# *Review*

*SuperCooperators: Altruism, Evolution, and Why We Need Each Other to Succeed.* By Martin A. Nowak, with Roger Highfield. New York: Free Press, 2011. 352 pages. $27.00.

Martin Nowak calls himself a "mathematical biologist." That might surprise us, though "mathematical physicist" would not. Newton and Einstein used much math; Darwin used little. Still, dimensions of biology are quite mathematical, such as population genetics. Nowak hopes by mathematical analysis to show that evolution generates *SuperCooperators.* We find out: *Why We Need Each Other to Succeed,* with the prospect that such *Evolution* explains *Altruism.* Math will show how altruism is inevitable.

Nowak can explain this by reporting on his math but without here using any. He prefers storytelling, often his interacting with famous biologists—enjoying their feats, foibles, and idiosyncrasies. The writing is excellent; he is assisted by science writer Roger Highfield. The book is more like a stimulating after-dinner conversation than a state-of-the-field analysis, though that is what the reader is simultaneously getting. But Nowak seems unaware that these many delightful and insightful personal episodes undermine his fundamental claim. "The cosmos itself is mathematical; everything and anything that happens in it is the consequence of universal logic acting on universal rules" (p. 2). His storytelling indicates otherwise.

Nowak is swimming upstream. Current Darwinists claim: "We are motivated by self-interest alone. ... Yet competition does not tell the whole story of biology. Something profound is missing. Creatures of every persuasion and level of complexity cooperate to live. ... This is the bright side of biology" (pp. xii-xiv). "Cooperation is the master architect of evolution" (p. xviii). "I have accumulated a wide range of evidence that competition can sometimes lead to cooperation" (p. 14). "By cooperation, I mean that would-be competitors decide to aid each other instead" (p. xiv).

Humans decide, maybe also wolves. Ants deciding? (Chapter 8) Vampire bats? (p. 21). They do coact, cooperate, operate together, work together, their behaviors coordinated. But such seeming deciding might be just stereotyped in their genes. One has to make a good many allowances for metaphors in this book. "To succeed in life, you need to work together—pursuing the snuggle for existence, if you like—just as much as you strive to win the struggle for existence" (p. xvii). Helpful metaphors give insight into the math, but one also has to watch for slippage between the terms. We use the word "attraction" across a spectrum from gravity to sexual love, but the two are unrelated phenomena. Similarly "cooperation" from molecules to morals might be useful "anthropomorphism" (p. 130), or maybe just intellectual confusion.

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Nowak is really a computer biologist. Some biological behaviors can be mimicked on computers. The most famous one is "prisoner's dilemma." Most *Zygon* readers know these games; they have been debated for decades. Two competitors often settle into a "tit for tat" strategy. A player starts cooperating and continues so as long as the opponent cooperates. If not, the player likewise switches to defect—until such time as the opponent may again venture cooperation.

These games are modified, often to recognize probabilities, randomness, mistakes, confusions, clumps of cooperators ostracizing noncooperators, public goods, punishments, operators in groups with fuzzy edges in the real world, migration between groups. A quite stable solution is "Generous Tit for Tat." "Win Stay, Lose Shift" can replace that, although Nowak finds that if the players do not make simultaneous decisions, "Generous Tit for Tat" returns.

Nowak is actually rather open-ended here, or thinks the long-term and ongoing results may be open. Life is more like chess than tic-tac-toe. "Our analysis of how to solve the Dilemma will never be completed. This Dilemma has no end" (p. 49). With such a closing to Chapter 1, readers may wonder whether mathematics is showing us selection processes that are indeterminate. That worry continues up to the end: "Cooperation comes and goes, waxes and wanes. It has to be reborn in endless cycles" (p. 276).

Five mechanisms make us work together: direct reciprocity, indirect reciprocity (which involves reputation), spatial selection, multilevel selection, and kin selection (Chapters 1-5; p. 270). None of these really reach "altruism." Reciprocity—you scratch my back; I'll scratch yours—is misleadingly called reciprocal altruism. Nowak is doubtful whether kin selection or inclusive fitness can account for most of the cooperation found in nature. These concepts that dominated the field for decades have lately withered. His discussion of how language enriches cooperation (Chapter 9) would have been enriched by more attention to "theory of mind" (mentioned on p. 55).

Nowak favors the power of reputation. The Good Samaritan gains because he builds his reputation and the benefits of this can outweigh his losses in caring for the victim. Of course this is not yet altruism either, because the Good Samaritan's behavior is in fact driven by the benefits he gets, even if the victim simultaneously benefits (Rolston, 2004).

Elliot Sober and David Sloan Wilson argue that tribes of "altruistic'* cooperators will out-reproduce tribes of selfish cooperators, but there is no "universal benevolence." "Group selection favors within-group niceness and between-group nastiness" (Sober and Wilson, 1998, p. 9). Nowak welcomes this work (p. 86). But he does not seem to realize this undermines his hope for universal SuperCooperators, a "crescendo of cooperation" (Chapter 14).

Dealing with climate change, Nowak fears the tragedy of the commons, but hopes that "game theory can save the world" (p. 215). "I believe that climate change will force us to enter a new chapter of cooperation" (p. 278). "Although we are teetering on the brink of disaster, we are also on the brink of advancing to the next level of cooperation" (pp. 277-78).

Nowak does not seem to realize that, although his account might show the natural history of how cooperation evolved, it is powerless to explain how a universal ethic could be produced or kept in place, as promoted, for example, by a missionary faith. Disciples, genetically unrelated to the proselytizers, enjoy the same survival advantage. There is no differential genetic benefit to the Samaritans or to related or unrelated others whom they convert. Universalist religion with its capacity to generate this generous altruism still needs adequate explanation.

Cultural nongenetic traits can help produce more offspring. Parents who build fires stay healthier in winter and have more healthy babies. But everyone else is soon building fires too, and the differential survival advantage is lost to particular individuals, their families, tribes, or even nations. Similarly, "Do to others as you would have them do to you" helps us to cope. Spread globally, it helps us cope *equally*. Without differential survival of genes in the next generation, Darwin is out of business.

But that is where Nowak hopes to end up with his "crescendo of cooperation," SuperCooperators so inclined to assist each other that among them there is no differential survival benefit. Perhaps what we learn, alas, is that such clusters of SuperCooperators can be forever invaded by resurgent Darwinian self-interest. "The degree of cooperation in a society will fail as inevitably as it will rise again" (p. 282). So does mathematical biology give us SuperCooperators or not?

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