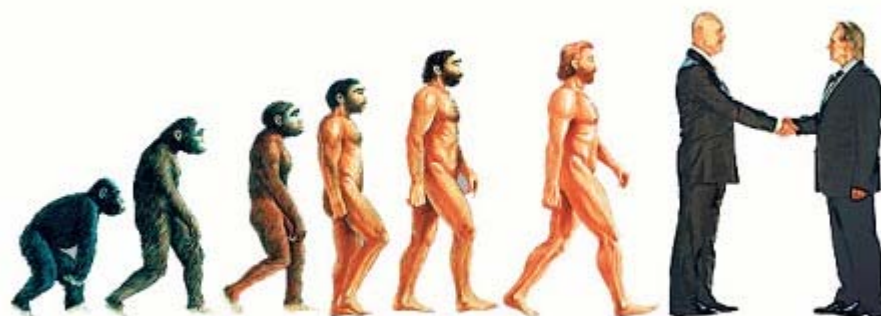


The Telegraph

Martin Nowak: a helping hand for evolution

Martin Nowak's latest book – written with Telegraph columnist Roger Highfield – is going to create controversy. He tells Tom Chivers why the values preached by Jesus are encoded in the laws of biology.



Martin Nowak's new book, *SuperCooperators*, co-authored with Telegraph columnist Roger Highfield, will be serialised next week.



By [Tom Chivers](http://www.telegraph.co.uk/journalists/tom-chivers/) (<http://www.telegraph.co.uk/journalists/tom-chivers/>)

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Even by the febrile standards of the [evolutionary](http://www.telegraph.co.uk/science/evolution/) biology community, Martin Nowak has become a controversial figure. An article he wrote for *Nature* last year with the mathematician Corina Tartina and Edward Wilson, the great entomologist, on the evolution of eusociality, has attracted the ire of prominent figures in the field, including Richard Dawkins and Jerry Coyne. Now comes the equally provocative *SuperCooperators*, a new book written with *Daily Telegraph* columnist and *New Scientist* editor Roger Highfield, which is to be serialised in this paper next week.

The controversy surrounds a core part of modern evolutionary theory, inclusive fitness. First suggested by the British scientist [JBS Haldane](http://www.telegraph.co.uk/science/), who declared that he would "lay down his life for two brothers, or eight cousins", and taken forward by his countryman Bill Hamilton, inclusive fitness implies that evolution can favour individuals who do not reproduce, so long as they aid the survival and reproduction of relatives who carry the same genes – the classic example being the sterile workers in an ant colony, who help the queen to raise their sisters, but never have children.

This concept is considered central to biology, since it provides the best explanation for why existence is not simply a dog-eat-dog, Darwinian struggle. But Prof Nowak is doubtful. "Inclusive fitness is somewhat like an epicycle," he says, referring to the Ptolemaic model of the solar system with the Earth at its centre, which required the planets to move in complicated flower patterns to explain their movement in the sky. "Somehow you

have the impression that there is some reality attached to it, but the actual mathematical description of any evolutionary process shows that evolutionary fitness is an unnecessary concept."

Instead, Nowak stresses that co-operation and altruism are just as important. "The two pillars of evolution are mutation and natural selection: mutation generates diversity, and natural selection chooses the winner. What I want to argue in this book is that, in order to get complexity, there is a third principle, co-operation. It's not just a small phenomenon, it is something that is really needed to explain the world as we see it." Without it, he says, we would have a world without multi-cellular creatures – or even without cells, just monomolecular replicators in an organic soup.

In the academic world, this is dynamite – Jerry Coyne has accused Nowak and Wilson of "wilful ignorance of the literature". Then there are creationists and the like eager to seize on any apparent divisions in biology's united front to show that Darwin's house is in ruins. Prof Nowak, a soft-spoken, wry, and politely charming man, is not afraid of picking a fight. After winning his PhD at the University of Vienna, Prof Nowak moved to Oxford University, where he mingled with some of the greatest minds in biology. His speciality is using mathematical equations to model and predict biological behaviour. "I talked to Bill Hamilton a lot, when I was at Oxford. And I talked an awful lot with Richard Dawkins as well. But I've never written a paper with them," he says. "I have written a paper with John Maynard Smith, and one with Ed Wilson," he adds, casually dropping two giants into conversation. And who are the ones who have most influenced you, I ask. "Robert May [the former chief scientific adviser to the government], influenced me very, very much." After nine years at Oxford, Prof Nowak moved to Harvard, where he is Professor of Biology and Mathematics. What riles some scientists is that he is not just the holder of prestigious prizes, but also a committed Christian. In particular, he is on the board of advisers of the Templeton Foundation – dismissed by Dawkins as an organisation which annually gives "a very large sum of money... usually to a scientist who is prepared to say something nice about religion".

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Nowak, however, sees no conflict. "I think that science and religion are components of what people need and what people want in terms of the search for truth. I don't see science as constructing or providing an argument against well-formulated and thoughtful religious philosophy." He is a Catholic, but in his book he quotes with approval Einstein's line about God as a sort of abstraction, seen in the beauty of nature's laws. I ask him to expand, but he shies away. "I am very open-minded, very curious, very keen to learn from other different traditions, different approaches." He does, however, believe in the divinity of Christ.

The great irony of his work, which heartens and amuses his religious side, is that he is, in essence, making a scientific argument that the virtues preached by Jesus – compassion, concern, love for your neighbour – are encoded into the laws of biology. "The mathematical analysis shows that winning strategies in the game of co-operation have to be hopeful, generous and forgiving."

In humans, that co-operation took a giant leap forward with the development of brains, and even more so with the invention of language. In the mathematical mechanisms for the evolution of co-operation created by Nowak and others, two key strategies for intelligent co-operation are "direct reciprocity" (I treat you according to how you have treated me) and "indirect reciprocity" (I treat you according to your reputation). Direct reciprocity is widespread in the animal kingdom, but indirect reciprocity is far rarer. Nowak has a simple explanation: "You can say it beautifully in one sentence, like my colleague David Haig at Harvard has done: 'For direct reciprocity you need a face; for indirect reciprocity you need a name.' For efficient indirect reciprocity, you need to be able to tell a story: 'Yesterday, when I had the following interaction with a certain person, this happened. So don't trust that person.' " It is humanity's ability to engage in this story-telling that led Nowak to give our species the title "super-cooperators".

"Now more than ever we need to know about the science of co-operation, to achieve co-operation on a very large scale, because the climate problem is a problem between different generations. And this makes it particularly complicated, because human selfishness and laziness will say 'I don't really care now, the people after me will solve the problem anyway' . ."

The next few years will see the central argument played out on the world stage: are we selfish creatures, whose innate self-interest will make things far worse for the species, or will the spirit of co-operation inspire us to face the challenges? For the sake of future generations, we'd better hope Prof Nowak has got his equations right.

'SuperCooperators: The Mathematics of Evolution, Altruism and Human Behaviour (Or Why We Need Each Other to Succeed)' (<http://books.telegraph.co.uk/BerteShopWeb/viewProduct.do?ISBN=9781847673367>) by Martin Nowak and Roger Highfield is published by Canongate on Thursday