

Spiteful genes show their nature

After the selfish gene, popularised by the evolutionary biologist Richard Dawkins, comes the spiteful gene. Researchers at Edinburgh University are building a framework of theory and observation to show that "spite" – organisms deliberately harming both themselves and other members of the species – occurs much more frequently in nature than most biologists realised.

Spite is distinct from selfishness, in which an organism will do anything to help itself, and altruism, in which it helps others at its own expense. Andy Gardner, a theoretical biologist at Edinburgh, calls spite "the relatively neglected ugly sister of altruism". It evolves when individuals within a species compete aggressively for resources in a confined environment. Spiteful behaviour may pay off for the perpetrator when it is "negatively related" to the victim. This means that genetically it has less in common with its victim than with other competitors.

"Spite has been neglected by social evolution theory because negative relatedness

is generally regarded as implausible," says Dr Gardner. "However, we have shown that when there is strong competition between individuals, substantial negative relatedness can arise. This means that individuals are happy to hurt their social partners, even if they hurt themselves in the process."

One example is a parasitic wasp that lays its eggs in a moth caterpillar. Most hatch into normal larvae, which compete for food inside the caterpillar. But some develop very rapidly into an aggressive, sterile form, which sacrifices its chances of reproduction and swims around murdering as many larvae as it can. It recognises its genetic relationship with other larvae and concentrates on killing those that are most distantly related, so more food is left for its closer kin.

In papers published today in *Science* and the *Journal of Evolutionary Biology*, Dr Gardner and his colleague Stuart West argue that spite is a widespread evolutionary force among insects and bacteria.

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