Townes, the inventor of the laser. In a similar vein Gerald Holton writing of Isidor Isaac Rabi, an orthodox Jew and distinguished physicist, speaks of the way that Rabi was 'God-struck throughout his life' even though he separated from orthodoxy.[9] Like Einstein, Rabi was a Nobel Laureate and he saw science as a means of transcendence; doing great physics was walking the path of God. 'Whenever one of my students came to me with a scientific project,' he said, 'I asked only one question, "Will it bring you nearer to God?" Failure to approach science with an open mind can result in hubris and self-interest; failure to approach faith in a similar way can spawn prejudice and injustice instead of a lifestyle driven by 'love, joy, peace, patience, kindness, goodness, trustfulness, gentleness and self-control'.

Professor Sir Brian Heap CBE, FRS was previously Foreign Secretary and Vice-President of the Royal Society, and Master of St Edmund's College, Cambridge. He is on the Editorial Board of *Science & Christian Belief*.

9 Holton, G. *Victory and Vexation in Science: Einstein, Bohr, Heisenberg and Others*, Cambridge, MA: Harvard University Press (2005).