# Helping out: altruism and cooperation

## Why do people help others, even though at first glance it may not be in their own best interests?






**Above (from left):** Ants (*iStockphoto*); humans (*www.johnbirdsall.co.uk*); rodents (*Oxford Scientific Films*); bees (*Oxford Scientific Films*); voting (*iStockphoto*); disposing of dog mess (*Rex Features*).

**Through Darwinian eyes, life is a struggle. Every creature is constantly competing – for food, water, energy or the chance to mate. Cooperation is fine, too, but only in one's own interests. Theory says the benefit must exceed the cost, where benefit is defined as increased fitness of an individual's selfish genes.**

So there would be no reason to cooperate, let alone do anything outright altruistic, unless you restrict it to close relatives, who share your genes. But humans, thank goodness, seem more cooperative than this implies. Of course, this agreeable disposition may have evolved when the steaks cut from the mammoth your band had just killed were going to be eaten by a roster of siblings and cousins. But why do we now help complete strangers whom we will never see again?

The impulse toward cooperation seems deeply embedded. Felix Warneken and Michael Tomasello in Leipzig showed that infants as young as 18 months spontaneously try to 'help' adults who are obviously having trouble with a task such as picking up something just out of their reach, or stacking books so high that one keeps falling off the top. Less expectedly, the same team found that young chimps (at any rate ones raised by humans) sometimes respond in the same way. But the chimps only saw what might be needed on the simplest tasks, and other studies suggest that chimps have no inclination to help outside their immediate family.

Others caution that results on chimps are of limited relevance. "It doesn't really get us any closer to understanding just what the differences between humans and our nearest relatives are – or why they have come to be that way," says Professor Robin Dunbar at the University of Liverpool.

Understanding that difference is not just an intellectual puzzle. It also raises questions for policy makers – when we may all have to cooperate to reduce the effects of global warming, for example. And in recent years the evolutionary theorists who have grappled with it have been joined by anthropologists and economists in exploring key details of human behaviour. They are uncovering a story of costs, payoffs, pleasure and punishment that shows how cooperation can be sustained, and maybe even how it might have evolved.

### Cost–benefit analysis

Much work has been done on computer simulations or models, where 'cooperators' interact with 'defectors' – who receive a benefit but give nothing in return. At its simplest, cooperators soon disappear, outcompeted by the selfish defectors.

But if cooperators are just a little more sophisticated, the advantage of cooperation begins to win out. In fact, in a simple model based on repeated interactions between two individuals who could either cooperate or defect, Robert Axelrod in the 1980s discovered that a very simple strategy – 'tit-for-tat' – was the most successful. The trick was to cooperate first then to mimic whatever the other player did.

This basic model has been added to over time, with more realistic simulations. One powerful concept is the idea of reciprocal altruism. This 'do as you would be done by' behaviour has clear benefits when both parties are related, and is widespread. As Professor Martin Nowak at Harvard University has put it, "reciprocal altruism has been demonstrated in animals as diverse as stickleback and cichlid fish, chimpanzees and undergraduates". Interestingly, the success of indirect reciprocity is dependent on 'reputation' – whether an individual is known as a cooperator or not.

By Jon Turney, a science writer based in London.

So much for theory – what about reality? Human behaviour has the same issues as the simulations. Cooperation with non-relatives ought to be undermined by cheating. If everyone else digs the dyke, fights the fire or vaccinates their child except you, you still get the payoff. But if they all think the same, disaster ensues. Economists call it the 'public goods' problem. Less dramatic examples are voting, recycling, or cleaning up after your dog (yes, yours) in the park.

Simple 'economic games' with monetary rewards linked to behaviour confirm the problem. Even if there are just a few free-riders at first, their numbers grow. In more complex games, perhaps a bit closer to real human behaviour, punishments of various kinds for the cheaters can keep cooperation going. But the core problem pops right up again. Punishment costs the punisher as well as the recipient. So why not be a second-order free-rider? Cooperate on the task, whatever it is, but let others take care of the punishment. By the logic of the theory, punishment is itself altruistic, hence hard to explain.

Some of the most striking recent findings here come from Bettina Rockenbach at the University of Erfurt in Germany. She and her colleagues have shown experimentally that given a choice between a group that uses punishments to keep cooperation going and one that does not, people start out preferring no punishment. But as the experiment goes on, everyone eventually switches their allegiance to the group with punishments because they can see that it is doing better.

The game suggests the stabilising power of punishment. There is also a neuroscientific angle to the story. It was already known that people get a kick out of trusting another player in the classic prisoner's dilemma games, in which two players have to cooperate to achieve a result.

Dominique de Quervain and colleagues at the University of Zürich – and, in work funded by the Wellcome Trust, Tania Singer and colleagues at UCL – have found that punishment can be similarly rewarding. Using functional imaging techniques, the groups found that delivering a punishment to a 'cheat', or knowing that a cheat was getting his or her comeuppance, activated areas of the brain involved in reward. Revenge really is sweet.

In humans, the work with cooperation games is being extended to check that other cultures (that is, ones not populated by university students) yield similar results. And there is work in New Guinea, for example, suggesting that new complexities arise when members of different groups are mixed in such experiments: 'referees' punish outsiders more.

One day, though, the combination of biology, economics and cultural analysis may help us to build better institutions. According to Joe Henrich at Emory University, Atlanta, and the University of British Columbia, game theory and experiments can tell us what works to build cooperation and trust, and reduce free-riding. Key strategies include punishment, and gain or loss of reputation. But local solutions, he says, "really depend on motivations that are, in part, culturally transmitted, so the combination of these that will work varies tremendously. In Fiji for example, where I do research, no one will punish, but reputation is powerful."

Dr Rockenbach suggests that the new insights into cooperation and punishment, from experiments by her group and others, already have implications for how we act from day to day. "Although humans have strong resentments against a society with effective means of sanctioning, the breakdown of cooperation in the sanction-free alternative 'converts' them."

**Ant and bee**

Altruistic behaviour is rare in nature, but is seen in social insects as well as humans. Helping kin is important, but recent research has highlighted the importance of coercion – individuals are forced to cooperate by 'policers'. In the honey bee and several wasp species, workers forgo reproduction and help raise offspring. They are 'encouraged' to do so by the queen or fellow workers who destroy any worker-laid eggs. Effective policing thus promotes social order.

Even so, when law enforcement is removed, some altruistic behaviour is still seen, suggesting that relatedness is an important underlying factor. There are hopes that the recent sequencing of the honey bee genome will lead to new insights into the biological mechanisms of altruism in this fascinating creature.

Nevertheless, argues Professor Nowak, punishment may promote cooperative behaviour but it cannot establish it. It enhances underlying principles such as indirect reciprocity.

What of humans? Our adoption of altruism seems to have gone hand in hand with the expanded capacity of the human brain. Indirect reciprocity calls for significant cognitive skills, Professor Nowak points out, as we monitor our interactions with others, remember how people behave and communicate information. The benefits of cooperation could conceivably have driven the evolution of social cognition, language and possibly intelligence itself.

**Further reading**


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