

The mystery of altruism

Does true altruism exist? And can science provide the answer?

By Oren Harman

The origin of kindness is a mystery. Where do giving and altruism come from? Were they inherited on the wings of natural selection – a gift bestowed upon us via the inching, evolutionary march of sacrificial amoeba, selfless penguins and charitable baboons? Or is altruism a unique refinement, a singular human triumph over ‘nature red in tooth and claw’? Charles Darwin called this the greatest single riddle, and thinkers ever since have tried to crack it.

Here is the mystery: if evolution is a process of survival of the fittest, and altruism is a behaviour that reduces

fitness, why do we find altruistic acts wherever we look in nature? Consider the honey-pot ants of the American deserts, hanging upside down like great big pots of sugared water, perennially, waiting to be tapped by the queen and her brood when they are thirsty; or gazelles, conspicuously jumping up and down to signal to the troop that a lion lurks in the grass; or, for that matter, yellow jewelweed plants (*Impatiens pallida*), which, when sunlight becomes scarce, do not hog it by investing in the creation of leaves, but rather invest in stems and roots so as to share the sunlight with everyone. These are just a few of thousands of examples from across the natural world.

Biological altruism is defined by the result of an action: if an amoeba acts in such a way as to reduce its own fitness while providing a fitness benefit to another, it is an altruist. (Certain species of social amoeba are known to sacrifice themselves for their brethren.) Human, or psychological altruism, on the other hand, is all about intent: if I help an old lady cross the

Commonly referred to as slime mould, *Dictyostelium discoideum* is a soil-living amoeba. When starved, the normally free-living cells aggregate into a ‘slug’, consisting of viable spores and an altruistic, non-reproducing stalk.

Images courtesy of Owen Gilbert



Image courtesy of D Gordon E Robertson; image source: Wikimedia Commons

- ✓ Biology
- ✓ Social studies
- ✓ Evolution
- ✓ Natural selection
- ✓ Genetics
- ✓ Ages 15+

Altruism is a behaviour observed in all types of organism, yet its causes remain a mystery. In this article, Oren Harman explores the plausible causes of altruism and whether true altruism exists in humans.

This is not a science article in the strict sense; it could be used just as easily in a social studies lesson. Teachers could use the article as the basis of a discussion of many topics that link science and social studies subjects: for example, natural selection and altruism; the genetic basis of altruism; altruism and the fitness of the group; and mathematical formulations for altruism. The article could be used for any age group of secondary-school students, in particular those aged 15-19.

The article could be used in a comprehension exercise, with potential questions including:

1. Why is altruism considered to be a behaviour that reduces fitness for the individual organism?
2. Some people believe that true altruism does not exist in humans. Why is this?
3. Altruism is a behaviour that could play a role in natural selection. Use a specific example to support this idea.
4. 'If altruism could be explained by mathematics, it was never really what it seemed.' Explain what this means.

Michalis Hadjimarcou, Cyprus

REVIEW

Gazelles conspicuously jump up and down to signal to the troop that a predator is lurking in the grass.

road because I have secret designs to be written into her will, then I am not considered an altruist, even if a truck hits and kills me during the process. Still, is there a connection between altruistic acts in amoeba and altruism in humans? After all, just like the actions of the brainless miniature amoeba, the brain that allows us humans to act selflessly is a product of evolution.

Ever since Darwin, and really much earlier, we have sought to answer these riddles. In particular, we have been interested in whether true altruism even exists. 'Scratch an altruist and see an egoist bleed,' some philosophise. Is that how we should explain the lives of Nobel Peace Prize winners Albert Schweitzer and Mother Theresa? Or a soldier jumping on a grenade to save his mates? Cynics would say that, whether consciously or not, sacrifice is always driven by ulterior motives.

History teaches that when considering the relationship between nature and morality, we often stumble into what is called Hume's Guillotine (described by the Scottish philosopher David Hume [1711-1776] and often mistakenly referred to as 'the naturalistic fallacy'). That is, the mistake of confusing that which *is* with that

Bees, wasps and ants (the Hymenoptera) exhibit haplodiploidy, whereby females are more genetically similar to their sisters than to their own offspring.

A honeybee, *Apis mellifera*

A German wasp (*Vespa germanica*)

Image courtesy of CrazyD; image source: Wikimedia Commons

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Image courtesy of Stephen Ausmus; image source: Wikimedia Commons

Fire ants



In a colony of honey-pot ants, some individuals have vastly swollen abdomens, providing a food resource for the rest of the colony.



Image courtesy of the UK Ministry of Defence

How can altruistic behaviour such as a soldier jumping on a grenade to save his comrades be explained scientifically?

One scientist who tried to solve the mystery of altruism was the US population geneticist George Price. Deriving an equation in the late 1960s that would later carry his name, Price came to believe that if altruism could be explained by mathematics, it was not true altruism. Selflessness was always interested – this is what he believed his equation seemed to indicate (Price, 1970).

For George Price, this was a terrible realisation and he descended on the homeless people of London, UK, like an angel, determined to disprove the very maths that he had constructed. In the end, having given away all his possessions, he became a homeless derelict himself, committing suicide in a cold London squat in 1975.

Science is a powerful tool for understanding the world. Neurogenetics and functional magnetic resonance imaging studies are attempting to find the genes for altruism and the particular regions of the brain that play a role in altruistic behaviour (Churchland, 2011). But precisely because of this, we need to remember the fate of George Price: his story is a personification of the very paradox of altruism. It

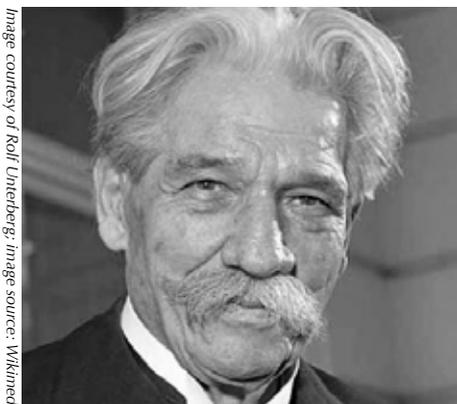


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Albert Schweitzer (1875-1965) won the Nobel Peace Prize in 1952 for his philosophy of 'reverence for life'.

which *ought to be*; or, what we observe in nature with a rule for our own behaviour (Hume, 1739). This is important when it comes to altruism, because in the years since Darwin, science has provided a number of explanations for the evolution of sacrificial traits.

One of these explanations is nepotism: the closer the genetic relatedness, the greater the chance of altruism. This was formalised in algebra by the late British evolutionary biologist Bill Hamilton, who stated that a genetic trait for altruism should spread through a population if:

$$rB > C$$

where *r* is the genetic relatedness of the two individuals, *B* is the reproductive benefit gained by the recipient of the altruistic act, and *C* is the repro-

ductive cost to the individual performing the altruistic act (Hamilton, 1964a, 1964b). Does this mean that it is natural to help kin, but unnatural to help strangers?

Perhaps not. Another explanation is simple reciprocation: one individual should help another in the expectation of being helped in return. Related to this is the matter of trust: if I cannot signal to others that I can be trusted, I won't survive in a world that depends on co-operation.

A third explanation is group selection: those groups that use altruism as a social glue to help to cement cohesion will outcompete groups of non-co-operative individuals.

But do these explanations leave room for true altruism? The explanations satisfy the sceptic, as they all ultimately hinge on the logic of egoism: it's worth helping others or even the group if it benefits yourself. And if that is what models and theories show, supported by empirical observation, then perhaps true altruism is really just a dream. More dangerous still is the idea that if we evolved to be altruistic only for selfish reasons, perhaps we shouldn't even attempt to behave as true altruists.

Naked mole rats are sometimes referred to as the social insects of the mammal world.



Image courtesy of Lishears; image source: Wikimedia Commons



Mother Teresa of Calcutta (1910-1997) won the Nobel Peace Prize in 1979 for serving the poorest of the poor.

Image courtesy of Evert Oudekerken; image source: Wikimedia Commons

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Science and Society

In low light conditions, yellow jewelweed plants (*Impatiens pallida*) are thought to grow tall and leggy, to share the sunlight with other plants of the same species.



Biology

To find out why psychologist Steven Pinker does not support the idea of group selection, see his essay 'The false allure of group selection'. <http://edge.org/conversation/the-false-allure-of-group-selection>

If you found this article interesting, you may like to browse the other biology-related articles in *Science in School*. See www.scienceinschool.org/biology

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As a writer, Oren has contributed to *The New Republic*, *Science*, *Nature*, *The New York Times*, *The Times*, the *Times Literary Supplement*, the *New York Review of Books*, the *Economist*, *Forbes*, *The Huffington Post* and many others. He used George Price's story in his book *The Price of Altruism* (Harman, 2010) to illustrate 150 years of efforts to find the origins of kindness. The book won the 2010 Los Angeles Times Book Prize.



NY, USA: W.W. Norton. ISBN: 9780393067781

Hume D (1739) *A Treatise on Human Nature*. Cheapside, UK: John Noon
The text is freely available online via Project Gutenberg. See: www.gutenberg.org/ebooks/4705

Price GR (1970) Selection and covariance. *Nature* **227**: 520-521. doi: 10.1038/227520a0

Download the article free of charge on the *Science in School* website (www.scienceinschool.org/2012/issue25/altruism#resources), or subscribe to *Nature* today: www.nature.com/subscribe

Web reference

w1 – This article is based on an article by Oren Harman^{w1} on the Forbes website (www.forbes.com). See the direct link: <http://tinyurl.com/orenharman>

Also on the Forbes website, watch a video of Oren Harman discussing the story behind his latest book, *The Price of Altruism*. <http://video.forbes.com/fvn/booked/price-of-altruism>

Resources

Philosopher Elliott Sober and biologist David Sloan Wilson attempt to reconcile altruism, both evolutionary and psychological, with the scientific discoveries that seem to portray nature as 'red in tooth and claw'.

Sober E, Wilson DS (1998) *Unto Others: The Evolution and Psychology of Unselfish Behavior*. Cambridge, MA, USA: Harvard University Press. ISBN: 978-0674930476

shows that the tools of science are not always relevant to the kinds of questions we are interested in, such as how we should behave. If we are able to answer all the scientific questions we can pose, will it explain everything that we want to understand? George Price's story demonstrates that the answer to this question is 'no'.

Acknowledgement

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